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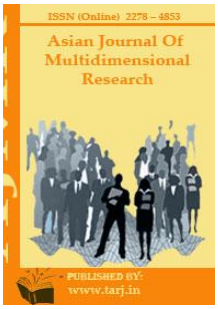

Asian Journal of Multidimensional Research (AJMR)

(Double Blind Refereed & Reviewed International Journal)

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Special Issue

National Conference Titled:

CHALLENGES AND SUSTAINABLE APPROACHES TOWARDS FOOD AND NUTRITION SECURITY-A GLOBAL PERSPECTIVE

7-8 DECEMBER 2018,

Organised By

DEPARTMENT OF FOOD SCIENCE AND NUTRITION

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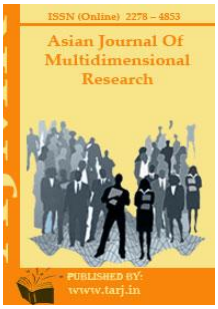

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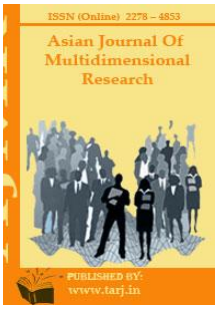

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FORMULATION AND STANDARDIZATION OF WATERMELON SEED POWDER INCORPORATED WHEAT RUSK

Shezna S*; Priya A**

*PG Student,
Department of Foods and Nutrition,
Rathnavel Subramaniam College of Arts and Science,
Sulur, Tamil Nadu, INDIA
Email id: sheznashan@gmail.com

**Assistant Professor,
Department of Foods and Nutrition,
Rathnavel Subramaniam College of Arts and Science,
Sulur, Tamil Nadu, INDIA

ABSTRACT

Watermelon (Citrullus lanatus) is one of the important fruit crop is a herbaceous creeping plant, which belongs to the family Cucurbitaceae is a vine-like flowering plant originally from Southern Africa. Watermelon seeds are known to be highly nutritional as they are rich source of protein, vitamins B, minerals such as magnesium, potassium, phosphorus, sodium, iron, zinc, manganese and copper, fat and as well phytochemicals. Watermelon seed was incorporated in the standard product in four variations such as sample A (5%), sample B(10%),sample C(15%) and sample D(5%) by substituting the major ingredient wheat flour. The aim of the study was achieved and it was concluded that the watermelon seed powder incorporated wheat rusk with 15% was accepted. The prepared product is high in protein and iron when compare to the standard product. The prepared product is acceptable till 5th day without any microbial growth if it is stored in polythene cover properly.

KEYWORDS: *Cucurbitaceae, Phytochemicals, Nutritional, Incorporated, Polythene*

1. INTRODUCTION

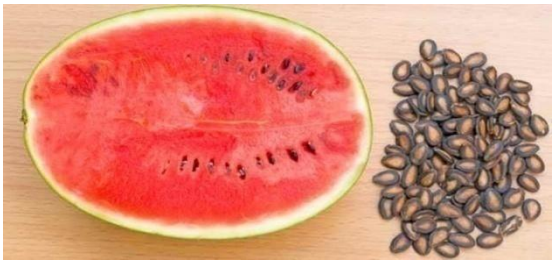
Watermelon (*Citrullus lanatus*) is one of the important fruit crop is a herbaceous creeping plant, which belongs to the family *Cucurbitaceae* is a vine-like flowering plant originally from Southern Africa. Watermelon is large, oval, round or oblong in shape. It is a special kind of fruit referred by botanists as a "pepo", a berry which has a thick rind (exocarp) and fleshy center (mesocarp and endocarp). Watermelon is an important summer season crop whose peak season of harvest falls on the hot summer days and is highly relished due to its cool and thirst quenching property. The content of edible flesh of watermelon fruit per 100 g is; water 92 %, protein 0.2 %, minerals 0.3 % and carbohydrates 7.0 %. The edible portion of the fruit about 60 % of the whole fruit and juice is the major product for which the fruit is processed. Watermelon juice contains a fair amount of Vitamin C, Vitamin A Precursor (Lycopene), carotenoids and a high content of potassium.

Production of high quality watermelon seeds depends upon the precise timing of the harvest of mature fruits and upon proper seed extraction and storage practices. Watermelon seeds are known to be highly nutritional as they are rich source of protein, vitamins B, minerals such as magnesium, potassium, phosphorus, sodium, iron, zinc, manganese and copper, fat and as well phytochemicals. The seeds are for instance used to prepare snacks, milled into flour and used in preparation various snack items. In spite of many health benefits of watermelon seeds they are often discarded while fruit is eaten. In this study, watermelon seed powder incorporated wheat rusk was prepared and subjected for nutritional, shelf life, microbial and cost analysis and moreover the best variation was popularized among the adolescent population.

2. MATERIALS AND METHODS

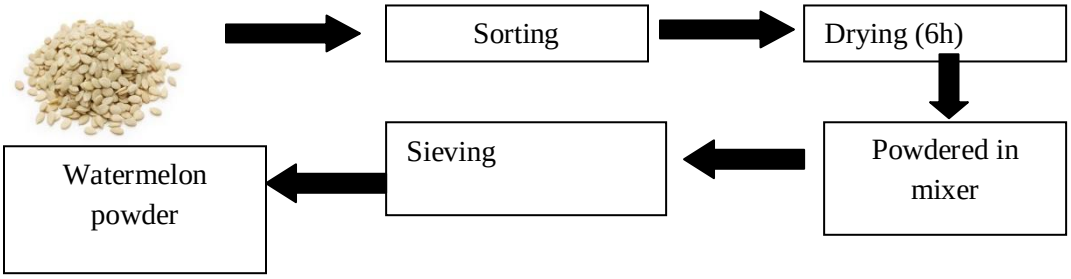
Watermelon seeds were collected from the local market and it was powdered and stored in an air tight container.

PLATE 1-THE SELECTED WATERMELON SEEDS



2.1 PREPARATION OF WATERMELON SEED POWDER

Watermelon seed



2.2 PREPARATION OF WATERMELON SEED POWDER WHEAT RUSK: Wheat rusk is manufactured from wheat flour, salt and a raising agent by a traditionally slow process of baking,

drying, gristing and blending to produce a consistently high quality product capable of absorbing twice its own weight of water without being soft and pasty. Watermelon seed was incorporated in the standard product in four variations such as sample A(5%),sample B(10%),sample C(15%) and sample D(5%) by substituting the major ingredient wheat flour. The prepared products along with the standards were subjected to secondary analysis and the best product was selected for further study.

PLATE 2-PREPARED RUSK

2.3 SENSORY EVALUATION: Sensory evaluation is a scientific discipline that applies principles of experimental design and statistical analysis to the use of human senses (sight, smell, taste, touch and hearing) for the purposes of evaluating consumer products. The prepared products and standard were underwent sensory evaluation to select the best sample by a semi-trained panel members from the Department of Foods and Nutrition. A score card was prepared using five point hedonic scales for the criteria like appearance, colour, flavor, texture and taste and the same was used for sensory evaluation.

2.4 NUTRIENT ANALYSIS: Nutrient of the best sample of watermelon seed powder incorporated wheat rusk and standard were analysed. Nutrient analysis was carried out in Alpha lab. Protein is analysed by using micro kjeldahl method and iron is analysed by ash test.

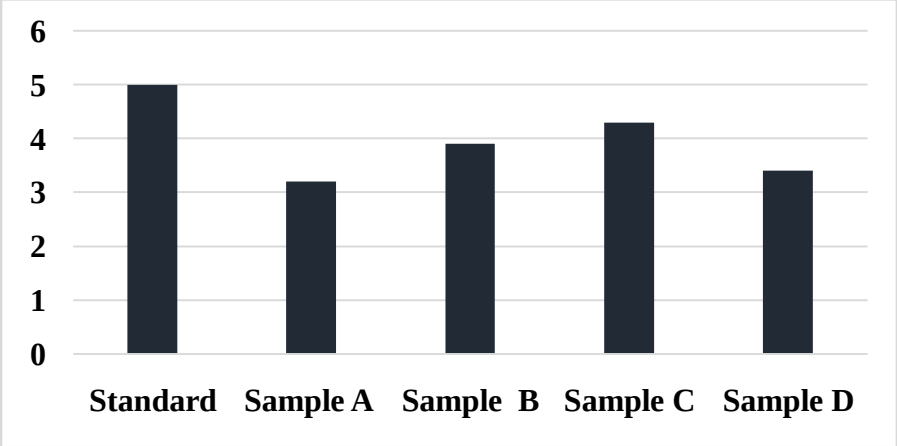
2.5 MICROBIAL ANALYSIS: Microbial test was done every third day of the study for both standard and the selected product by using spread plate technique.

2.6 POPULARIZATION: The prime aim of the popularization program was to create awareness among the public about the beneficial effect of Watermelon Seed Powder incorporated Wheat Rusk and their contribution to health. The popularization was done among adolescent girls.

3. RESULT AND DISCUSSION

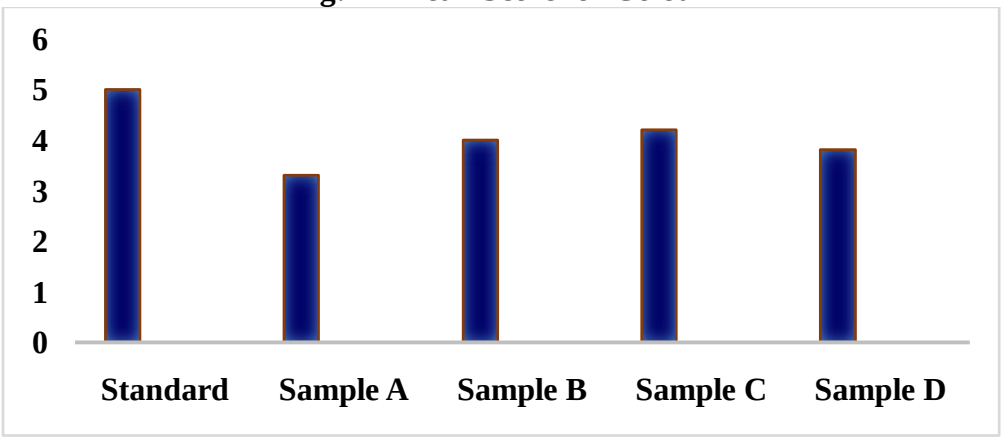
3.1 SENSORY EVALUATION OF WHEAT RUSK

Fig: 1 Mean Score for Appearance



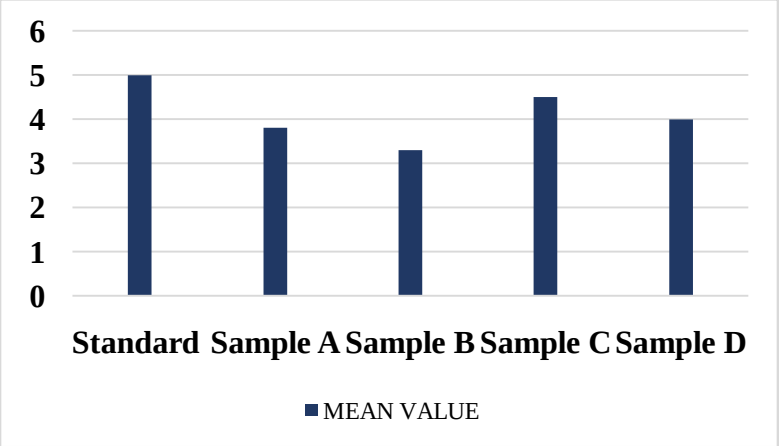
From the above **Figure 1**, it is observed that standard Wheat Rusk had a highest mean score of 5±0 for appearance. On incorporation of Watermelon Seed Powder, sample C (15%) had a highest mean score of 4.3±0.62 and sample A, had a lowest mean score of 3.2±1.07, whereas the sample B, D have moderate values of 3.9±0.96 and 3.4±1.13 respectively. The scores indicate that 15% incorporation of Watermelon Seed Powder in Wheat Rusk was accepted.

Fig: 2 Mean Score for Colour



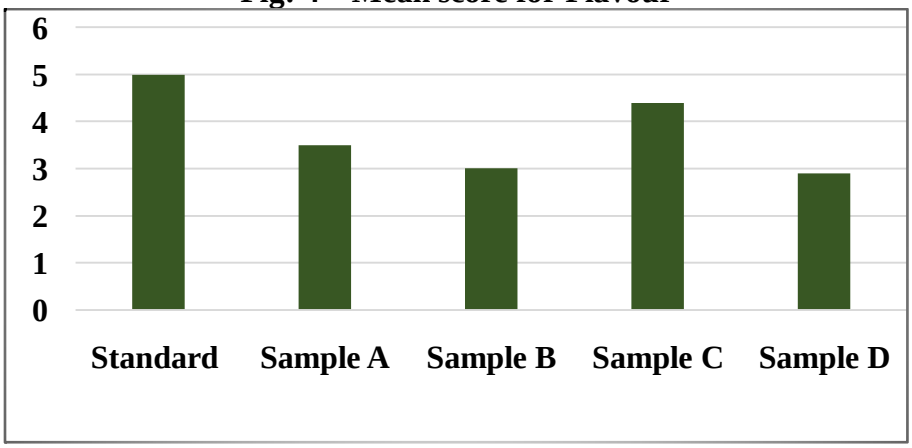
From the above **Figure 2,** it is observed that standard Wheat Rusk had a highest mean score of 5±0 for color. On incorporation of Watermelon Seed Powder, sample C (15%) had a highest mean score of 4.2±0.80 and sample A, had a lowest mean score of 3.3±1.12, whereas the sample B, D have moderate values of 4.0±0.98 and 3.8±1.12 respectively. The scores indicate that 15% incorporation of Watermelon Seed Powder in Wheat Rusk was accepted.

Fig: 3 Mean score for Texture



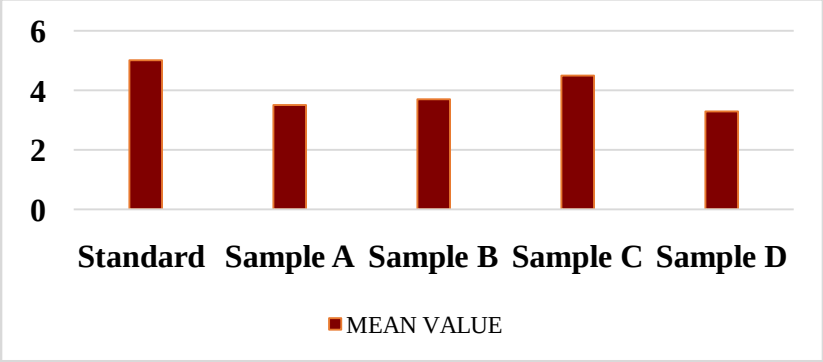
From the above **Figure 3**, it is observed that standard Wheat Rusk had a highest mean score of 5±0 for texture. On incorporation of Watermelon Seed Powder, sample C (15%) had a highest mean score of 4.5±0.72 and sample B, had a lowest mean score of 3.3±1.24, whereas the sample A, D have moderate values of 3.8±1.06and 4.0±0.90 respectively. The scores indicate that 15% incorporation of Watermelon Seed Powder in Wheat Rusk was accepted.

Fig: 4 Mean score for Flavour



From the above **Figure 4,** it is observed that standard Wheat Rusk had a highest mean score of 5±0 for flavor. On incorporation of Watermelon Seed Powder, sample C (15%) had a highest mean score of 4.4±0.85 and sample D, had a lowest mean score of 2.9±0.96, whereas the sample A, B have moderate values of 3.5±1.10 and 3.0±0.98 respectively. The scores indicate that 15% incorporation of Watermelon Seed Powder in Wheat Rusk was accepted.

Fig: 5 Mean score for Taste

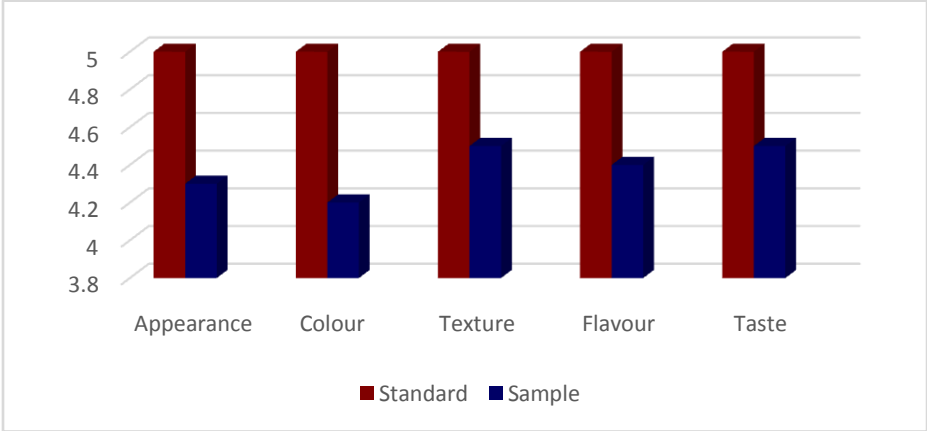


From the above **Figure 5,** it is observed that standard Wheat Rusk had a highest mean score of 5±0 for taste. On incorporation of Watermelon Seed Powder, sample C had a highest mean score of 4.5±0.73 and sample D, had a lowest mean score of 3.3±1.05, whereas the sample B, C have moderate values of 3.5±1.19 and 3.7±1.08 respectively. The scores indicate that 15% incorporation of Watermelon Seed Powder in Wheat Rusk was accepted.

Table I and Fig: 6

Table I and Fig: 6- Comparison of Mean Scores of Standard and Selected Proportion of Watermelon Seed Powder Incorporated Wheat Rusk

SL.NO	CRITERIA	SCORE	STANDARD PRODUCT	SELECTED PRODUCT
1.	Appearance	5	5±0	4.3±0.62
2.	Colour	5	5±0	4.2±0.80
3.	Texture	5	5±0	4.5±0.72
4.	Flavour	5	5±0	4.4±0.85
5.	Taste	5	5±0	4.5±0.73



From the above **Table I and Figure 6**, it was concluded that the mean sensory scores for the overall acceptability obtained by the sensory evaluation of standard Wheat Rusk and varying proportions of Watermelon Seed Powder incorporated Wheat Rusk with the help of score card. Sample C (15%) had the highest mean score in all the criteria when compared to other samples like sample A, B and D. So that we can conclude that Sample C with 15% Watermelon Seed Powder was selected as the best product.

3.2 NUTRIENT ANALYSIS OF SELECTED AND STANDARD PRODUCT

Table II- NUTRIENT ANALYSIS OF THE PRODUCTS

SL.No	NUTRIENT	STANDARD	SAMPLE
1	Protein (g)	14	17.5
2	Iron (mg)	2.7	8.70

From the above **Table II,** it was observed that the Protein content was 26.1g/100g in selected product and 14g/100g protein in standard product. Iron content was 8.70/100g in selected product and 2.7g/100g iron in standard product. From the results, it can be concluded that there is an increase in protein and iron content on incorporation of Watermelon Seed Powder.

3.3 MICROBIAL ANALYSIS: It was clear from the microbial analysis that there was no microbial growth in standard and sample immediately after preparation and on 1st, 2nd and 4th day. So, from the result we can conclude that the product is safe for consumption on storage in polythene cover hygienically.

3.4 COST ANALYSIS: On cost analysis of standard and best product it was observed that the cost of 100g watermelon seed powder incorporated wheat rusk was Rs 50/-. Whereas the cost of standard was Rs.35/-. Though the cost of the selected product is high, it is rich in protein and iron when compared to standard.

3.5 POPULARISATION: About 30 adolescent girl participants were selected randomly for the study and they were given a set of ten questions before popularisation and the same questions were given after popularisation and it was found that after popularisation about the importance of nutrient and health benefits of under- utilised watermelon seeds there was a positive effect among the selected population of the study.

4. CONCLUSION

The aim of the study was achieved and it was concluded that the watermelon seed powder incorporated wheat rusk with 15% was accepted. The prepared product is high in protein and iron when compare to the standard product. The prepared product is acceptable till 5th day without any microbial growth if it is stored in polythene cover properly. The cost of the best product was higher than standard. In the popularization study the entire adolescent population accepted the product.

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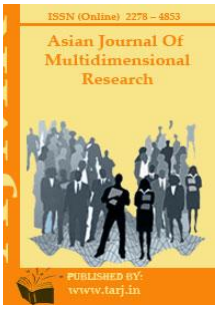

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IMPLEMENTING SUSTAINABLE, HEALTHY NUTRITURE BY INTRODUCING DIPLAZIUM ESCULENTUM AMONG THE TRIBAL ADOLESCENT GIRLS WAYANAD DISTRICT KERALA

Remya M.J*; A. Thirumnani Devi**

*Research Scholar,
Avinashilingam Institute for Home Science and
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: remyasabs@gmail.com

**Professor and Head,
Avinashilingam Institute for Home Science and
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

The health status of tribal populations including adolescents is very poor and worst because of their isolation, and remoteness. Adolescence is a period of rapid growth and maturation inhuman development. This technique can reveal the spatial interrelationships and three-dimensional structure of plant cell organelles, pictured cytoskeletal elements, probably microtubules, in leaf mesophyll cells and thus provided an overall idea about the tested sample. Most of the tribals are forest dwellers as well as the forest gathers too. They commonly found their daily food like roots and tubers, bamboo rice, leafy vegetables, fruits and seeds, honey, etc. from the forest itself. It not possible to easily introduce new foodstuff among such groups. Here introducing foodstuff which is seen among them with a purpose can help to irradiate deficiency to some extent. Through this study the invigilator tries to make an awareness among the tribal adolescents girls (10-15yrs) about the Diplazium esculentum in the selected area. From these herbs, Diplazium esculentum(Churuli chappu) is selected for the Further study due to its wide distribution.

KEYWORDS: *Adolescents, Organelles, Cytoskeletal Elements, Probably Microtubules,*

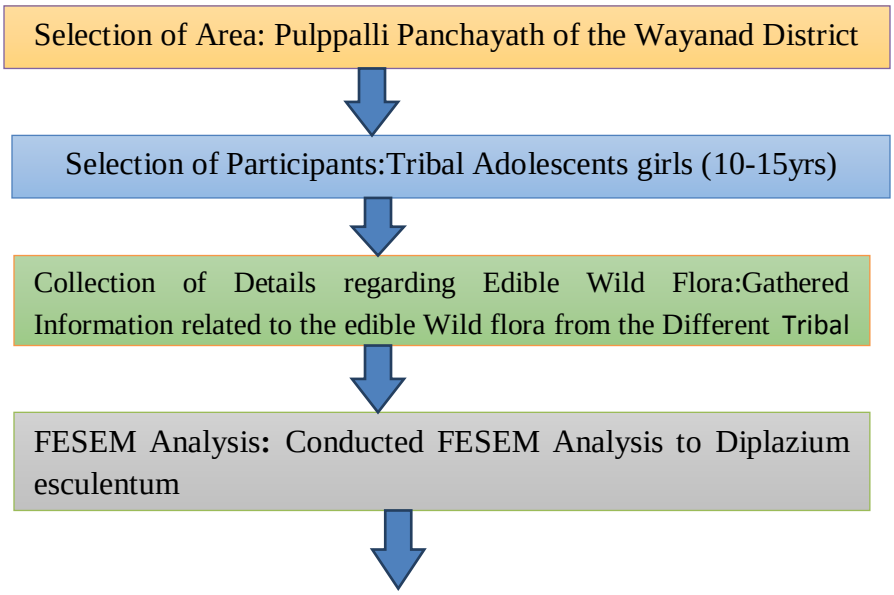
1. INTRODUCTION

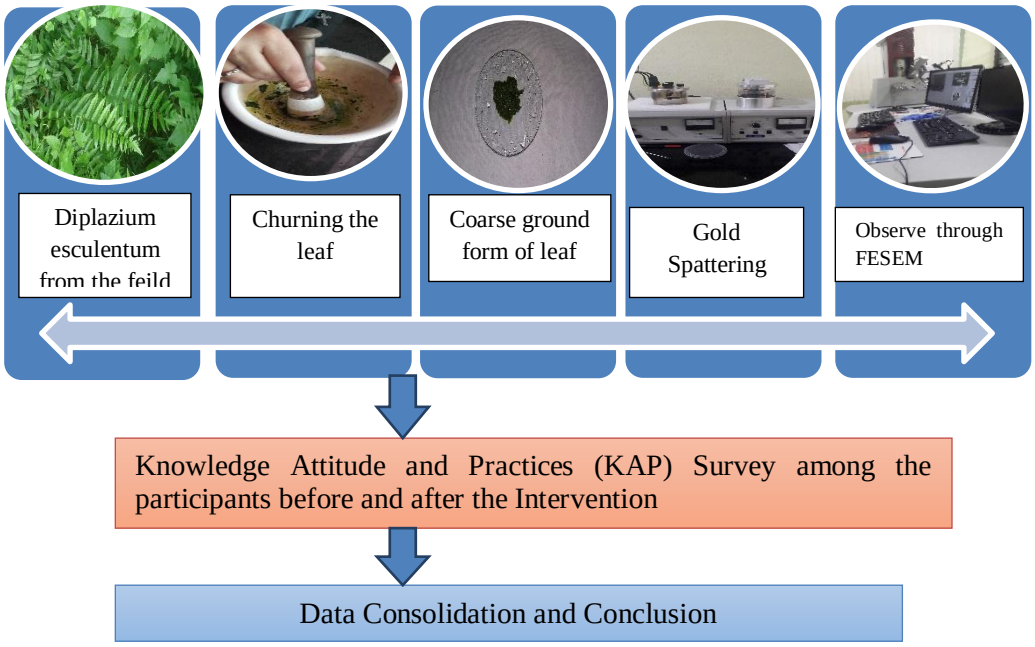
At 1996, FAO Rome World Food Summit, food security was defined as a condition that exists when all people, at all times have satisfactory access to, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. The health status of tribal populations including adolescents is very poor and worst because of their isolation, and remoteness. Adolescence is a period of rapid growth and maturation inhuman development. Health is one of the major issues revolving the stage of adolescence. It is estimated according to the 2011 census, every fifth person in India is an adolescent. The tribal adolescent girls need special care in view of their role in shaping the health and wellbeing of the present as well as future generations Passi and Malhotra (2012). The nutritional status of adolescent girls, the future mothers, contributes significantly to the nutritional status of the community. *Diplazium esculentum* commonly called Churuli Chappu is the most common edible fern seen in the forest areas and riversides Kerala State. Even though the herb is widely distributed, this was not utilized properly or neglected to use because of obliviousness of the nutritional importance. Field Emission Scanning Electron Microscope (FESEM) is a microscope that works with electrons instead of light. This technique can reveal the spatial interrelationships and three-dimensional structure of plant cell organelles, pictured cytoskeletal elements, probably microtubules, in leaf mesophyll cells and thus provided an overall idea about the tested sample. Through this study the invigilator tries to make an awareness among the tribal adolescents girls (10-15yrs) about the *Diplazium esculentum* in the selected area.

So the objectives of this study are; to,

1. Assess the surface topography of Diplazium esculentum by using FESEM.
2. The elemental composition of Diplazium esculentum by Energy Dispersive X-ray Spectroscopy (EDX).
3. Imparting Nutritional Knowledge about the *Diplazium esculentum* among selected participants and Assess Knowledge Attitude and Practice (KAP)

2. METHODOLOGY





Materials and methods

3. RESULTS AND DISCUSSION

200 tribal adolescents girls (10-15yrs) were selected from Pulppalli Panchayath of the Wayanad District by purposive random sampling method for this study due to the convenience of the investigator.

1. **Collection of Details regarding Edible Wild Flora**: Gathered Information related to the Wildedible flora from the different tribal communities

TABLE 1.DETAILS REGARDING WILD EDIBLE FLORA USED BY THE TRIBAL POPULATION.

S/N	Scientific Name of the Herb	Local name by tribals
1.	Hygrophila auriculata	Vayalchulli
2.	Erythrina stricta Roxb	Murikkin chappu
3.	Glycosmis pentaphylla	Pannal
4.	Dunaliella salina	Thumba
5.	Cassia tora	Thakara
6.	Diplazium esculentum	Churuli chappu
7.	Amaranthus caudatus	Kaattu cheera
8.	Amaranthus viridis	Kuppa cheera
9.	Colocasia esculenta	Chembuthall
10.	Solanum nigrum	Kaakkachappu
11.	Phyllostachys edulis	Illi koombu
12.	Bambusa vulgaris	Mulakoombu

Most of the tribals are forest dwellers as well as the forest gathers too. They commonly found their daily food like roots and tubers, bamboo rice, leafy vegetables, fruits and seeds, honey, etc. from the forest itself. There are so many plant sources which normally used by the tribal population but these are some herbs particularly used by tribals and most of them were not recognized by other

population in the same locale. From these herbs, *Diplazium esculentum* (Churuli chappu) is selected for the Further study due to its wide distribution.

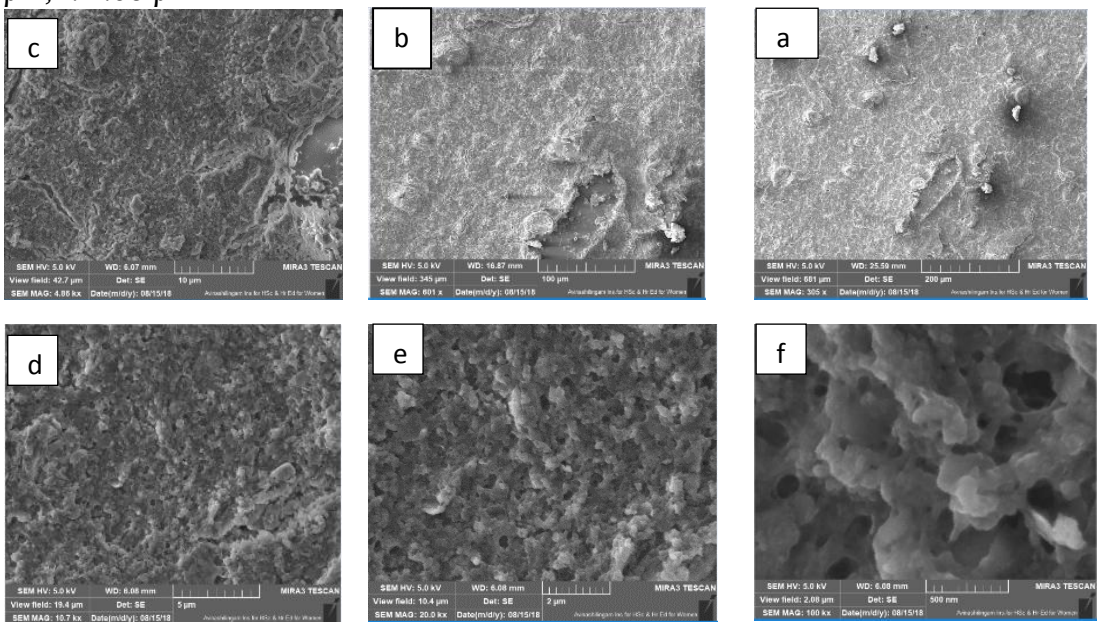
2. FESEM Analysis: Conducted FESEM Analysis to *Diplazium esculentum*

There is some procedure prior to analysing *Diplazium Esculent m*using FESEM. Which were,

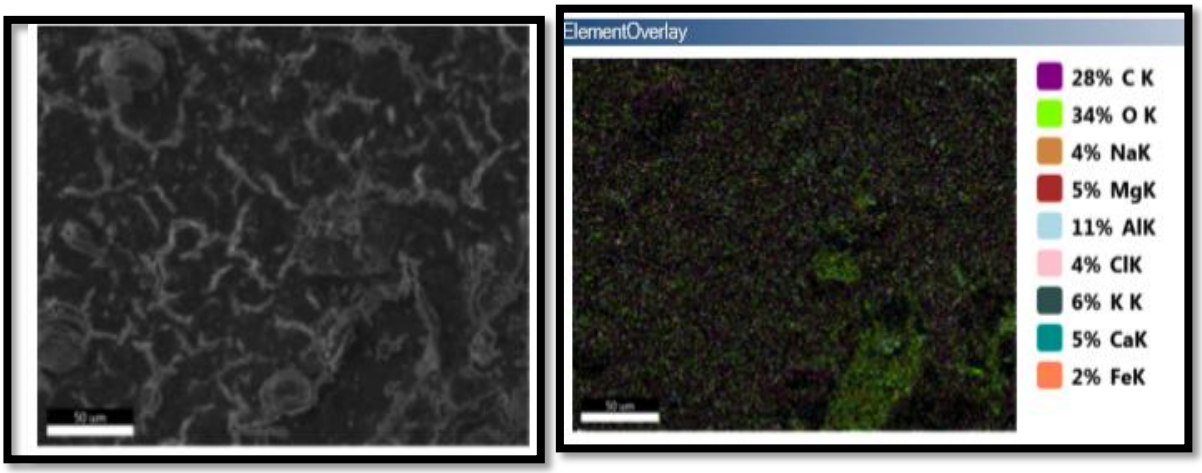
- Collect the plant from the field and wash it scrupulously by distilled water.
- Coarse ground the sample using a finer abrasive.
- Wet it to prevent heating and to get the better surface finish.
- Polished it to produce flat and stretch free surface and dry well.
- Sputtered with gold and fixed on a metal stub by using double-sided carbon tape.
- Observe through Field Emission Scanning Electron Microscope (FESEM)

i. The topography and surface morphologies of the samples

FESEM Views of *Diplazium Esculentum* in a. 681µm, b. 345 µm, c. 47.7 µm, d. 15.4 µm, e. 10.4 µm, f. 2.06 µm

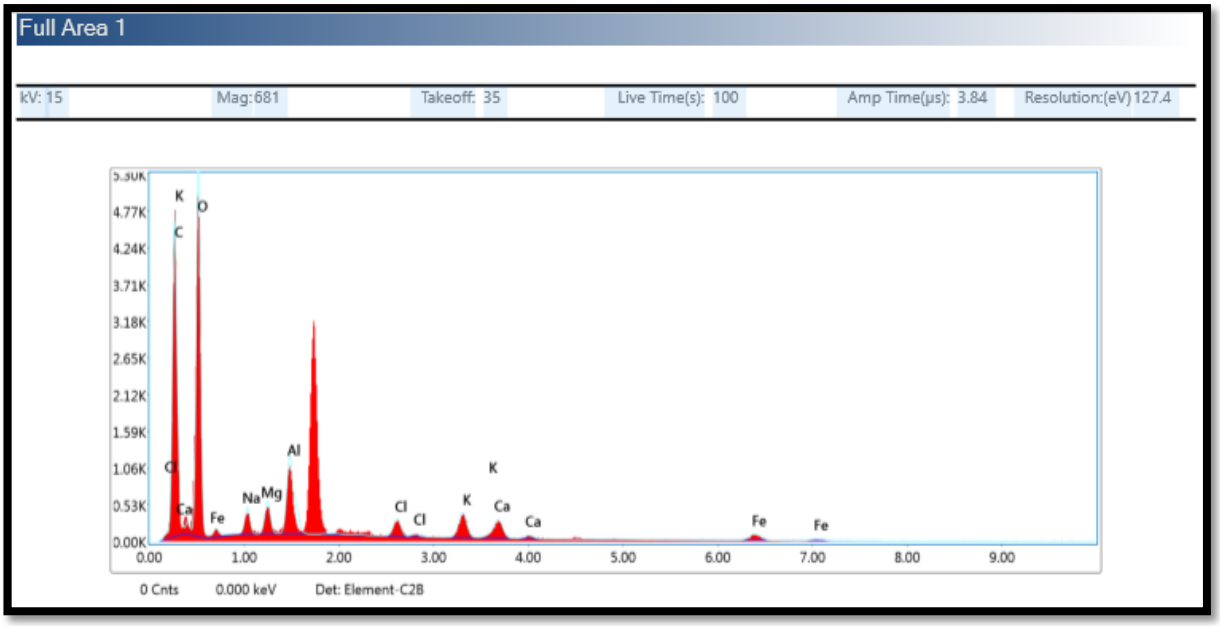


ii. The Element/ Nutrient Distribution of the Sample



The Nutrients distribution is visible at the 50 µm Distance in FESEM view. From this it is discernible that the *Diplazium esculentum* is a good source of, Sodium, Calcium, Potassium, Iron, magnesium, and Aluminum.

iii. The EDAX Image of the sample



EDX (Energy Dispersive X-Ray Analysis) is a kind of X-ray method normally accustomed to recognize the definite Material's elemental composition. It is also Known as EDS or EDAX. This is generally attached to SEM. The records generated from EDAX showing different peaks corresponding to the elements composition of the selected sample. The qualitative as well as the quantitative analysis along with its spatial distribution could be measured.

iv. The Elemental Distribution with its percentage of weight atomic percentage

Table II: Specifics Regarding the Elemental Distribution

Smart Quant Results

Element	Weight %	Atomic %	Net Int.	Error %	Kratio	Z	A	F
C K	35.72	46.95	256.56	8.02	0.1479	1.0613	0.3901	1.0000
O K	43.62	43.04	322.08	9.10	0.1218	1.0100	0.2765	1.0000
NaK	2.42	1.66	25.66	10.16	0.0107	0.9119	0.4852	1.0014
MgK	2.06	1.34	34.11	7.57	0.0121	0.9259	0.6322	1.0023
AlK	4.57	2.68	83.71	5.15	0.0305	0.8903	0.7474	1.0028
ClK	1.71	0.76	24.71	7.63	0.0142	0.8431	0.9680	1.0173
K K	3.39	1.37	38.72	5.69	0.0289	0.8369	0.9950	1.0251
CaK	3.23	1.27	30.32	6.20	0.0279	0.8511	0.9942	1.0208
FeK	3.27	0.92	12.87	9.89	0.0264	0.7496	1.0084	1.0668

3. Knowledge Attitude and Practices (KAP) Survey about the *Diplazium esculentum* among the participants before and after the Intervention

TABLE III: INFORMATION APROPOS KNOWLEDGE ATTITUDE AND PRACTICES (KAP)

S/N	Particulars	Before Intervention	Percentage	After Intervention	Percentage
1	Knowledge	117	59	196	98
2	Attitude	57	29	182	91
3	Practice	85	43	190	95

From the table it exposes that the Knowledge increased from 59 percent to 98 percent, Attitude increased from 29 percent to 91 percent, and practicing (that is including this herb in their daily diet in different forms) increasing from 43 percent to 95 percent after the nutrition awareness programme.

4.CONCLUSION

Kerala is the state which possesses the large figure of tribal population. Tribals especially tribal adolescents are suffering from nutritional deficiency as well. The elements which found out from Diplazium esculentum using FESEM analysis have important roles in human nutriture. Food security among the uneducated and primitive population is not an easy task. It not possible to easily introduce new foodstuff among such groups. Here introducing foodstuff which is seen among them with a purpose can help to irradiate deficiency to some extent.

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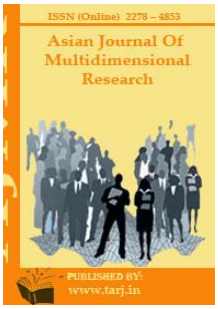

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DEMOGRAPHIC TRENDS AND LIFESTYLE PATTERN OF TYPE II DIABETICS IN COIMBATORE

Gomathi*; K Amirthaveni, M**

*Assistant Professor,
Department of Home Science,
Sri Sarada College for Women,
Salem, Tamil Nadu, INDIA
Email id: goms.fsn@gmail.com

**Retired Professor and Head,
Department of Food Science and Nutrition,
Avinashilingam University for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Background: *Diabetes has emerged as a major epidemic and healthcare problem in India. Demographic trends are identified as risk factors having an association with diabetes* ***Material and methods:*** *About 332 Type II diabetic subjects in the age group of 30 - 65 years of both male and female were selected.Anthropometric measurements like height, weight, waist circumference were measured and Body Mass Index (BMI), Waist to Height Ratio (WHtR) and Conicity Index (CI) were calculated. Fasting, post prandial blood glucose levels, glycosylated hemoglobin levels and lipid profile were measured.* ***Results and Discussion:*** *Among the 332 Type II diabetics surveyed, 173 subjects (52.1 per cent) were male and 159 subjects (47.9 per cent) were female. A higher percentage (34.1) of male diabetics were in the age group between 41-50 years. The mean medical expenditure incurred by the male and female diabetes were Rs.1641 and Rs.1536 per month respectively. The observed patterns of mean fasting blood glucose in female diabetics were especially higher (144.23 mg/dl) than male diabetics (142 mg/dl) which was well above the reference value. Mean total cholesterol, LDL cholesterol, triglyceride and VLDL cholesterol values of the diabetics were higher than the desirable values.* ***Conclusion:*** *This study found that the demographic factors like age, gender, occupation and monthly income were associated with type II diabetes.*

KEYWORDS: *Circumference, Anthropometric, Glycosylated, Cholesterol,*

INTRODUCTION

Diabetes has emerged as a major epidemic and healthcare problem in India. According to Diabetes Atlas published by the International Diabetes Federation (IDF, 2013), there were an estimated 40 million persons with diabetes in India in 2007 and this number is predicted to rise to almost 70 million people by 2025. The prevalence of diabetes in the age group of 20 to 79 years stood at nearly nine per cent of the population in India. Population based studies from India point out that in addition to genetic predisposition the lifestyle changes, sedentary life, lack of exercise and associated excess weight, diet and related epidemiological transition are the major factors in the development of diabetes (Arunachalam*et al*, 2002 and Valliyot*et al.*, 2013). Demographic trend is a total measure of an individual's or families economic and social position. Some Socio Economic Status factors are identified as risk factors having an association with diabetes (Hu, 2011).

MATERIAL AND METHODS

Selection of locale

The present study was conducted in the diabetic clinics in and around Coimbatore city, due to easy accessibility and availability of sufficient diabetics visiting the hospital periodically and also the willingness to co-operate for the study.

Selection of Type II diabetics

Based on their willingness to participate in the study, about 332 Type II diabetic subjects of both male and female belonging to the age group of 30 - 65 years were selected by purposive sampling method.

Formulation of tool and collection of baseline data

A well structured interview schedule was framed and pre tested to elicit information about age, sex, composition of the family, educational status, occupation, dietary pattern, exercise pattern and life style habits. Anthropometric measurements namely height and weight were recorded and Body Mass Index (BMI), Waist Circumference (WC), Waist to Height Ratio (WHtR) and Conicity Index (CI) were calculated. Fasting, post prandial blood glucose levels, glycosylated hemoglobin levels and lipid profile values were also noted from the medical reports at the time of personal interview.

RESULTS AND DISCUSSION

Demographic profile of the selected Type II diabetics

Demographic profile of the selected 332 Type II diabetics is furnished in Table I.

TABLEI - DEMOGRAPHIC PROFILE OF THE SELECTED TYPE II DIABETICS

Details	Male		Female		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
Age (years)						
<30	6	3.5	3	1.9	9	2.7
31-40	46	26.6	37	23.3	83	25.0
41-50	59	34.1	55	34.6	114	34.3
51-60	45	26.0	34	21.4	79	23.8
>60	17	9.8	30	18.9	47	14.2
Total	173	100.0	159	100.0	332	100.0

Educational qualification						
Illiterates	15	8.7	29	18.2	44.0	13.3
Primary	28	16.2	37	23.3	65.0	19.6
High school	53	30.6	41	25.8	94.0	28.3
Degree	51	29.5	34	21.4	85.0	25.6
Professional	26	15.0	18	11.3	44.0	13.3
Total	173	100.0	159	100.0	332	100.0
Occupation						
Doctor	1	0.6	-	0.0	1	0.3
Engineer	9	5.2	5	3.1	14	4.2
Government	35	20.2	21	13.2	56	16.9
Private	26	15.0	24	15.1	50	15.1
Farmer	63	36.4	22	13.8	85	25.6
Business	18	10.4	5	3.1	23	6.9
House wife	-	0.0	75	47.2	75	22.6
Retired	21	12.1	7	4.4	28	8.4
Total	173	100.0	159	100.0	332	100.0
Activity						
Sedentary	129	74.6	89	56.0	218	65.7
Moderate	35	20.2	67	42.1	102	30.7
Heavy	9	5.2	3	1.9	12	3.6
Total	173	100.0	159	100.0	332	100.0

Among the 332 Type II diabetics surveyed, 173 subjects (52.1 per cent) were male and 159 subjects (47.9 per cent) were female.

A higher percentage (34.1) of male diabetics were in the age group between 41-50 years. Around 26.6 and 26 per cent of the selected male diabetics were in the age group between 31-40 and 51-60 years respectively. About 9.8 per cent of the male diabetics were elderly with more than 60 years. Only 3.5 per cent of type II diabetics were young adults with 30 years of age and below.

Majority of the selected female Type II diabetics (34.6 per cent) were in the age group between 41-50 years followed by 23.3 and 21.4 per cent in the age group between 31-40 and 51-60 years respectively. About 18.9 per cent of the female Type II diabetics were geriatrics with more than 60 years of age. About 1.9 percentages was less than 30 years of age.

Of the selected 332 Type II diabetics 34.3 per cent were in the age group ranging between 41-50 years. Higher prevalence of diabetes in this younger and economically productive age certainly imposes the burden on financial development of the nation. Diabetes exerts in adults and leads to a significant burden to individual and national income losses by increased morbidity and mortality, decreased life expectancy and reduced quality of life (Mohan *et al.*, 2013). It was saddening to note that around 13.3 per cent of the selected Type II diabetics were uneducated. About 28.3 per cent were educated up to high school and 25.6 per cent were graduates and 13.3 were highly qualified with a professional degree.

From the 159 female subjects, majority of 25.8 per cent were studied up to high school level. Low educational status was observed among female when compared to male 23.3 per cent had studied up

to primary level, 21.4 per cent were degree holders and 11.3 per cent had studied up to professional level of education. About 18.2 per cent of the female diabetics were illiterates which has strong influence on their blood sugar level (Agardh*et al.*, 2008).

Occupational status has asymmetric effects on health condition. A higher percentage (36.4 per cent) of selected male Type II diabetics were doing farming followed by 20.2 per cent employed in Government offices. With regard to the occupation of women, majority (47.2 per cent) of them were housewives.

According to Madaan*et al.*, (2014) modernization of life style using modern techniques had made the human population more sedentary, which is one of the main etiological factor for diabetes. This is on par with the present study that the majority (65.7per cent) of Type II diabetics were deskbound with sedentary activity (74.6 per cent male and 56 per cent female). Consequently 20.2 per cent male and 42.1 per cent female diabetics were doing moderate activity.

Income level

Income level of the selected diabetics is presented in Table II.

TABLE II INCOME LEVEL OF THE SELECTED TYPE II DIABETICS

Income Level*	Male		Female		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
Economically Weak	18	10.4	32	20.1	50	15.1
Low	28	16.2	30	18.9	58	17.5
Middle	74	42.8	78	49.1	152	45.8
High	53	30.6	19	11.9	72	21.7
Total	173	100.0	159	100.0	332	100.0

* Twelfth five year plan (2007 - 2012)

Majority (45.8 per cent) of the selected diabetics were in the middle income group earning with Rs. 7500-14500 per month as their family income followed by 21.7 per cent in the high income group earning more than Rs.14500 per month. Among the selected diabetics, 17.5 per cent were in the low income group and 15.1 per cent in the economically weaker section. In the present study, the income had an influence on the diabetes management as reported by Corsi and Subramaiyan, (2012) that the household wealth was the strongest socioeconomic factor associated with diabetes in India.

DIETARY PATTERN

Dietary habit and meal pattern

Dietary habit and meal pattern of the Type II diabetics is given in Table III.

Dietary intake is a significant modifiable environmental risk factor in the onset and prevention of Type II diabetes. From the Table it is revealed that around 75.7 per cent male and 71.1 per cent female diabetic subjects were non vegetarians consuming fleshy foods like meat, fish and egg. Around 24.3 and 28.9 percent of male and female diabetics respectively were vegetarians.

TABLE III DIETARY HABIT AND MEAL PATTERN

Dietary habit & Meal pattern	Male		Female		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
Vegetarian	42	24.3	46	28.9	88	26.5
Non vegetarian	131	75.7	113	71.1	244	73.5
Total	173	100.0	159	100.0	332	100.0
No.of meals						
≤2	49	28.3	107	67.3	156	47.0
3	116	67.1	29	18.2	145	43.7
4 and above	8	4.6	23	14.5	31	9.3
Total	173	100.0	159	100.0	332	100.0

It was discouraging to note that 67.3 per cent of females skip their breakfast and are having only two meals a day. Since majority of females were housewives, they had the habit of drinking more number of tea instead of meals. About 43.7 per cent of the selected diabetics were having three meals a day regularly.

Type of fats and oils used by the selected Type II diabetics

Table IV shows the type of fats and oil used by the selected diabetics.

TABLE IV TYPE OF FATS AND OIL USED BY THE TYPE II DIABETICS

Type of oil used	Number*	Per cent
Sunflower oil	**176**	**53.0**
Groundnut oil	**118**	**35.5**
Palm oil	**40**	**12.0**
Gingelly oil	**37**	**11.4**
Coconut oil	**10**	**3.3**
Others (corn, rice bran)	**6**	**1.8**
Ghee	**25**	**7.5**
Vanaspathy	**32**	**9.6**

***Multiple responses

Refined sunflower oil was preferred and used by 53 per cent of the diabetic subjects followed by 35.5 per cent using ground nut oil since groundnut is one of the important crop cultivated in their own land or borrowed from neighbours. About 12 per cent of the selected subjects were using palm oil mainly due to the economically weaker section as the palm oil distributed by Government at subsidized rate. Gingelly oil was used by around 11.4, 3.3 and 1.8 per cent of the diabetics were using coconut oil and other oils like corn and rice bran oil respectively.

Family and personal history of the disease condition

Family history of diabetics

Table V elucidates the family history of the Type II diabetics.

TABLE V FAMILY HISTORY OF TYPE IIDIABETICS

Family history	Male	Female
Yes*	**107**	**99**
Both parents	32	25
One of the parents	89	64
Grand parents	21	12
Close relatives	13	8
No	46	37

*Multiple responses

The lifetime risk of developing the disease is approximately 40 per cent in offspring of one parent with Type II diabetes, greater if the mother is affected, and approaching 70 per cent if both parents have diabetes (Lyssenko and Laakso, 2013). This is on par with the findings of the present study that 107 male and 99 female diabetics were having a history of diabetes in their family. Majority of diabetics (male 89 and female 64) were having a single parental history of this disease.

From the surveyed diabetics, it is inferred that both the parents were affected with diabetics for 32 male and 25 female followed by 89 male and 64 female diabetics with single parental history of the disease. About 21 male and 12 female diabetics grandparents were affected by diabetes. The maternal and paternal relatives of the 13 male and eight female diabetics were having previous episodes of diabetes. Around 46 male and 37 females were not having any family history of diabetics.

Frequency of visit to clinics by the diabetics

Frequency of visit to clinics by the selected diabetics is given in Table VI.

TABLE VI FREQUENCY OF VISIT TO CLINICS

Frequency	Number	Per cent
Monthly	142	42.8
More than six times a year	115	34.6
Two to six times a year	38	11.4
Once a year	22	6.6
Rarely	15	4.5
Total	332	100.0

The above Table reveals that 42.8 per cent of the selected diabetics were health conscious and knew the importance of visiting the clinics regularly and were visiting the clinics once in a month. Around 34.6 per cent of the selected subjects were visiting the hospitals more than six times a year.

Monthly expenditure towards the disease condition

Table VII indicates the medical expenditure details by the Type II diabetics.

TABLE VII MONTHLY EXPENDITURE TOWARDS THE DISEASE CONDITION

Details	Expenditure per month in Rs.					
	Free	>100	100-500	600-1000	1100-2000	>2000
Diabetic medicine	**4**	**20**	**82**	**135**	**63**	**28**
Visit to the clinic	**12**	**32**	**254**	**34**	**0**	**0**
Analysis of blood profile	**28**	**76**	**184**	**27**	**12**	**5**

It is clear from the Table that out of 332 diabetics about 135 members spent Rs. 600-1000 per month, followed by 82 of them spending Rs.100-500 per month for diabetic medicines. Around 63 and 28 diabetics spent `Rs. 1100-2000 and more than Rs. 2000 towards medications respectively for their diabetic condition along with its other complications.

Medical expenditure of the selected diabetics

Table VIII and Figure 1 presents the monthly medical expenditure of the diabetics studied.

TABLE VIII MEDICAL EXPENDITURE OF THE DIABETICS

Expenditure (`RS`)	Male	Female
Medical expenses	1126	1056
Consultation charges	245	220
Blood analysis	270	260
Month medical expenditure	1641	1536
Average monthly income	20,180	13,765
Percentage of income spent per month	**12.3**	**8.98**

The above Table highlights that the mean monthly income of te male and female subjects were Rs.20,180 and Rs.13765 respectively. The mean expenditure incurred by the male and female diabetes wereRs.1641 and Rs. 1536 per month respectively.

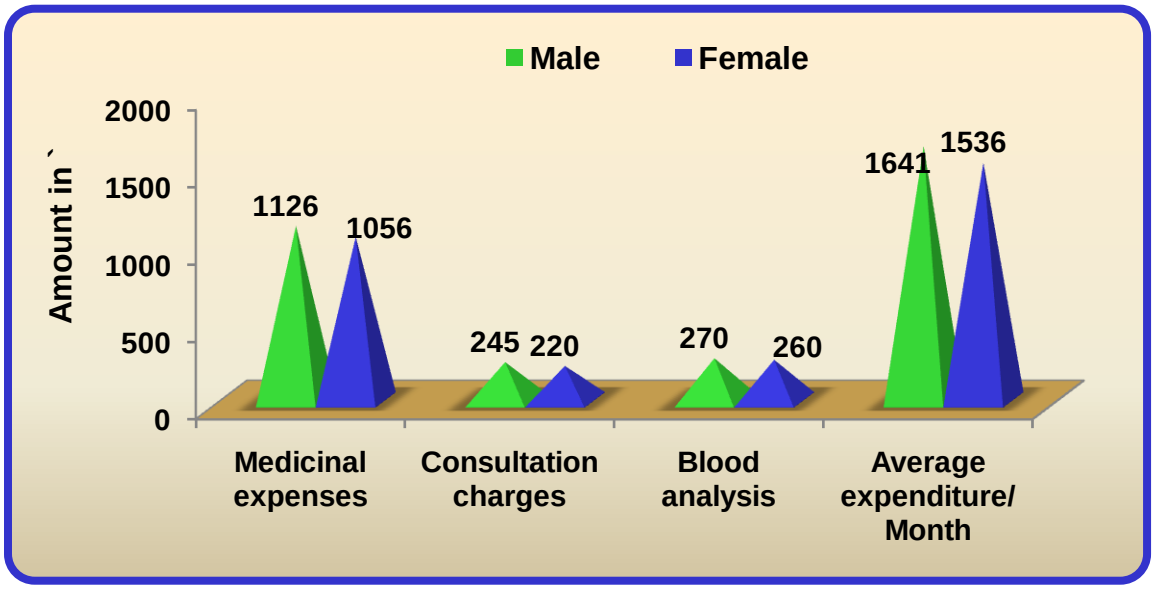

FIGURE 1 MEDICAL EXPENDITURE

About 12.3 per cent and 8.98 per cent of the monthly income was spent towards hypoglycemic drugs, doctors fee and blood analysis by the male and female subjects respectively. Diabetes being a life-long disorder is an expensive ailment for a very large proportion of subjects in developing societies. In India the money was spent from the family's financial resources. Although the amount spent by the upper and the lower class persons were similar, the percentage of the income spent was higher among the latter which is due to their lower earning (Mohan *et al.*, 2003).

Life style pattern

Exercise pattern of Type II diabetics

Lack of exercise is one of the vital causes for the development of Type II diabetes. Table IX depicts the physical activity pattern of the Type II diabetics.

TABLE IX EXERCISE PATTERN OF TYPE II DIABETICS

Details	Male		Female		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
Yes	61	35.3	48	30.2	109	32.8
No	112	64.7	111	69.8	223	67.2
Total	173	100.0	159	100.0	332	100.0
Type of Exercise						
Walking	53	30.6	31	19.5	91	27.4
Yoga & meditation	4	2.3	5	3.1	9	2.7
Cycling	14	8.1	2	1.3	16	4.8

Physical activity is a defensive factor for the development of diabetes.In the present study, it is saddening to note that only 35.3 per cent male and 30.2 female diabetics were doing regular exercise. Maximum of 67.2 percentageof the selected diabetics were not doing any kind of exercise which in turn increases the micro vascular and macro vascular complications of diabetes.

Walking is the preferable type of exercise by 30.6 per cent of male and19.5 percent of female diabetics respectively. Few diabetics (8.1 percent male and 1.3 percent female) were using cycle for daily routine activity. Yoga and meditation were done by 2.7 percentages of diabetics only.

NUTRITIONAL ASSESSMENT OF THE SELECTED TYPE II DIABETICS

Nutritional assessment is one of the important step in the management of diabetes.

Anthropometric measurements

Body Mass Index

Table X represents the body mass index of the selected 332 Type II diabetics.

TABLE X BODY MASS INDEX OF THE SELECTED TYPE II DIABETICS

BMI Classification*		Male		Female		Total	
		Number	Percent	Number	Per cent	Number	Per cent
<18.49	**Underweight**	4	2.3	7	4.4	11	3.3
18.5 – 24.9	**Normal**	69	39.9	76	47.8	145	43.7
25.0-29.9	**Pre obese**	75	43.4	58	36.5	133	40.1
30.0- 32.49	**Mild obese class I**	12	6.9	10	6.3	22	6.6
32.5-34.9	**Moderate obese class I**	7	4.0	6	3.8	13	3.9
35.0- 37.49	**Mild obese class II**	4	2.3	2	1.3	6	1.8

37.5-39.9	**Moderate obese class II**	1	0.6	0	0.0	1	0.3
≥40.0	**Obese class III**	1	0.6	0	0.0	1	0.3
TOTAL		173	100.0	159	100.0	332	100

*** WHO 2004**

From the above Table X, it was noted that among the 173 male diabetics, 43.4 per cent of them were considered as pre obese having BMI ranging from 25 to 29.9 followed by 39.9 per cent had normal BMI of 18.5 to 24.9 and very few of2.3 per cent of male diabetics were underweight.

Almost 6.9 and four per cent of the selected diabetics were under mild and moderate obese class I category respectively, 2.3 per cent of them were in mild obese class II category and only 0.3 per cent each were in moderate obese class II and obese class III category.

From the above Table it is clear that, among the 159 female diabetics, 47.8 per cent of them had their BMI between 18.5 to 24.99 and are considered normal. Around 36.5 per cent fall under the pre obese category, 6.3 per cent fall under mild obese class I category, 3.8 per cent were under moderate obese class I category, 1.3 per cent fall under mild obese class II category.

Mean body mass index determined for the screened male and female were 26.05 and 25.23 respectively which shows that they were in pre obese category which is also associated with increased risk of diabetes. A multiethnic cohort study identified that incident diabetes risk, adjusted for age, sex, socio demographic characteristics and BMI, was significantly higher for South Asians (20.8/1,000 person-years; HR 3.40), blacks (16.3/1,000; 1.99), and Chinese (9.3/1,000; 1.87), compared with non-Hispanic whites (9.5/1,000) (Chiu *et al.,* 2011).

Waist circumference, waist to height ratio and conicity index

Table XI depicts waist circumference, waist to height ratio and conicity index of the selected 332 Type II diabetics.

TABLE XI WAIST CIRCUMFERENCE, WHtR AND CI OF TYPE II DIABETICS

Anthropometric measurements	**Male**			**Female**		
	Ref. value	**Mean ±SD**	**Excess**	**Ref. value ***	**Mean ±SD**	**Excess**
Waist circumference*	<90	92.72±10.15	+2.72	<80	88.42±8.73	+8.42
Waist to height ratio**	0.536	0.56±0.06	+0.024	0.492	0.56±0.06	+0.068
Conicity Index***	1.25	1.30±0.10	+0.05	1.18	1.30±0.15	+0.12

*ICMR 2010 ** (Xin*et al.*, 2012), *** (Valdez *et al*., 1993)

The findings of the present study was similar to those of the study conducted by Farzad*et al*.,(2012), in which it was reported that waist circumference and conicity index were superior to BMI for identifying visceral adiposity, metabolic disorders and cardiovascular risk factors. The above table reveals that the mean waist circumference of the female subjects were much higher (8.42) than the reference value. Male diabetics also showed an elevated waist circumference compared to the reference value of <90 cm.

The above Table clearly says that the female diabetics had higher mean waist to height ratio (0.068) and conicity index (0.12) than the desirable levels. The mean waist to height ratio and conicity index of the 173 male diabetics were also faintly higher than that of the reference values.

Biochemical estimations

Mean blood glucose levels of the selected Type II diabetics

The mean blood glucose levels of the selected 332 Type II diabetics is described in Table XII and 249Figure2.

TABLE XII MEAN BLOOD GLUCOSE LEVELS OF THE SELECTED TYPE II DIABETICS

Blood glucose	Desirable level *	Mean ±SD	
		Male	Female
Fasting Blood Glucose (mg/dl)	≥ 126	142.00 ± 42.73	144.23 ± 51.70
Postprandial Blood Glucose (mg/dl)	≥ 200	224.29 ± 67.44	226.75 ± 79.16
Glycosylated heamoglobin HbA1c(per cent)	≥ 6.5	8.10 ± 1.49	8.29±1.79

*NDEP2011

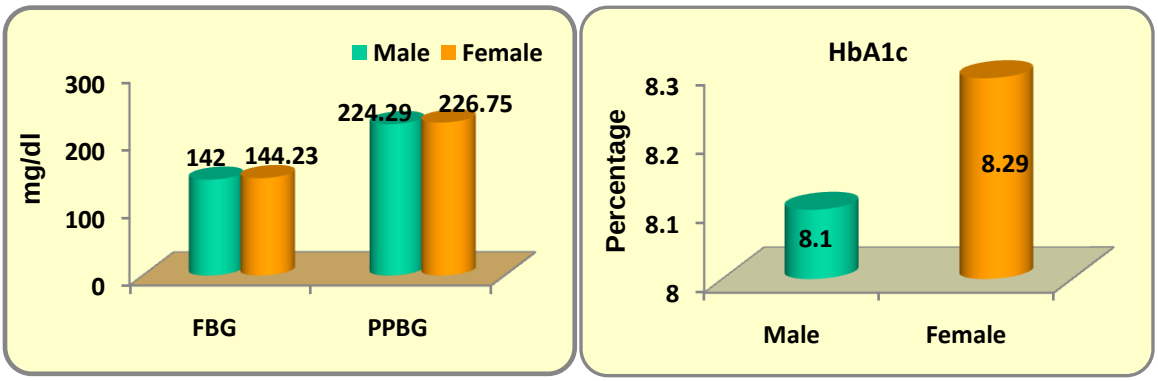

FIGURE 2 MEAN BLOOD GLUCOSE LEVELS OF THE TYPE II DIABETICS

Elevated blood glucose at all times is the commonest finding in Type II diabetic patients. The observed patterns of mean fasting blood glucose in female diabetics were especially higher (144.23 mg/dl) than male diabetics (142 mg/dl) which was well above the reference value. The present study is in accord with the study by Madaan*et al*., (2014) that the mean fasting plasma glucose in males was 149.36 ± 19.51 mg/dl and females was 147.43 ± 18.19 mg/dl. Mean 2 hour postprandial plasma glucose was 259.94 ± 51.36 mg/dl and 259.65 ± 51.39 mg/dl in male and female respectively.The mean postprandial levels of the male and female subjects were 224.29 and 226.75 mg/dl respectively.

HbA1c values reflect overall glycemic exposure over the past two to three months and are determined by both fasting (FPG) and postprandial plasma glucose levels. Among the 332 surveyed diabetics the mean HbA1c levels were 8.29 per cent for female and 8.10 per cent for male diabetics respectively. This is on par with the preliminary results from the Diabcare India 2011 study in the mean HbA1c of8.97 ± 2.2 per cent for more than 6000 diabetics in India and shows the poor glycemic control in India (Mohan *et al.*, 2012).

Lipid profile of the selected Type II diabetics

The mean lipid profile of the selected 332 Type II diabetics is presented in Table XIII.

TABLE XIII MEAN LIPID PROFILE OF THE SELECTED TYPE II DIABETICS

Lipid profile (mg/dl)	Desirable levels*	Mean ±SD	
		Male	Female
Total – cholesterol	< 200	222.98 ± 34.62	224.16 ± 18.84
HDL- cholesterol	> 50	41.82 ± 8.6	40.86 ± 7.27
LDL- cholesterol	< 130	145.1 ± 34.28	148.38 ± 22.11
VLDL- cholesterol	< 30	36.76 ± 16.55	34.14 ± 11.01
Triglyceride	< 150	189.25 ± 98.35	172.57 ± 54.54

****National Diabetes Education Program-ATP IV Guidelines (NDEP), 2012***

Abnormalities in lipoproteins are very common in non insulin dependent diabetes mellitus. Diabetes leads to changes in the plasma lipid and lipoprotein profile thereby raise the risk of cardio vascular disease. In subjects with Type II diabetes hyper triglyceridemia and low HDL-cholesterol levels are common (Parmer *et al*., 2011). The present study support with the above statement that the mean serum total cholesterol of the 173 male subjects were found to have222.98 mg/dl, mean HDL cholesterol was recorded as 41.82 mg/dl,145.1 mg/dl as mean LDL cholesterol, 189.25 mg/dl was recorded for triglycerides and as an average of 36.76 mg/dl for VLDL cholesterol.

Out of the 159 female subjects, mean total cholesterol level was found to be 224.16 mg/dl, average HDL cholesterol values were found to be 40.86 mg/dl, mean LDL cholesterol was 148.38 mg/dl, triglyceride level was 172.57 mg/dl and the average VLDL cholesterol level recorded was 34.14 mg/dl.Mean total cholesterol, LDL cholesterol, triglyceride and VLDL cholesterol values of the diabetics were higher than the desirable values. The mean HDL cholesterol values were lower when compared with the desirable values.

CONCLUSION

Among the 332 Type II diabetics surveyed, 173 subjects (52.1 percent) were male and 159 subjects (47.9 per cent) were female.Of the selected 332 Type II diabetics 34.3 per cent were in the age group ranging between 41-50 years. The mean medical expenditure incurred by the male and female diabetes were Rs.1641 and Rs.1536 per month respectively The mean postprandial levels of the male and female subjects were 224.29 and 226.75 mg/dl respectively. Among the 332 surveyed diabetics the mean HbA1c levels were 8.29 per cent for female and 8.10 per cent for male diabetics respectively. Mean total cholesterol, LDL cholesterol, triglyceride and VLDL cholesterol values of the diabetics were higher than the desirable values. This study found that the demographic factors like age, gender, occupation and monthly income were associated with type II diabetes.

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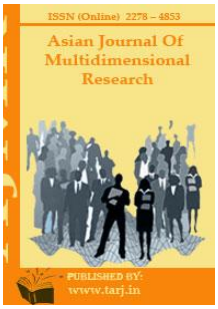

Asian Journal of Multidimensional Research (AJMR)

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DEVELOPMENT OF IRON RICH ANTIOXIDANT HEALTH MIX BY INCORPORATION OF BEET GREENS (BETA VULGARIS L)

Harine Sargunam J*; Dr.Thilkavathy S

*Ph.D (part time) Research Scholar & Assistant Professor,
Department of Nutrition & Dietetics,
Jamal Mohamed College, Tiruchirappalli, INDIA
Email id: harinelawren@gmail.com

**Research Supervisor and Assistant Professor (SS),
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and
Higher Education for Women University,
Coimbatore, INDIA

ABSTRACT

In India various types of Green leafy vegetables (GLVs) are available seasonally, but are not utilized to the extent these should be despite their very high nutritive value. Looking into the prevalence of high level of micronutrient deficiency among the vulnerable group, utilization of underutilized greens can be explored to overcome nutritional disorders. Besides supplying good amounts of protein, vitamin C, calcium, phosphorus, zinc and fibre, beet greens are also a good source of iron and antioxidants. The aim of the study was to develop Iron Rich Antioxidant Health Mix by using locally available millets, cereals, pulses, oilseed, spices and beet greens, which can be consumed by all the age group in any form such as powder, porridge, nutriball especially by children, women and elderly people. Iron rich Antioxidant health mix with varying proportions of beet greens powder (1%, 1.5%, 2% and 2.5%) was developed along with a control. The organoleptic evaluation of the Iron Rich Antioxidant health mix was carried out using 9-Point Hedonic scale. The data obtained was analyzed statistically. The products incorporated with 2.5% level of beet greens powder were found most acceptable.

KEYWORDS: *Beet Greens, Underutilized, Iron Rich Antioxidant Mix, Organoleptic Evaluation*

INTRODUCTION

In India, leafy vegetables from many plants have been used in the diet from ancient times. Leafy vegetables are inexpensive and protective foods, which have acclaimed as a basic component of balanced diet. Leafy vegetables are prerequisite of poor man's luxury because of their richness in protective nutrients, wide range of choice and low cost. Green leafy vegetables supply many nutrients and are rich sources of carotene, iron, calcium, ascorbic acid, riboflavin, folic acid and appreciable amounts of other minerals[1].

While beets themselves are rich in calcium, vitamin A, iron, and other healthy minerals, their leaves are excellent sources of vitamin A, vitamin C, protein, and dietary fibre. The antioxidant capacity of beet greens was very high, placing them among the vegetables with the highest antioxidant capacity[2]. The total phenolic content (TPC) in beet greens resulted higher than other leafy vegetables. The identification of polyphenols by TLC reveals the presence of quercetin, kaempferol and Rutin in the enriched methanolic extract of beet leaves. The subsequent HPLC analysis revealed that the main polyphenol on beet leaf (61 % of total polyphenols) is Rutin, with a concentration of 9.7 mg/ kg. Phytonutrients, plant pigments such asBetalains, water-soluble nitrogen-containing pigments with two subclasses: betacyanins (redviolet pigments) and betaxanthins (yellow-orange pigments) are found abundantly in beet leaves. Beet greens supplies 60% of RDA of iron[3].

Foods such as whole grains, millets, pulses, oilseeds and spices are rich in iron and antioxidant[4]. Ragi is a good source of iron[5], yellow maize is rich in carotene, it also contains thiamine and folic acid. Wheat is rich in bioactive compounds include carotenoids, tocopherols, tocotrienols, phenolic acid, phytic acid, phytosterols and flavonoids[6]. Black pepper is recognized as carminative, diaphoretic and diuretic properties[7]. Garlic contains antioxidants that prevent the development of cancer, fight heart disease and also have anti-aging properties[8].

Thus, present study was carried out to identify and develop iron rich antioxidant health mix by selecting locally available millets, cereals, pulses, oilseed, spices and it was incorporated with Beet Greens.

METHODOLOGY

Procurement and processing of Beet Greens: Beet Greens were procured from the cultivation area of Ootagamandu. Leaves were sorted with tender stem and healthy leaves. Leaves were washed thoroughly by dipping in water for one minute. The procedure was repeated till the leaves are devoid of dirt and soil. Leaves were blanched (enclosed in muslin cloth) in a stainless steel pan for 2 minutes at 80°C and dried in a hot air drier at 60±5°C for 8 hours. After that, dry matter was crushed in grinder to get a fine powder and packed in low density polythene bags and stored in air tight container for future use.

Development of Iron Rich Antioxidant Health Mix

The ingredients selected for the development of Iron rich antioxidant health mix were Ragi, Samai, Kambu, Cholam, Red rice flakes, Green gram dhal, Roasted Bengal gram dhal, Black gram dhal, flaxseed, pepper and garlic. Each ingredient was purchased from the local market, shadow dried separately, roasted at 60°C to obtain good aroma then cooled to room temperature. The ingredients were grinded separately to get a fine powder. Finally, all the ingredients mentioned in the Table 1 composition were mixed together to obtain an iron rich antioxidant health mix.

Beet Greens powder was incorporated in the developed Iron rich Antioxidant

Health Mix and standardized in four variations of 1%, 1.5%, 2% and 2.5% and sensory Analysiswas donefor its acceptability.

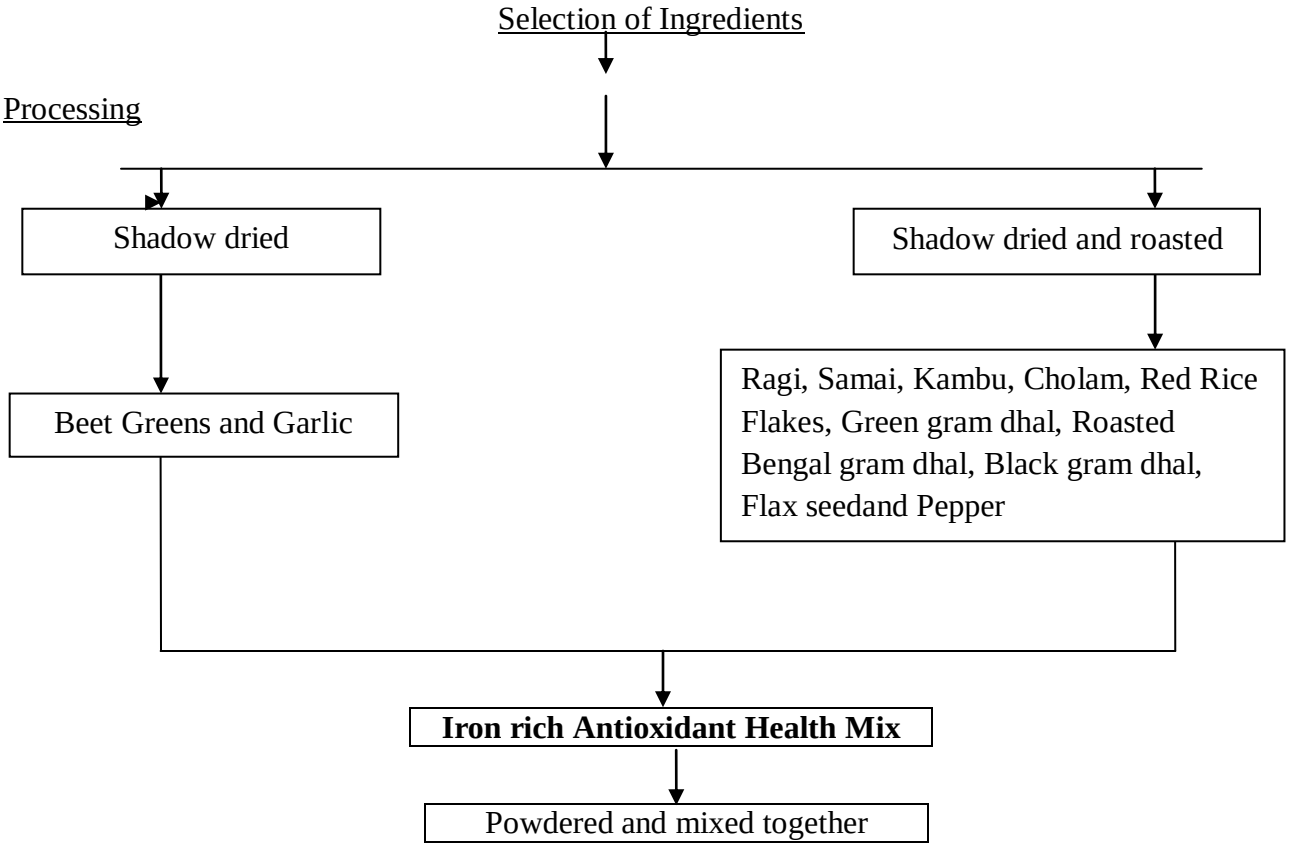
Composition of Iron Rich Antioxidant Health Mix

Table I presents the composition of ingredients used for developing the iron rich antioxidant health mix.

TABLE 1 COMPOSITION OF IRON RICH ANTIOXIDANT HEALTH MIX

Ingredients used	**Quantity in grams**				
Millets					
Finger millet (Ragi)	10	10	10	10	10
Little millet (Samai)	5	5	5	5	5
Pearl millet (Kambu)	5	5	5	5	5
Jowar – Red (Cholam)	5	5	5	5	5
Cereals					
Red Rice Flakes	5	5	5	5	5
Pulses					
Green gram dhal	2	2	2	2	2
Roasted Bengal gram dhal	10	10	10	10	10
Black gram dhal	2	2	2	2	2
Oilseed					
Flaxseed	2	2	2	2	2
Spices					
Pepper	2	2	2	2	2
Garlic	2	2	2	2	2
Beet Green Powder (in variation)	**0**	**2**	**3**	**4**	**5**

Figure 1: Flow Chart of preparation of Iron rich antioxidant health mix



Sensory Evaluation of Iron Rich Antioxidant Health Mix

The iron rich antioxidant health mix was prepared and subjected to sensory evaluation to a panel of 20 members using 9 point hedonic scale[9]. The results of the sensory evaluation is discussed below in Table II

TABLE II MEAN SCORE OF SENSORY EVALUATION OF IRON RICH ANTIOXIDANT HEALTH MIX

Beet Greens Powder in Grams	Characteristics				
	Appearance	Colour	Flavor	Taste	Overall Acceptability (Mean±S.D)
Iron Rich Antioxidant Health Mix only (Control)	8.85±0.35	8.7±0.45	8.9±0.3	8.8±0.4	8.95±0.21
Iron Rich Antioxidant Health Mix + Beet Greens (2g) (S1)	8.35±0.66	8.35±0.79	8.2±0.87	8.3±0.55	8.45±0.49
Iron Rich Antioxidant Health Mix + Beet Greens (3g) (S2)	8.4±0.66	8.4±0.66	8.25±0.82	8.3±0.64	8.45±0.58
Iron Rich Antioxidant Health Mix + Beet Greens (4g) (S3)	8.45±0.73	8.5±0.59	8.3±0.71	8.4±0.49	8.5±0.5
Iron Rich Antioxidant Health Mix + Beet Greens (5g) (S4)	8.55±0.49	8.55±0.49	8.35±0.52	8.5±0.738	8.55±0.48

Table 2 shows the data regarding the mean score of sensory evaluation of beet greens incorporated iron rich antioxidant health mix. The results revealed that the highest scores for appearance, colour, flavor, taste was obtained by control(C) with an overall acceptability score of 8.95 being liked very much.Overall acceptability score of test sample incorporated with beet greens powder S4 (2.5%) was 8.55±0.48, which was liked very much, followed by S3 (2%) with an overall acceptability score of 8.5±0.5. The lowest scores for overall acceptability was obtained by S2 (1.5%) was 8.45±0.58 followed by S1 (1%) was 8.45±0.49. Iron rich Antioxidant Health Mix was most acceptable at 2.5% level of incorporation of Beet Greens powder.

CONCLUSION

The Iron Rich Antioxidant health mix prepared from iron and antioxidant rich food stuffs like cereals, millets, pulses, oilseed, spices and green leafy vegetables especially with different variations of beet greens was developed and sensory analysis was done for its acceptability. Thus, the development and use of Iron rich Antioxidant Health Mix incorporated with Beet Greens can serve as dietary approach to prevent micronutrient deficiencies, reduces morbidity and mortality.The developed product can be consumed by all the age group's daily in any form like powder, porridge and nutriball by especially children, women and elderly people to meet a part of their nutritional requirement.

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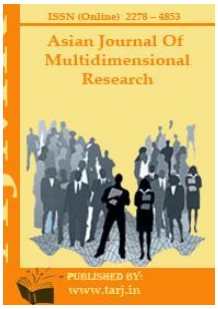

Asian Journal of Multidimensional Research (AJMR)

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DEVELOPMENT AND SHELF LIFE EVALUATION OF VALUE ADDED CHICKEN MEAT SAUSAGES

Abhirami Sivaprasad*; Dr. Manjula Kola; Dr. G. Vijaya Bhaskar Reddy*****

*Ph.D Scholar,
Dept of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: abhiramisiv@gmail.com

**Assistant Professor,
Dept of Home Science,
Sri Venkateswara University, Tirupati, INDIA

***Assistant Professor,
Dept of Live Stock Products Technology
College of Veterinary Science, Tirupati, INDIA

ABSTRACT

Meat products can be modified by adding ingredients (value adding) considered beneficial for health or by eliminating or reducing components that are considered harmful. The decrease in flavour scores might be due to cumulative effect of all treatments on storage period and as storage prolongs, there is reduction of efficacy of antioxidants. These results are in agreement with Gupta et al., (1993) in mutton and mutton+ chicken sausages. Population growth, urbanization, economic growth and flourishing markets all lead to the increasing demand for meat and animal products. Also, changing nutritional needs, driven by growing incomes and demographic transitions, there is an increased need for livestock products including meat on a global scale.According to people, food they eat should not only taste better but also be attractive, safe and healthy, since time constraints prevent them from spending enough time for exercise to keep them fit. Both lipid oxidation and microbial counts of chicken meat sausages incorporated with barley flour were well within acceptable limits upto 25 days at refrigerated (4±1°C) storage.

KEYWORDS: *Urbanization, Ingredients, Eliminating, Flourishing*

INTRODUCTION

The meat which we consume is an essential component in our diet. They are considered as protein food along with other food category like poultry, fish and eggs in the food pyramid. unquestionably, meat is a main source of food proteins with high biological value in many countries. But in recent times, negative campaign about muscle foods, and their possible health hazard effects, shows that consumers are increasingly interested about health oriented functional meat products. According to people, food they eat should not only taste better but also be attractive, safe and healthy, since time constraints prevent them from spending enough time for exercise to keep them fit. To ensure the continued growth and competitiveness of meat industry, it is essential that the quality and safety of meat products should be maintained during processing. Meat is part of the human diet in most cultures, where it often has symbolic meaning and important social functions It is also a good source of iron and zinc and a number of B Vitamins, and liver is a very rich source of vitamin A. Meat products can be modified by adding ingredients (value adding) considered beneficial for health or by eliminating or reducing components that are considered harmful. The utilization of barley in the development of processed meat products especially in sausages is still an unexplored area

With this background, the research work has been designed to develop value added sausages with the following objectives

1. To develop and standardize the preparation of value added chicken meat sausages with different levels of barley powder.
2. To study the shelf life of developed chicken meat sausages during refrigerated storage (4±1°C).

METHODOLOGY

The study was conducted in two phase. In the first phase, the product was standardised with best suitable formulation with one optimum level concentration of barley flours the second phase was designed to study the shelf life of the product with the addition of selected concentration of barley powder 6 % under refrigeration (4±1°C) temperature.

Standardisation of the product

During the first phase, six trials were conducted initially for standardize the chicken meat sausages with different levels (3, 6 and 9 per cent) of barley flour to determine the optimum level of inclusion of barley flour. The meat and skin were cut into small pieces to facilitate easy mincing and they were further subjected to thorough mincing by using a meat mincer (Sirman TC12E) through a 6 mm diameter plate to obtain a uniform mix and later through 4 mm diameter plate. The procedure for the preparation of meat sausages is depicted in the form of a flow chart

Figure 1 Minced Meat

Flow Chart for the Preparation of chicken meat sausages

Meat was minced
↓
Spice mix and condiment mix were added and chopped for 45 seconds
↓
Barley flour added @ 3% 6% and 9%
↓
Water was mixed while chopping and chopped
↓
Emulsion Stuffed into synthetic cellulose casings using horizontal sausage stuffer
↓
Linking at uniform interval
↓
Cooked in open bath cooker for 45 min until internal core temperature reaches to 80°C
↓
Set in refrigerator for few minutes
↓
Cooked in oven for 1 min
↓
Stored at refrigerated temperature (4±1°C) till further quality evaluation

Determination of optimum level of inclusion of barley flour in chicken meat sausages

The optimum level of inclusion of barley flours determined by preparing six batches of chicken meat sausages, incorporating barley flour at three different levels (3, 6 and 9 per cent) and subjecting them to quality analysis viz., physico-chemical characteristics , proximate analysis and sensory evaluation. The optimum level of inclusion of flour was determined based on the results obtained for the above parameters

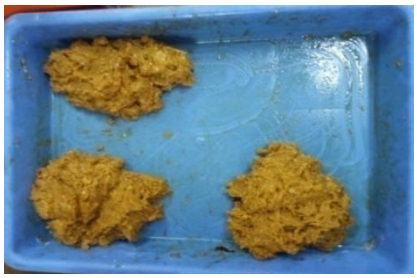

Figure 2 Standardization of sausage With different levels of barley flour

The chicken meat sausages thus prepared as per the standardized formulations were oven cooked separately and subjected to sensory evaluation on a 9 point hedonic scale by a semi-trained five member taste panel.

During the first phase, based on the physic-chemical, proximate and sensory evaluation one best level was selected for further shelf life studies.

Figure 3 Sensory evaluation

Shelf life studies of chicken meat sausages incorporated with selected level of barley flour

Separate batches of chicken meat sausages were prepared incorporating with the standardized level of barley flour as determined during first phase. These sausages were packed in low density polyethylene (LDPE) bags and stored at refrigeration temperature (4±1°C). The refrigerated samples were drawn at an interval of five days (0, 5, 10, 15, 20, 25, 30 days)

Figure 4 Packaging of chicken meat sausages

and up to 30 days and were analysed for physico-chemical characteristics, microbial counts, total plate count and sensory quality along with control.

RESULTS AND DISCUSSION

The result of the study are discussed under the following headings

Effect of incorporation of different levels of barley flour on the physico-chemical properties, proximate composition and sensory characteristics of chicken meat sausages

Physico-chemical characteristics, proximate composition and sensory evaluation of chicken meat sausages incorporated with 6 % barley flour during refrigeration (4±1°C) temperature.

Effect of incorporation of different levels of barley flour on the physico-chemical properties, proximate composition and sensory characteristics of chicken meat sausages

The mean ±S.E values of various physico-chemical parameters such as per cent cooking loss, per cent emulsion stability, per cent water-holding capacity, pH, proximate composition and sensory characteristics of control and chicken meat sausages incorporated with barley flour at 3 per cent, 6 per cent and 9 per cent levels were depicted in Table 1

The chicken sausages incorporated with 6 percent barley flour having superior sensory characteristics like colour, flavour, juiciness, tenderness and over all acceptability than control and other two levels of barley flour added chicken meat sausages

TABLE 1 MEAN ±S.E VALUES OF PHYSICO-CHEMICAL, PROXIMATE AND SENSORY CHARACTERISTICS OF CHICKEN MEAT SAUSAGES INCORPORATED WITH DIFFERENT LEVELS OF BARLEY FLOUR.

Parameters	Control	Chicken meat sausages incorporated with barley flour		
		3 percent	6 percent	9 percent
Physico-chemical characteristics*				
Cooking loss (%)	11.84±1.10^{a}	08.5±0.70^{b}	06.5±0.70^{c}	06.00±1.80^{d}
Emulsion stability (%)	68.66±0.94^{d}	87.16±0.70^{c}	90.50±0.70^{b}	92.16±1.17^{a}
Water holding capacity (%)	55.40±0.14^{d}	59.25±0.07^{c}	64.21±0.07^{b}	67.38±0.02^{a}
pH	06.50±0.00	06.55±0.07	06.58±0.02	06.53±0.04
Proximate characteristics (%)*				
Moisture	57.99±0.25^{d}	59.14±0.64^{c}	60.04±0.39^{b}	61.25±0.58^{a}
Crude fibre	0.25±0.01^{d}	0.52±0.035^{c}	0.76±0.25^{b}	01.31±0.04^{a}
Crude protein	21.06±0.70^{a}	19.99±0.48^{b}	18.08±0.69^{c}	17.39±0.20^{d}
Crude fat	08.23±0.08^{d}	08.52±0.13^{c}	09.26±0.04^{b}	09.55±0.09^{a}
Total ash	02.46±0.06^{c}	02.81±0.14^{b}	02.87±0.07^{b}	03.12±0.05^{a}
Sensory characteristics**				
Colour	6.96±0.00^{d}	7.23±0.04^{b}	7.65±0.01^{a}	7.10±0.00^{c}
Flavour	7.21±0.07^{a}	7.13±0.00^{b}	7.23±0.07^{a}	6.86±0.04^{c}
Juiciness	6.86±0.04^{b}	7.21 ± 0.02^{a}	7.28±0.02^{a}	6.78±0.02^{b}
Tenderness	7.46±0.04^{b}	7.36±0.04^{c}	7.86±0.04^{a}	7.06±0.04^{d}
Overall acceptability	6.96±0.00^{b}	7.28±0.02^{a}	7.26±0.00^{a}	6.93±0.00^{b}

Means bearing at different superscript in the same row differ significantly (P<0.05).

* n = 12; ** n = 15.

The incorporation of barley flour at 6 percent level in to chicken meat sausages was considered to be optimum for all the desired qualities and also considering that sensory scores plays predominant role for consumer acceptance. Hence chicken meat sausages added with 6 per cent barley flour has been selected for further shelf life studies.

Physico-chemical characteristics, proximate composition and sensory evaluation of chicken meat sausages incorporated with 6 % barley flour during refrigeration (4±1°C) temperature

In second phase, the control and barley flour added sausages were packed separately in low density polyethylene (LDPE) bags and stored at refrigeration temperature (4±1°C). The refrigerated samples were drawn at an interval of five days (0, 5, 10, 15, 20, 25, 30 days) and analysed for various physico-chemical characteristics, microbial counts (total plate count)- and sensory quality along with control.

Microbial characteristics of chicken meat sausages incorporated with 6 % barley flour during refrigeration (4±1°C) temperature

Total Plate Count

The mean ±SE values of the total plate count (log_{10}cfu/g) of chicken meat sausages as influenced by treatments during refrigerated storage as presented in Table 2 . The mean total plate count of chicken meat sausages were significantly (P<0.05) influenced by treatment and between days of refrigerated storage. The overall mean ±S.E. values of total plate count of chicken meat sausages on 0,5,10,15,20,25 and 30 days of refrigerated storage (4±1°C) were tabulated below

TABLE 2 MEAN ±S.E TOTAL PLATE COUNT (LOG_{10}CFU/G) OF CHICKEN MEAT SAUSAGE AS INFLUENCED BYADDITION OF BARLEY FLOUR DURING REFRIGERATED STORAGE (4±1°C).

Days of storage	Total plate count (log_{10}cfu/g)	
	Control Sausage	Barley flour added sausage
0th day	1.20 ± 0.014^{aG}	1.22 ± 0.021^{aG}
5th day	1.33 ± 0.035^{aF}	1.39 ± 0.028^{aF}
10th day	1.44 ± 0.021^{aE}	1.38 ± 0.021^{bE}
15th day	2.46 ± 0.092^{aD}	2.06 ± 0.021^{bD}
20th day	3.28 ± 0.014^{aC}	2.89 ± 0.049^{bC}
25th day	3.47 ± 0.124^{aB}	2.96 ± 0.078^{bB}
30th day	3.95 ± 0.014^{aA}	3.05 ± 0.099^{bA}

Mean with different superscripts in a row (lower case) and column (upper case) differ significantly (P<0.05); n=12.

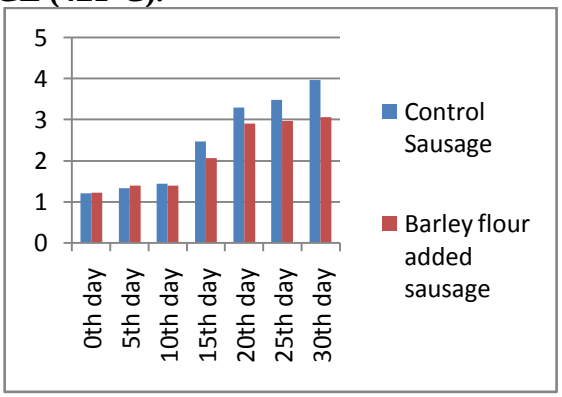

Figure 5
Graphical representation of Table 2

The analysis of variance revealed that, the overall mean total plate count value of treatment was significantly (P<0.05) lower than control. This might be due to conducive water activity, change in pH and packaging conditions (Leistner*et al.*, 1995) However, in this study spoilage was not noticed upto 14 days (4.38 log10cfu/g) of refrigerated storage whereas, generally spoilage of meat reported at 8logcfu/g (Narasimha Rao and Schindra, 2002).Similar results were also noted by and Thomas *et al.*, (2006) in restructured buffalo meat nuggets during refrigerated storage.

Sensory characteristics of chicken meat sausages incorporated with 6 % barley flour during refrigeration (4±1°C) temperature

Flavour

The mean ±SE of flavour scores of chicken meat sausages as influenced by selected treatment during refrigerated storage .The mean ±SE of flavour scores of chicken meat sausages were significantly (P<0.01) influenced by different treatment and storage periods.

The analysis of variance revealed that treatment recorded significantly (P<0.0l) higher, flavour scores when compared to control. The decrease in flavour scores might be due to cumulative effect of all treatments on storage period and as storage prolongs, there is reduction of efficacy of antioxidants. These results are in agreement with Gupta *et al.*, (1993) in mutton and mutton+ chicken sausages. Both control and barley flour added chicken meat sausages showed a decreasing trend in all sensory characteristics viz., colour, flavour, juiciness, tenderness and overall acceptability during the refrigerated storage (4± 1 ° C). However the scores were well within the limits of acceptability of panelists.

CONCLUSION

Population growth, urbanization, economic growth and flourishing markets all lead to the increasing demand for meat and animal products. Also, changing nutritional needs, driven by growing incomes and demographic transitions, there is an increased need for livestock products including meat on a global scale. Both meat and its associated products can be modified by adding ingredients considered beneficial for health or by eliminating or reducing components that are considered harmful. In this way, a series of foods can be obtained which, without altering their base, are considered healthy. The accelerated fast track life has been driving human forces to consume highly preferred ready-to-eat comminuted meat products like sausages, nuggets, balls, etc., Sausages, are an example of comminuted meet products that are generally recognized as emulsified, stuffed, linked, smoked, and cooked meat products.

Lipid oxidation and microbial counts are considered as major components which determine the shelf life of the meat products. Both lipid oxidation and microbial counts of chicken meat sausages incorporated with barley flour were well within acceptable limits upto 25 days at refrigerated (4±1°C) storage. The result showed that chicken meat sausages extended with 6 per cent barley flour was considered superior in respect to its quality characteristics and was find to be stable for a period of 25 days under refrigerated (4±1°C) storage without any quality deterioration.

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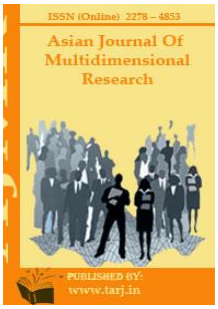

Asian Journal of Multidimensional Research (AJMR)

(Double Blind Refereed & Reviewed International Journal)

UGC APPROVED JOURNAL

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CAUSE OF OBESITY AMONG SELECTED OBESE WOMEN (25-35YEARS)

D. Pushparani*; Ms. A. Kanniammal**

*Ph. D Scholar,
Avinashilingam Institute for Home Science and
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: pushparani040682@gmail.com

** Lecturer,
Department of Home Science,
Gandhigram Rural Institute,
Gandhigram, INDIA

ABSTRACT

A deficiency of the thyroid gland can reduce the basal metabolism, but overweight from this cause can reduce the basal metabolism, and can be prevented if the diet is sufficiently restricted in calories(Espanol,2005).Nutritional status was assessed on 50 obese women using anthropometric measurements and dietary assessment. Nutrition education was imparted to the women as an intervention programme. According to Goldberg (2004), the genes involved in obesity may be considered as predisposed and one or several of them may be acting in conjunction.Psychological causes can increase obesity and also the psychological change in obesity becomes a consequence of obesity (www.khou.com). The study was designed with the following objectives are to find the socio-economic background of the selected premenopausal obese women. To find the causes of obesity among the selected premenopausal obese women. The height of the selected women was measured in centimetres by making them stand straight, without shoes or hat, heels together and looking straight ahead. The weight had been measured in kilograms with help of weighing balance in early morning. With regard to the diet pattern consumed cereals and pulses, twenty six percent of them avoided meat and meat products. Thirty per cent of avoided carbonated beverages. Sixty-five per cent consumed three meals a day and preferred taste and spicy foods.

KEYWORDS: *Metabolism, Carbonated, Premenopausal, Consequence*

INTRODUCTION

Health is a state of complete physical, mental and well-being and not merely the absence of disease or infirmity (WHO, 2003). Obesity is a state in which there is a generalised accumulation of excess adipose tissue in the body leading to more than 20 per cent of the desirable weight. It is an excess of body fat that frequently results when the size or number of fat cells in a person's body increases. It is a condition of higher than normal body fat content (Altschul, 1988).Within families, if one parent is obese, a child has 40 per cent chance of becoming obese and only seven per cent if neither parent its obese (Williams, 1989).Thomas (1995) states that, it is seen often in the lower socio-economic groups. These people tend to be less active than other people. Inactivity contributes to obesity. According to Goldberg (2004), the genes involved in obesity may be considered as predisposed and one or several of them may be acting in conjunction. Psychological causes can increase obesity and also the psychological change in obesity becomes a consequence of obesity (www.khou.com). These women commonly show complications at puberty, which continues through pregnancy, and menopause suggesting an endocrine factor. A deficiency of the thyroid gland can reduce the basal metabolism, but overweight from this cause can reduce the basal metabolism, and can be prevented if the diet is sufficiently restricted in calories(Espanol, 2005). These women and men are more at risk for many diseases like diabetes, gall bladder disease, heart and blood vessel problems, bone related arthritis, abnormal levels of fat in blood, gout and sleep apnoea syndrome (www.hormone.org/lean/obesity). Due to obesity complications like type 2 (non- insulin dependent) diabetes, cardiovascular disease, hypertension, dyslipidaemia, angina pectoris, cholecystitis, cholelithiasis, osteoarthritis, polycystic ovary syndrome (PCOS) may occur (www.nlm.nib.gov/medline plus). Blood pressure increase with weight and hypertension as an illness is three times more frequent in obese people than in normal population(Rector, 2006).Goldberg (2004) states that intake of more calories than our body's requirement definitely causes the calories to accumulate and for every 7,500 calories our body accumulate the weight gain of one kg which leads to gain obesity (www.knou.com). Over consumption of high calorie foods, some factors like overexposure to food and advertisements that promote consumption of high calorie foods leads to obesity (Swaminathan, 2005). It can be prevented by avoiding excessive and frequent eating of foods rich in calories, fried foods, nuts, sweets etc (Swaminathan, 2003). The study was designed with the following objectives are to find the socio-economic background of the selected premenopausal obese women. To find the causes of obesity among the selected premenopausal obese women. To assess the anthropometric measurements and dietary pattern of the selected premenopausal obese women.

METHODOLOGY

Selection of the Area:

The study was carried out in Dindigul district, due to the willing response of the women and easy access to the venue. About 100 obese pre-menopausal women were selected by purposive sampling. According to Basotia (2002), in a purposive sampling the researcher uses his or her own judgement, about, which respondents to choose and picks only those who best meet the purpose of the study. An interview schedule was formulated to elicit information like socio- economic status, causes of obesity, diet pattern of the selected samples. In an interview schedule, an interviewer presents the questions of the schedule to the interviewer and records their responses on blank spaces (Saravanavel, 1995). Nutritional status is the condition of health of individual as influenced by the nutrients (Jewel, 2000). Nutritional anthropometry is measurement of human body at various ages and levels of nutritional status (Bamji et al, 1999).Nutritional status was assessed on 50 obese

women using anthropometric measurements and dietary assessment. Nutrition education was imparted to the women as an intervention programme. Anthropometry includes measurements of the physical characteristics of the body such as height and weight (from which BMI was calculated); waist circumference and hip circumference(from which WHR was calculated).The height of the selected women was measured in centimetres by making them stand straight, without shoes or hat, heels together and looking straight ahead. The weight had been measured in kilograms with help of weighing balance in early morning. The samples were weighed with empty stomach without shoes, with indoor clothes. The ratio between the body weight in kilograms and height in m^2 is called Body Mass Index and was calculated using the equation:

$$BMI = \frac{\text{Weight (Kg)}}{\text{Height (cm)}}$$

The women were categorised using the classification by InternationalObesityTask Force/ WHO, 2002

BMI Value	**Health Status**
< 18.5	Under weight
18.5-24.9	Normal
25.0-29.9	Overweight
30.0-34.9	Obesity class I
35.0-39.9	Obesity class II
>40	Obesity class III

The waist circumference was taken by using a flexible non-stretchable fibre glass tape placed around the navel part of the belly button. Hip circumference was taken by using the inch tape placed over the largest part of the buttocks. The ratio between waist circumference and hip circumference is called waist to hip ratio. When waist to hip ratio is greater than 0.8, the women are at a greater risk of obesity (Thomas, 1995).

$$\text{Waist to Hip Ratio} = \frac{\text{Waist Circumference (cm)}}{\text{Hip Circumference (cm)}}$$

A careful history including nutritional information in relation to living situation and other personal, psychological and economic problems area a fundamental component of nutritional assessment. A food frequency checklist was used to collect data on the frequency of food consumption and eating habits of the selected volunteers. Nutritional assessment that asks how often the subject consumes specific consumes specific foods or groups of foods rather than what specific foods or groups of foods the subject consumes daily is called Food frequency check list(Insel*et al*, 1990).

RESULTS AND DISCUSSION:

The Socio-economic details of the women is given in the Table I

TABLE I

Age (in Years)	**Number of women**	**Percentage**
25-27	14	14
28-30	29	29
31-33	27	27
34-36	30	30
Educational status		
Illiterate	22	22
Primary school	44	44
High school	11	11
Higher secondary	16	16
Graduation	7	7
Total	100	100
Occupation		
Home maker	54	54
Self employed	19	19
Employed in forms	18	18
Coolie	9	9
Total	100	100
Type of work		
Sedentary work	90	90
Moderate work	9	9
Heavy	1	1
Total	100	100
Food consumption		
Non-vegetarian	80	80
Vegetarian	20	20
Total	100	100
Family History		
Both obese	45	45
Father obese	22	22
Mother obese	20	20
Relatives obese	12	12
No one obese	1	1
Total	100	100
Complications		
Diabetes	66	66
No complications	16	16
Minor complications	15	15
Hypothyroidism	3	3
Total	100	100
Managing stress	Number of women	Percentage

Eating	39	39
Sleeping	36	36
Fasting	15	15
Go outside	10	10
Total	100	
Height (cm)		
131-140	3	3
141-150	40	40
151-160	43	43
161-170	14	14
Total	100	100
Weight (Kg)		
50-60	20	20
61-70	58	58
71-80	22	22
Total	100	100

Fourteen per cent of the obese women were in the age range of 25-27 years, 29 per cent were in the age of 28-30 years, 27 per cent were in the age range of 31-33 years and 30 per cent were in the age range of 34-36 years. Forty four percent of the selected women had primary education and twenty-two per cent of them were illiterate. Fifty four percent of the selected women were homemakers. Fifty three percent of the women had low monthly family income thus belong to a low socio-economic status. Ninety per cent were sedentary workers and only one sample was heavy worker.

Twenty per cent of women were non- vegetarian and 80 per cent of them were vegetarian. Twelve per cent of the women reported that their relatives were obese, 20 per cent reported that their mother was obese, twenty-two per cent were father was obese, forty-five per cent reported that both parents were obese and only one sample reported that her father was obese. Of the obese women, 66 per cent were diabetic, 16 per cent had no complications, 15 per cent had minor complications like sleep apnoea and shortness of breath, three percent had Hypothyroidism in order to manage stress, thirteen nine per cent of women eat outside and sleep. The women were 141to 160 cm tall. Twenty per cent were in the weight range of 50-60 kg. Fifty-eight per cent were in the 61-70 Kg. Twenty-two per cent were in the 71-80 Kg. Eighty-two per cent of the women were in obese I category and 18 per cent of them were in obese II category. Seventy-five per cent of women had waist to hip ratio above 0.8 and 25 per cent had waist to hip ratio below 0.8.Sixty-five per cent of the women preferred tasty and spicy foods, 23 per cent of women preferred healthy foods and 12 per cent preferred foods that fast foods. All of them consumed cereals and pulses, while 12 per cent consumed green leafy vegetables daily,40 per cent of them consumed weekly twice, four per cent restricted green leafy vegetables whereas 14 per cent of them avoided green leafy vegetables. Fifty per cent of women consumed roots and tubers daily, 24 per cent of the consumed weekly twice, four per cent restricted roots and tubers where as 10 per cent avoided roots and tubers.

Dietary Assessment of the women:

Food preferences	**Number of samples**	**Percentage**
Tasty and Spicy	65	65
Healthy	23	23
Foods in fashion	12	12
Total	100	100

Frequency of consumption									
S. No	Food stuff	Daily		Weekly twice		Restricted		Avoided	
		No	%	No	%	No	%	No	%
1	Cereals	100	100	-	-	-	-	-	-
2	Pulses	100	100	-	-	-	-	-	-
3	Green leafy vegetables	12	12	40	40	4	4	14	14
4	Roots and tubers	50	50	24	24	4	4	10	10
5	Vegetable	42	42	22	22	4	4	-	-
6	Fruits	22	22	12	12	2	2	-	-
7	Nuts and oil seeds	36	36	22	22	6	6	8	8
8	Oil	40	40	16	16	8	8	-	-
9	Egg	48	48	32	32	6	6	4	4
10	Milk and milk products	48	48	16	16	6	6	30	30
11	Meat and meat products	20	20	34	34	20	20	26	26
Frequency of consumption									
1	Snacks	42	42	34	34	2	2	22	22
2	Fresh foods	28	28	40	40	2	2	30	30
3	Sweets	22	22	28	28	6	6	44	44
4	Fast foods	16	16	28	28	22	22	34	34
5	Carbonated beverages	6	6	24	24	40	40	30	30

CONCLUSION:

With regard to the diet pattern consumed cereals and pulses, twenty six percent of them avoided meat and meat products. Thirty per cent of avoided carbonated beverages. Sixty-five per cent consumed three meals a day and preferred taste and spicy foods. Successful weight loss does not depend on operation drugs, injections, food diets or other manipulation undertaken by the ability of the patient to manage the disorder and to persist indefinitely with some restrictions on dietary freedom.

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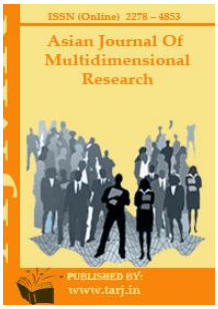

Asian Journal of Multidimensional Research (AJMR)

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EFFECT OF SOY PROTEIN ISOLATE IN DIET OF HYPERTENSIVE PATIENTS

Anit James*; Dr.Rachna Mishra**

*Ph.D Scholar,
Isabella Thoburn College, INDIA
Email: angeljames.james@gmail.com

** Senior Lecturer,
Isabella Thoburn College, INDIA

ABSTRACT

Diet low in saturated fat and cholesterol that include 25 g of soy protein per day may reduce the risk of heart diseases. Soy protein isolate are basically the proteins that are derived from the soybean cakes after the extraction of the oil. It can be incorporated in any food product to improve the protein quality. Soy protein Isolate has many health benefits like reducing cholesterol –Heart Disease, Hypertension, Certain Cancer, Diabetes, Menopause, Osteoporosis etc. The study conducted on "Effect of Soy Protein Isolate in diet of Hypertensive Patients". It has a high protein content derived from vegetable source containing a balancing supply of nine essential and non essential amino acids. In this study 60 subjects were taken and they were divided into experimental and control group respectively. The blood pressure levels of both the groups were taken together. Soy protein isolate was incorporated in form of cookies and were intervened for a month and again the blood pressure levels were taken to check the lowering effect. Mean, Standard Deviation, Chi – Square test, Wilcox on Signed rank statistic, Mann-Whitney U test were used in the study. Statistically no categorical change was observed in control group after one month whereas a statistically significant change in blood pressure was observed in the experimental group ($p<0.001$). It was thus revealed that at pre intervention interval maximum subjects had Grade I Hypertension whereas after intervention maximum subjects had high normal category of blood pressure. Hence it was seen that consumption of soy protein isolate in the diet had great influence in lowering blood pressure levels, with significant change blood pressure levels of the patients.

KEYWORDS: *Soy Protein Isolate, Hypertension, Non Essential Amino Acids*

INTRODUCTION

To meet the nutritional needs of an individual low cost blended foods like Soy Protein Isolates were used to prevent the lifestyle diseases like hypertension. Soy proteins Isolate are basically the proteins which are derived from the soybean cakes after the extraction of oil. These soy protein isolates are known to contain is of lavones which will help to prevent hypertension.

Hypertension is a state of sustained increase in the arterial blood pressure which is measured indirectly by an inflatable cuff and pressure known as Sphygmomanometer .There is an increased risk of developing cardio vascular diseases, stroke, paralysis etc. Age, obesity unhealthy eating habits, stressful lifestyle and indulging in alcohol and smoking are the leading causes of hypertension in most individuals. The normal blood pressure level is 120/80 mmHg. If the blood pressure ranges from 120-139/80-89mmHg it is known to be prehypertension. On the other hand if the blood pressure levels are from 140-159/90-99mmHg it is classified into High Stage 1 hypertension, whereas if the blood pressure ranges from 160 or higher /100 or higher it is termed as stage 2 hypertension. It can be prevented by improving our eating habits with less of salt, fat, caffeine and alcohol and by incorporating fibre foods like whole grains, oats, fruits and vegetables, reducing weight and by practicing yoga and meditation to reduce the stress.

OBJECTIVES

- To identify hypertensive patients from the selected population.
- To develop a food product using Soy Protein Isolate.
- To estimate the nutrient content analysis of the developed product
- To assess the acceptability of the developed product
- To see the effect of soy protein on the level of blood pressure.

METHODOLOGY

The present study was conducted in Gomti Nagar Area of Luck now. The sample size for the study was 60. They were divided into control and experimental group 30 in each group .The subjects in the control group were on normal diet and had oats cookies whereas the experimental group the subjects were intervened with soy protein isolate cookies. The soy protein isolates were prepared, organoleptic evaluation and sensory evaluation was done by using hedonic scale test ranging from 1to 9. A questionnaire was also prepared it was filled by the subjects the past medical history of the patients were recorded along with the medications prescribed by the doctor. Before the intervention the blood pressure was measured and recorded. The intervention was for a month. The patients were keenly observed they were counselled and educated about the dietary pattern and lifestyle. After the intervention period was over the blood pressure levels were again recorded using a sphygmomanometer.

Plan Of work

Identification of Hypertensive subjects

⇩

Preparation of Cookies with Soy Protein Isolates

⇩

Organoleptic Evaluation of Soy Protein Isolate Cookies and Analysis of nutrient content

⇩

Intervention on using a Case Control Design for 1 month

⇩

Effect of intervention on the level of blood pressure

⇩

The blood pressure was measured using a sphygmomanometer

⇩

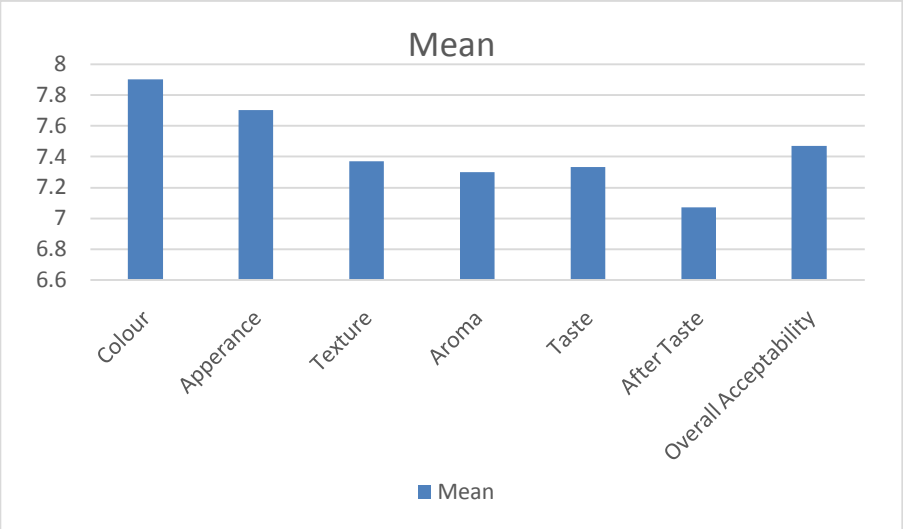
Result Analysis

RESULT AND DISCUSSION

The sensory evaluation was done for colour, appearance, texture, aroma, taste and after taste. The overall acceptability of the product was assessed. All the assessments were done using a hedonic scale ranging from 1 to 9 i.e. 9 was determined as liked extremely whereas 1 was disliked extremely.

Outcome of Organoleptic Evaluation (n=30)

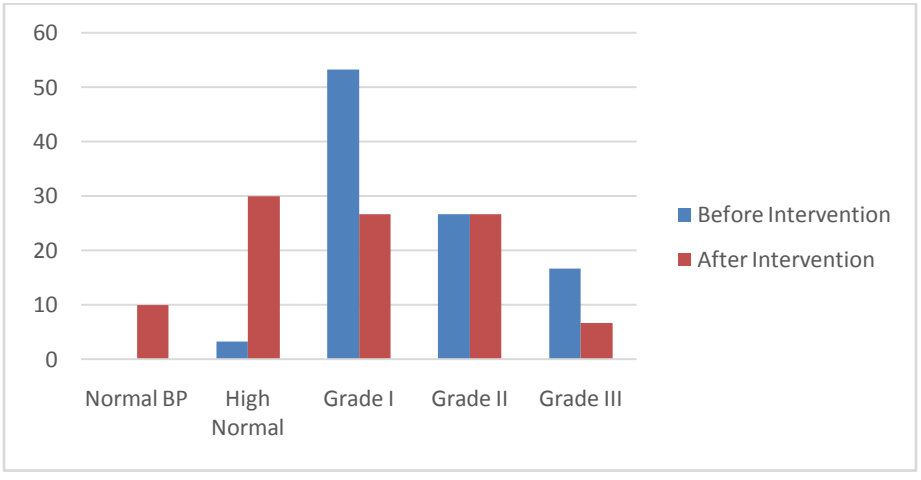
Dimensions	Minimum	Maximum	Mean	Std, Deviation
Colour	7	9	7.90	0.607
Appearance	7	9	7.70	0.750
Texture	6	8	7.37	0.615
Aroma	6	9	7.30	0.877
Taste	6	8	7.33	0.592
After Taste	6	8	7.07	0.626
Overall Acceptability	7	9	7.47	0.615



The colour , appearance and overall acceptability got the maximum scores, whereas after taste got the minimum score because the soy protein isolate itself does not have a taste of its own.

Comparison of Change in Blood Pressure in the Experimental Group (n=30)

Blood Pressure	Before Intervention		After 1 Month	
	No.	%	No.	%
Normal BP	0	0.00	3	10.00
High Normal	1	3.33	9	30.00
Grade I	16	53.33	8	26.67
Grade II	8	26.67	8	26.67
Grade III	5	16,67	2	6.67
Mean SBP+_ SD	159.20+_14.72		146.33+_14.06	
Mean DBP+_	99.13+_5.27		92.07+_6.00	



It was observed that after the intervention period of one month maximum subjects had Grade I hypertension whereas after intervention maximum subjects had high normal category of blood pressure. Lifestyle modification with change in diet showed drastic change in their blood pressure

levels. The study was conducted in the month of march and it got over in april , seasonal variation also plays an important role in lowering the blood pressure .

CONCLUSION

After the intervention it was observed that subjects showed a change in their blood pressure levels. There was a decrease in the mean values in both systolic and diastolic blood pressure. A statistically significant change of ($p<0.001$) in blood pressure was observed in the experimental group.

- The study was conducted on a small sample size to see the lowering effect of hypertension can be done on a larger sample size.
- The intervention period can be increased to see more beneficial effects.
- Soy proteins has many health benefits like it helps in cardio vascular diseases, diabetes , cancer and menopause so studies can be done on them
- To create an awareness among people so that they come to know more about soy protein isolate.
- To prevent wastage of soybean cakes after extraction of the oil, it can be utilized for the welfare of mankind.
- The intervention for the study can also be tried on animals first and then it can be tried on human beings.

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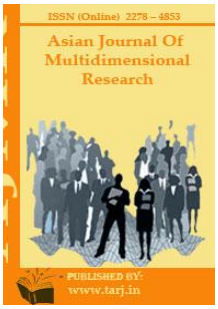

Asian Journal of Multidimensional Research (AJMR)

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FORMULATION AND STANDARDIZATION OF SESAME SEED INCORPORATED NUTRIENT BAR

Anagha Ravi*; Kalamani.R**

*Research Scholar,
Dept. of Foods and Nutrition,
Rathnavel Subramaniam College of Arts and Science,
Sulur, Coimbatore, Tamil Nadu, INDIA
Email id: anagharavi16@gmail.com

**Assistant Professor,
Dept. of Foods and Nutrition,
Rathnavel Subramaniam College of Arts and Science,
Sulur, Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Nutrient bars provide a convenient, portable snack or meal replacement for people who normally eat a healthy diet. The product was popularized among 30 school children to create awareness about the health benefits of sesame seed. A questionnaire was given before and after the popularization study to find the impact of the programme. The score obtained in the popularization study shows that there was a gain in the knowledge about the uses and benefits of sesame seed and school children liked the sensory attributes of the sesame seed incorporated nutrient bar. Sesame seed is a good source of copper, manganese, calcium, magnesium, iron, phosphorus, vitamin B1, zinc, molybdenum, selenium and dietary fibber. Sesame seeds contain two unique substances sesamin and sesamol in. The product was popularized among 30 school children to create awareness about the health benefits of sesame seed. A questionnaire was given before and after the popularization study to find the impact of the programme.

KEYWORDS: *Manganese, Calcium, Magnesium, Iron, Phosphorus,*

INTRODUCTION

New product development is used to describe the complete process of bringing new products of services to the market. It involves two parallel pathways one where in the ideas are generated, products designed as well as detailed engineering and second one involves market research and analysis. New product that delivers added consumer value.(Jasmohan,2000)

Sesame seed is a good source of copper, manganese, calcium, magnesium, iron, phosphorus, vitamin B1, zinc, molybdenum, selenium and dietary fibber. Sesame seeds contain two unique substances sesamin and sesamol in. Both of these substances belong to a group of special beneficial fibers called lignans. Lignans have a cholesterol lowering effect in humans and to prevent high blood pressure and increase vitamin E supplies in animals. Sesamin has also been found to protect the liver from oxidative damage. (Saydut et al., 2008)

Nutrient bars provide a convenient, portable snack or meal replacement for people who normally eat a healthy diet. Nutrient bar is a product obtained from the mixture or combination of one (or) more ingredient with specific nutritional values and flavours, added of a bonding ingredient which confers proper texture. (Rahul,2010).

The objectives for the present study is to

- Formulation of sesame seed incorporated nutrient bars.
- Evaluate the best proportions' of sesame seeds incorporated nutrient bars.
- Evaluate the shelf life stability of the products.
- Cost analysis of the standard and best product.
- Popularization of the products among school going children.

METHODOLOGY

The methodology was carried out under the following headings:

1. **SELECTION, DEVELOPMENT AND STANDARDISATION OF SESAME SEED INCORPORATED NUTRIENT BAR**
   Sesame seeds were purchased from the local super market.Nutrient bar was selected for this study.The sesame seed was incorporated intothe nutrient bar with different proportions 5%, 10%, 15% and 20% by the replacement of main ingredients like cashew nut.

2. **SENSORY EVALUATION OF THE NUTRIENT BAR**
   The sensory attributes of productswas found out using a five point hedonics scale by a semi skilled panel comprising of 30 post graduate students of the department of Foods and Nutrition, Rathnavel Subramaniam College of Arts and Science. The product that scored the highest in sensory analysis along with standard was taken for shelf life study.

3. **SHELFLIFE STUDY AND POPULARISATION OF NUTRIENT BAR**
   The standard and selected sesame seed incorporated nutrient bar was packed in aluminium cover and it was kept in room temperature for7 days to analyse the shelf life.The microbial analysis was carried out on the 1st, 4th and 7th day. The sensory analysis was done after micro bal analysis by the same panel members. The cost analysis was carried out both standard and formulated nutrient bar. The product was popularized among 30 school children to create awareness about

the health benefits of sesame seed. A questionnaire was given before and after the popularization study to find the impact of the programme.

4. STATISTICAL ANALYSIS

The data obtained was consolidated and tabulated meanand standard deviation were analysed.

RESULT AND DISCUSSION

The sensory analysis of the products showed that product B with 10% sesame seed scored the highest mean score with the standardised nutrient bar. Sample B was selected for shelf life study. No bacterial growth was observed standard and selected product till 7th day. So it was concluded that the products were shelf stable for seven days.

TABLE I MEAN SENSORY SCORE OF STANDARD AND SESAME SEED INCORPORATED NUTRIENT BAR

PRODUCT	APPEARANCE MEAN±SD	COLOUR MEAN±SD	TEXTURE MEAN±SD	FLAVOUR MEAN±SD	TASTE MEAN±SD
Standard	5±0	5±0	5±0	5±0	5±0
Sample A	4.7 ±0.87	4.8 ±0.12	4.7± 0.14	4.7± 0.46	4.7 ±0.32
Sample B	4.8 ±0.90	4.9 ±0.10	4.8± 0.20	4.9 ±0.12	4.9 ±0.16
Sample C	4.7± 0.85	4.7 ±0.38	4.6 ±0.41	4.5 ±0.62	4.5 ±0.63
Sample D	4.7 ±.084	4.6 ±0.24	4.6± 0.13	4.1 ±0.97	4.2 ±0.84

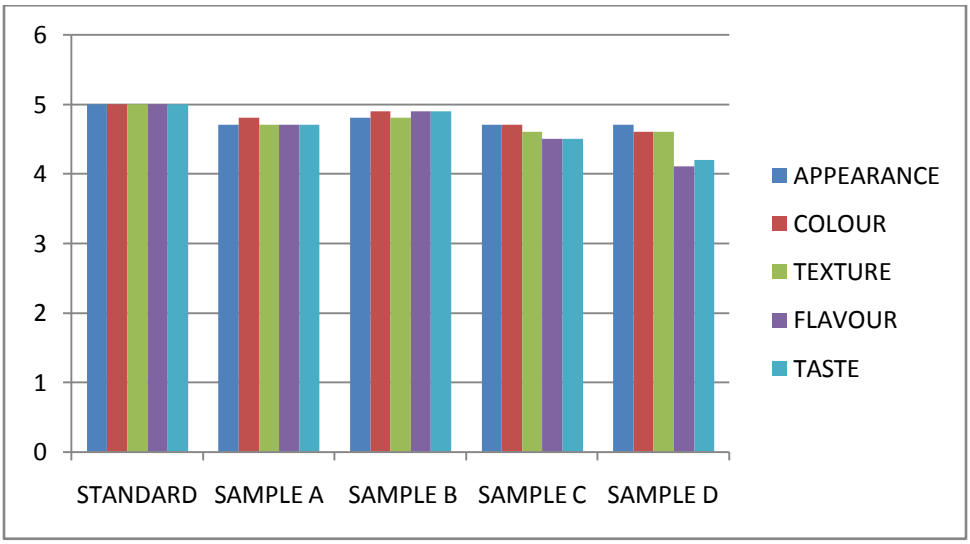

FIGURE -I

Microbial Analysis of Standard and Selected Sesame Seed Incorporated Nutrient Bar

TABLE -II

DAY	STANDARD NUTRIENT BAR	SESAME SEED INCORPORATED NURTRIENT BAR
Day 1	Good	Good
Day 4	Good	Good
Day 7	Good	Good

The sensory scores obtained during the shelf life study showed that the organoleptic characteristic of products stored in aluminium cover was good. Incorporation of sesame seed decreases the cost of the products. The score obtained in the popularization study shows that there was a gain in the knowledge about the uses and benefits of sesame seed and school children liked the sensory attributes of the sesame seed incorporated nutrient bar.

CONCLUSION

From the present study it was concluded that sesame seed incorporated nutrient bar was highly acceptable at ten percent level of incorporation. No bacterial growth was observed in this product.

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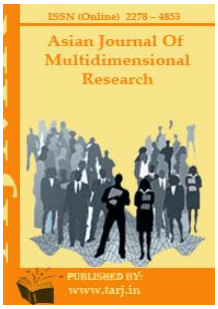

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ROLE OF NON-THERMAL PROCESSING IN THE REDUCING OF LOG RANGE OF TARGET ORGANISM IN GREEN ONIONS

Kamatchinathan M*; Jagannathan V**

*M.Sc Food science and Technology,
Pondicherry (central) university, Kalapet,
Puducherry, INDIA
Email id: mknathan6@gmail.com,

**M.Sc Food processing,
PGP College of arts and science,
Namakkal, Tamilnadu, INDIA

ABSTRACT

Traditional food processing relies on heat to kill microorganism to make food safe to eat. For many food items, heating is an effective way to kill organism and treat foods. However, there are many food items that show risk for organisms for which heat is either undesirable or shouldn't be used. In these cases alternative processing methods are used at various stages of development, and have the potential to destroy and retain the desired food quality. Here green onions are taken and tested through non-thermal processing techniques like pulsed light and Ultraviolet to reduce the log range of target organism.The result shows that there is a log range reduction of E.coli and Salmonella in green onions by 1.9-3.9 and 1.3-4.1 respectively via Pulsed light and log range reduction of E.coli and Salmonella in green onions by 0.9-1.3 and 1.4-2.1 respectively via ultraviolet compared to control (absence of non-thermal process) depending on treatment.The results show that there is maximum reduction of targeted organism (E.coli and Salmonella) in log stage compared to control in the green onions. Even though non-thermal processing technique is quite costlier when compare to others processing, these non-thermal processing has maximum reduction effect against organism and spores, and retain food quality and extend shelf life of food items.

KEYWORDS: *Traditional food processing, alternative processing methods, green onions, non-thermal processing, pulsed light and ultraviolet, food quality*

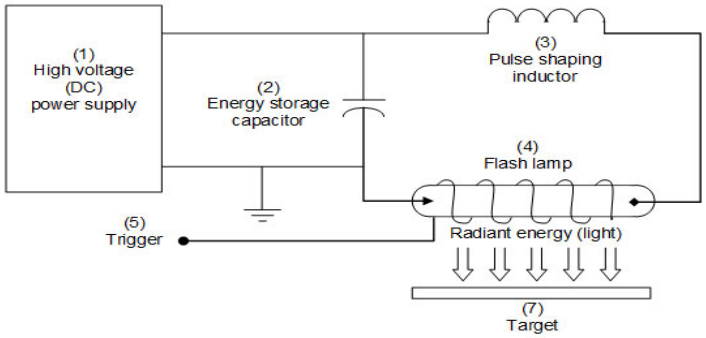
1. INTRODUCTION

Most of the foods that are consumed by people are processed in one way or the other. Foods are processed to make them safe (micro biologically), to develop flavor, color, texture, to make them easy for digestion, and to make them convenient for eating and handling. Foods can be preserved by addition or removal of heat. Traditionally, foods have been processed thermally in a variety of ways such as steam retorting, pasteurization, baking, and frying. However, there are many food items that shows risk for organisms for which heat is either undesirable or shouldn't be used and also have some disadvantages that include loss of color, flavor, freshness, and some nutritional aspects. New ways of processing food in non-thermal ways offer a way to eliminate some of these disadvantages and ensure food safety. Researchers have been studying non-thermal processing methods (methods that do not use heat) that will destroy pathogens and keep foods safe to eat, while retaining the sensory attributes and nutrient content similar to raw or fresh products.

2. METHODOLOGY

2.1.PULSED LIGHT TREATMENT:

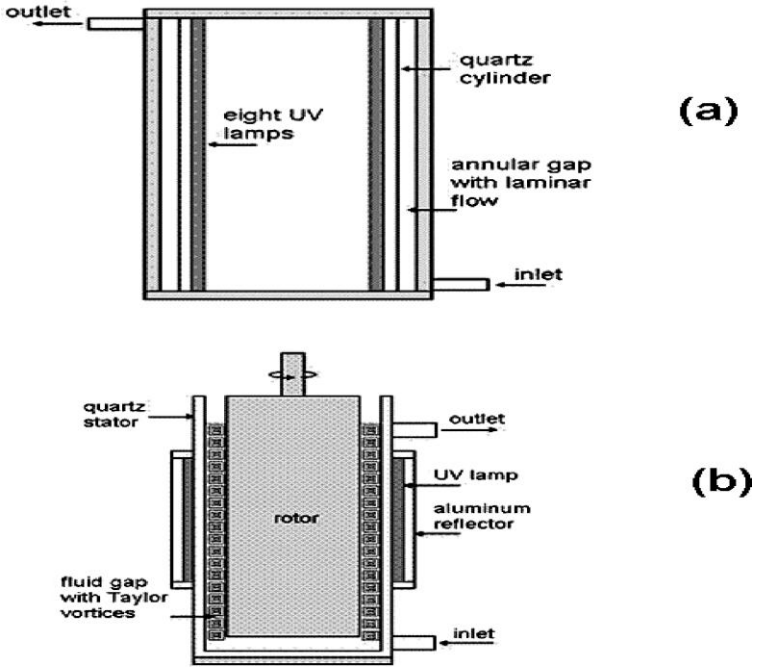
The term pulsed light is known since 1980 and was first adopted by the US Food and Drug Administration (FDA) for food processing in 1996.To increase the safety of fruit and vegetable juices, US FDA regulation has implemented 5-log pathogen reduction process. Significant microbial reduction in very short treatment time, low environmental impact, and its high flexibility are some of the major benefits of PL. Principle involves in the pulsed light treatment is gradually increasing from low to high energy and then releasing the highly concentrated energy as broad spectrum bursts, to ensure microbial decontamination on the surface of foods and packaging foods. Within fraction of second, the electromagnetic energy gets stored in the capacitor and is then released in the form of light within a billionth of a second, which results in power amplification and minimum additional energy consumption. The inactivation efficacy of pulsed light depends upon intensity (measured in Joule/cm-2) and the number of pulses delivered. The PL includes a wide wavelength range of 200–1100 nm, which includes ultraviolet (UV): 200–400 nm, visible (VIS): 400–700 nm, and near-infrared region (IR): 700–1100 nm.



2.2 ULTRAVIOLET TREATMENT:

UV has been used for disinfection since the mid-20th century, with beginnings even earlier when sunlight was investigated for bactericidal effects in the mid-19th century. It's used for drinking and wastewater treatment, air disinfection, the treatment of fruit and vegetable, juices, as well as a myriad of home devices. Ultraviolet light exists within the spectrum of light between 10 and 400 nm. The germicidal range of UV is within the 100-280nm wavelengths, known as UV-C, with the peak wavelength for germicidal activity being 265 nm. This range of UV light is absorbed by the DNA

and RNA of microorganisms, which causes changes in the DNA and RNA structure, rendering the microorganisms incapable of replicating. A cell that can't reproduce is considered dead; since it is unable to multiply to infectious numbers within a host. This is why UV disinfection is sometimes called ultraviolet germicidal irradiation (UVGI).The ultraviolet spectrum comprises of three wave ranges: Long-wave ultraviolet -A (320-400 nm), Medium wave ultraviolet -B (280-320 nm) and Short-wave ultraviolet -C (200-280 nm).



(a) A laminar thin film reactor (Cider Sure) and (b) a laminar Taylor - Couette UV reactor

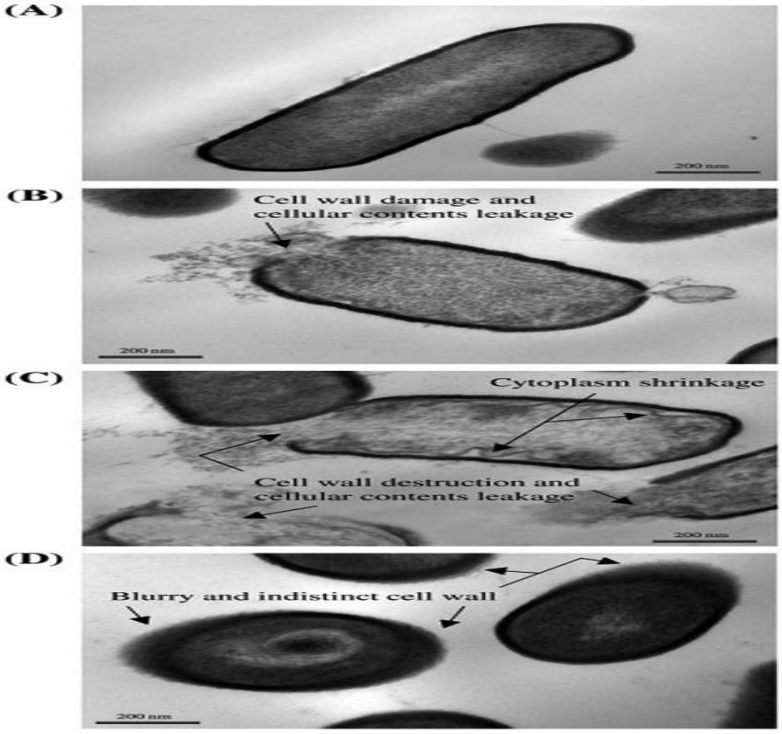
3. BEHAVIOUR OF E.coli AND SALMONELLA Spp ON GREEN ONIONS:

Bulb vegetables, including onion and garlic, have been implicated in several outbreaks of food borne disease caused by Escherichia coli and Salmonella, pathogens of increasing public health significance because of the severity of the gastrointestinal illness and long-term, chronic sequelae that can result from infection. A definitive association between the consumption of bulb vegetables and human disease provides implicit evidence of transfer from animal sources to field crops and retail commodities, including minimally processed or fresh-cut products. Understanding the behavior of E. coli and Salmonella in bulb vegetables during production, after harvest, in storage, during processing, and in packaged fresh-cut products is essential for the development of effective control measures.

4. MECHANISM OF MICROBIAL INACTIVATION BY PULSED LIGHT AND ULTRAVIOLET TREATMENT:

The lethality of Pulsed Light and UV may be attributed to its rich broad spectrum ultraviolet content, its short duration, high peak power and the ability to regulate the pulse duration and frequency output of flash lamps. As a substantial portion of the Pulsed light spectrum covers ultraviolet light, it is considered that ultraviolet plays a vital role in the microbial cell inactivation. It was also found that there is no killing effect if a filter is used to remove ultraviolet (UV) wavelength region lower than 320 nm. Mechanisms that have been proposed to explain the lethality of pulsed light treatment are related to ultraviolet (UV) part of the spectrum which include photochemical and photo thermal

effect. The lethal effect of pulsed light can be due to photochemical or photo thermal mechanism or both may exist simultaneously. However their relative importance depends on the fluence and target microorganism. The primary target cell of pulsed light in photochemical mechanism is nucleic acid as DNA is the target cell for these ultraviolet wavelengths. Ultraviolet light absorbed by the conjugated carbon-carbon double bonds in proteins and nucleic acids induces the antimicrobial effect as it changes the DNA and RNA structures. The bactericidal effect is attributed to the high energy short wave ultraviolet-C range. In the ultraviolet-C range of 250-260 nm, alterations in DNA take place due to pyrimidine dimers mainly thymine dimers. Ultraviolet irradiation usually generates thymine dimers in large quantity, cytosine dimers in low quantity and mixed dimers at an intermediate level. These dimers inhibit the formation of new DNA chains in the process of cell replication resulting in the chologenic death of affected microorganisms by ultraviolet. The ultraviolet treatment of bacterial spores may result in the formation of spore photo-product 5-thyminyl-5, 6-dihydrothymine and in single-strand breaks, double-strand breaks and cyclobutane pyrimidine dimers. It was also found by experiments that enzymatic repair of DNA does not occur after damaged by pulsed light and UV. The lethal effect of Pulsed light can also be due to photo thermal effect. As Pulsed light and UV causes cell membrane damage, it could be considered as a technique for sterilization.



(A) - Untreated organism

(B) (C) (D) - Treated organism

5. RESULTS:

LOG RANGE REDUCTION OF E.coli AND SALMONELLA IN GREEN ONIONS:

5.1.PULSED LIGHT TREATMENT:

TABLE 1:

Food Product	Microorganism	Treatment	Log range reduction
Green onion	E.coli	250pul/μs of 750nm width,PLfluence of 3j/cm^2	1.9 log CFU/ml
Green onion	Salmonella	250pul/μs of 750nm width,PLfluence of 3j/cm^2	1.3 log CFU/ml

TABLE 2:

Food Product	Microorganism	Treatment	Log range reduction
Green onion	E.coli	375pul/μs of 750nm width,PLfluence of 5j/cm^2	3.9 log CFU/ml
Green onion	Salmonella	375pul/μs of 750nm width,PLfluence of 5j/cm^2	4.1 log CFU/ml

PL processing is influenced by various factors that dictate its efficiency on microbial inactivation, retention of quality, and other properties of the product. Important factors that determine the effectiveness of PL is the fluence level applied on the sample, the amount of energy (dose or number of pulses/μs) and wavelength of light/composition of the spectrum. Inactivation of microbes (E.coli and Salmonella) is higher for PL treatment with higher pulse number/μs and higher fluence. From the table **1** and **2** it came to know that increasing in pul/μs from 250 to 375 and increasing fluence from 3j/cm^2 to 5j/cm^2 respectively to pul/μs shows reduction of E.coli from 1.9-3.9 log CFU/ml and reduction of Salmonella from 1.3 to 4.1 log CFU/ml respectively.

5.2.ULTRAVIOLET:

TABLE 3:

Food Product	Microorganism	Treatment	Log range reduction
Green onion	E.coli	400nm,UV dose of 4j/cm^2 for 120 sec	0.9 log CFU/ml
Green onion	Salmonella	400nm,UV dose of 4j/cm^2 for 120 sec	1.4 log CFU/ml

TABLE 4:

Food Product	Microorganism	Treatment	Log range reduction
Green onion	E.coli	400nm,UV dose of 5j/cm^2 for 120 sec	1.3 log CFU/ml
Green onion	Salmonella	400nm,UV dose of 5j/cm^2 for 120 sec	2.1 log CFU/ml

From the table **3** and **4** it came to know that increasing UV dose from 4j/cm^2 to 5j/cm^2 shows reduction of E.coli from 0.9-1.3 log CFU/ml and reduction of Salmonella from 1.4 to 2.1 log CFU/ml respectively.

6. CONCLUSION:

Generally, light has less damaging effects to the surrounding environment when used as agents for materials processing. The pulsed light and UV processing is a new concept and has many

applications in the food industry of food preservation. While developing the applications of pulsed light and UV processing, it is to be taken into consideration that the food to be processed, the microbial type and load affect the efficacy of the treatment. Though with some limitations, if complemented with other processing techniques this technology can help in better food preservation with minimal effects on the food quality. Here in this processing the standard log range of E.coli and Salmonella i.e. 8-12 log range and 10- 14 log range (depends on the time) respectively is reduced by 3.9 log range and 4.1 log range by pulsed light and 1.3 log range and 2.1 log range by UV respectively. Thus pulsed light and UV used to reduce the log range of microbes at the same it will preserve the food's flavour, colour and organoleptic nature.

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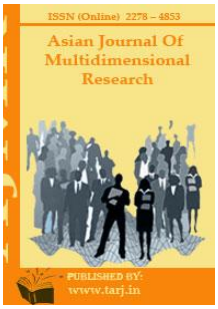

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GENDER INEQUALITY IN OCCURRENCE OF VITAMIN B12 DEFICIENCY AMONG HUMAN ADULT SUBJECTS

Zainab Nadeem*; Dr. Munira Hussain**

*PhD Research Scholar,
Mata JijaBai Girls P G College Indore, INDIA
Email id: catchzainab_nadeem@rediffmail.com

**Professor,
Mata JijaBai Girls P G College Indore, INDIA

ABSTRACT

Gender inequality leads to eating and nutritional habits that influence vitamin B12 status. This study has been aimed to examine gender differences in occurrence of the various demographic and health factors associated with vitamin B12 deficiency among human adult.

KEYWORDS: *Gender Inequality, Nutritional Habits, Vitamin B12, Demographic and Health Factors.*

1.INTRODUCTION

Vitamin B12 is a water soluble vitamin that plays a very fundamental role in DNA synthesis, red blood cell formation and neurological function. Vitamin B12 deficiency is common in India because malnutrition is extremely common, even among the rich. The reasons for these are too many and are related to diet, lifestyle, and social and cultural issues. In addition, the symptoms are modified also by the underlying disorder causing its deficiency. Vitamin B12 deficiency is found associated with various factors among those gender plays an important role. Gender inequality leads to eating and nutritional habits that influence women and men vitamin B12 status. The socially constructed gender roles of men and women interact with their biological roles to affect the nutrition of each gender. Because of women's cyclical loss of iron and their childbearing, their vitamin B12 status is particularly vulnerable to deficiencies in diet. A lack of vitamin B12 occurs when the body does not get or is unable to absorb the amount that the body needs. Humans obtain almost all of their vitamin B12 from dietary mean. Deficiencies of vitamin B12 are widespread and constitute a major global burden of morbidity affecting all age groups. Tests to determine the presence of vitamin B12 deficiency is used singly or in combination to establish the nutritional status. The clinical picture of vitamin B12 deficiency is feature of hematological and neuro-cognitive dysfunction. It has been argued that gender inequality is positively associated with wide spread of acute and chronic under-nutrition particularly among women and children (FAO, 2012).In 2009 the World Food Program revealed that 60% of the chronically hungry individuals were females (World Food Programme, 2009). When malnutrition and gender disparity interact in patriarchal societies, the female children have less chances to make up for deficiencies compared to their male counterparts due to the nutritional and eating habits reinforced by the male biased culture. Another example of the association between gender inequality and nutritional status is the restriction on women outside their homes without being accompanied by one of their male relatives which limits their access to fast food affecting females' nutritional status. It is important reason by which gender inequality interacts and influences nutrition status. Moreover, gender inequality and malnutrition also influence and interact with health conditions and affect the different aspects and dimensions of socioeconomic development, well-nourished and healthy people have higher productivity (World Bank, 2006). This study has been aimed to examine the relation of gender difference in occurrence of vitamin B12 deficiency among human adult with reference to some demographic and health factors.

2. METHODOLOGY

A random purposive sampling was employed to select 150 males and 150 females from the OPD visitors who came on voluntarily for routine health checkups during a 2 months span study period in a multispecialty hospital of Indore City. Informed verbal consent was taken from them prior to collection of data. Those who did not give consent were excluded from the study. Their biochemical report of serum vitamin B12 and hemoglobin were obtained from hospital records by maintaining the protocol of the hospital. The cut offs use <203 pg/ml for defining vitamin B12 deficiency according to WHO (2008). Hemoglobin was characterized as per cut off used for males and females according to WHO (2011).

Demographic information has been collected through interview method using a predesigned questionnaire which included information on personal characteristics like age, gender, educational level, occupation, income and marital status.

Information regarding clinical deficiency symptoms of vitamin B12, BMI, hemoglobin level were also obtained through observation and interview methods and recorded. As per occurrence of

the number of symptoms out of 12 listed associated symptoms of vitamin B12 (National Health Portal, 2016) in an individual, the subjects were classified in to three categories for the statistical assessment purpose as mild, moderate, and severe for having 1-4, 5-8 and 9-12 symptoms respectively.

Collected data were entered into a computer sheet and analyzed statistically using the SPSS software. Descriptive statistics like mean, SD, and percentage were applied to characterize the study population and chi test and t- test were used to assess significance of difference among the attributes. P-values <0.05 was considered as minimum level of significance.

3. RESULTS

TABLE 1: PERCENTAGE DISTRIBUTION OF MALES AND FEMALES AS PER THEIR VITAMIN B12 STATUS BY DEMOGRAPHIC FACTORS

Personal characteristics		n	Vitamin B12 status				Chi value	P value
			Male		Female			
			Normal N=101	Deficient N=49	Normal N=108	Deficient N=42		
Age (years)	30-40	121	36.63	48.97	31.48	61.90	36.46	0.00
	40-50	60	15.84	0	31.48	23.80		
	50-60	119	47.52	51.02	37.04	14.28		
Education	Illiterate	46	7.92	16.33	22.22	14.28	8.29	0.04
	literate	254	92.07	83.67	77.77	85.71		
Occupation	Non Working	100	10.89	0	54.62	71.43	96.86	0.00
	Working	200	89.11	100	43.37	28.57		
Marital status	Married	286	95.02	93.88	100	85.71	14.27	0.00
	Unmarried	12	4.95	6.12	0	14.29		
Income	Low	86	36.63	20.41	23.15	33.33	21.93	0.00
	Middle	119	31.68	51.02	35.19	57.14		
	High	95	31.68	28.57	41.67	9.52		

Table 1 shows that chi value were found significant for the distribution of subjects in all five parameters of vitamin B12 status of both gender in relation to their age, educational level, occupation, marital status and income (p<0.05). Furthermore the table clearly indicates that majority of males in 50-60 age group (51.02%), literate (83.67%), working (100%), married (93.88%) and of middle income group (51.02%) category were found to be vitamin B12 deficient whereas majority of females in 30-40 age group (61.90%), non working (71.43%), literate (85.71%), married (85.71%) and of middle income group (57.14%) category were found to be B12 deficient.

TABLE 2: HEALTH STATUS IN ASSOCIATION WITH GENDER

Variables	Options	Male N=150	Female N=150	T value	P value
Vitamin B12 (pg/ml)	Mean	278.99	293.94	0.88	0.38
	SD	157.85	136.96		
Hemoglobin (g/dl)	Mean	14.3	12.1	*	*
	SD	2.14	1.85		
BMI (kg/m^2)	Mean	25.86	26.45	1.17	0.24
	SD	3.86	4.95		

*Since the cut offs for males and females are different so t value is not applicable.

Table 2 shows mean and standard deviation of vitamin B12, hemoglobin and BMI of males and females. The data shows that t value was not found significant for vitamin B12 levels and BMI. Mean ± SD of vitamin B12 level found respectively as 278.99±157.85 and 293.94±136.96 pg/ml in males and females. Moreover mean Hemoglobin level of male and female subjects found within their respective normal recommended range.

TABLE 3: PERCENTAGE DISTRIBUTION OF VITAMIN B12 STATUS OF MALES AND FEMALES BY HEALTH STATUS

Personal characteristics	Category	n	Vitamin B12 status				Chi value	P value
			Male		Female			
			Normal N=101	Deficient N=49	Normal N=108	Deficient N=42		
BMI (kg/m^2)	Low (≤18.5)	9	0	6.12	3.70	4.76	7.63	0.26
	Normal (18.6-24.9)	109	42.57	28.57	35.19	33.33		
	High (25-29.9)	182	57.43	65.31	61.11	61.90		
Hemoglobin	Anemic	90	10.52	19.51	40.21	47.06	21.90	0.00
	Normal	210	89.47	80.49	59.79	52.94		
Clinical deficiency symptoms	Mild	213	89.11	61.22	67.59	46.61	48.63	0.00
	Moderate	69	8.91	34.69	28.70	28.57		
	Severe	18	1.98	4.08	3.70	23.80		

Table 3 shows that vitamin B12 status differed significantly in respect to their hemoglobin, and clinical deficiency symptoms of vitamin B12. Furthermore, vitamin B12 status of males and females were found not significant in respect to BMI. 80.49% males with normal hemoglobin level were found to be deficient whereas almost equal distribution 47.06% and 52.94% of anemic and normal hemoglobin level respectively was found among females. Majority of males with mild clinical deficiency symptoms of vitamin B12 61.22% were found deficient whereas 46.61 % females with mild deficiency symptoms were found to be deficient.

OUTCOMES

- Vitamin B12 deficiency is found prevalent somehow more in females, however males are also have had significant occurrence of vitamin B12 deficiency.

- Gender affects the vitamin B12 status of the individual with special reference to some demographic features like older, working males and younger and non working females were more found to have vitamin B12 deficiency.
- Vitamin B12 level of females were slightly higher than their male counterparts. Hemoglobin level of both males and females were in normal range categorize as per cut WHO (2011). BMI of both gender were higher than normal category but found slightly more in females.
- Females found equally anemic and normal category while majority of males were having normal hemoglobin level. So anemia is prevalent more in females than males.

The data showed that t-value was not found significant for vitamin B12 level and BMI among both genders. Chi value was significant for age, education, occupation, marital status, income, hemoglobin level, and clinical deficiency symptoms of vitamin B12 among both genders. Moreover chi value was not significant for BMI among both genders. Mean±SD vitamin B12 levels of males and females were found 278.99±157.85 and 293.94±136.96 pg/ml respectively. Majority of males in 50-60 age-group, literate, working, married and of middle income group category were vitamin B12 deficient whereas majority of females in 30-40 age group, non working, literate, married and of middle income group category were found B12 deficient. Furthermore majority of both males and females with higher BMI and mild clinical deficiency symptoms of vitamin B12 were found to be deficient respectively.

4. CONCLUSION

Reaching a better understanding of the demographic and health factors associated with vitamin B12 status would be relevant to design further prevention strategies.

This study was done in order to understand gender differences in occurrence of vitamin B12 deficiency among 150 male and 150 female adult subjects. Data so obtained in present study clearly indicated that difference in occurrence of vitamin B12 status were found in males and females with significantly different pace with regards to their age, education, occupation, income, marital status, hemoglobin and clinical deficiency symptoms of vitamin B12. The nutritional status is an outcome and reflection of nutrients intake which is affected by the culture of the society. Thus, it is imperative to conduct research that highlight the impact of gender inequality on the nutritional status of one of important social groups. Low vitamin B12 levels occur among large percentage of adults in Indian population because of vegetarianism. Any one of its varied manifestations can occur in isolation and can be coexisting with other co morbidities (Sasidharan PK, 2017).Adopting a more holistic and gender sensitive nutrition policy (i.e. mainstreaming gender issues in nutrition improvement initiatives) is expected to result in more success and have more significant impact (FAO, 2012). VitaminB12 deficiency is simple to prevent and simple to treat, but the diagnosis is easy to miss and is often overlooked in the outpatient setting. If such a deficiency is found however, a need exists for the systematic study of vitamin B12 status because of concerns about the potential for associated adverse effects that can affect quality of life. Reaching a better understanding of the socio demographic and lifestyle factors associated with vitamin B12 status would be relevant to the design of further investigation and prevention strategies.

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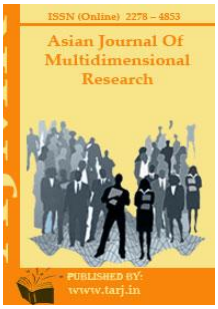

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DIETARY PATTERN AND FOOD FREQUENCY CONSUMPTION OF THE SELECTED BREAST CANCER PATIENTS IN KERALA

Jobil.J. Arackal*; Geethanjali Santhanam**

*Research Scholar,
Department of Home Science,
Mother Teresa Women's University, INDIA
Email id: jobil.j.arackal@gmail.com

**Assistant professor,
Department of Home Science,
Mother Teresa Women's University, INDIA

ABSTRACT

Cancer has become one of the ten leading causes of death in India. Breast cancer is the top cancer in women both developed and developing countries breast cancer refers to cancer originating from breast tissues most commonly from the inner lining of the milk ducts or the lobules that supply ducts with milk. Inadequate food consumption have been associated with breast cancer risk. The present article aims to study the dietary pattern and food frequency consumption of the selected breast cancer patient in Kerala. A hospital based Case control study was conducted at Kerala government hospitals. The dietary patterns such as types of die, meal pattern, and timing of meal, reason of skipping the foods, 24 hrs dietary pattern, and food frequency consumptions were recorded with the standard questionnaire. It was observed that the patients had a statistically comparing the Recommended Dietary Allowances (RDA). 13.6 percent deficient protein intake the daily life similarly calcium, vitamin were also less. It indicated that the result for 75% under the malnutrition category. It was observed that the risk of breast cancer increased with decreasing level of food consumption. The results of the present study revealed a strong association in overweight and obesity with breast cancer in the Kerala population.

KEYWORDS: *Cancer, Breast Cancer Risk, Kerala Government Hospitals, Dietary Pattern, RDA, Malnutrition, Overweight and Obesity.*

1. INTRODUCTION

In world wide a numerous new cancer cases increases with breast cancer on the frontline. According to the World Health Organization (WHO, 2012) report 8.2 billion and 64.9% of the death have been recorded worldwide with a leading cause of cancer. In developing countries the majority 69% of death caused by breast cancer, especially in women population. In 2012 only from India, 70218 deaths were reported although early-stage breast cancer is treatable.

Dietary patterns are likely to vary among different populations due to geographic differences, socioeconomic status, and culture in food habits, preferences, and availability.

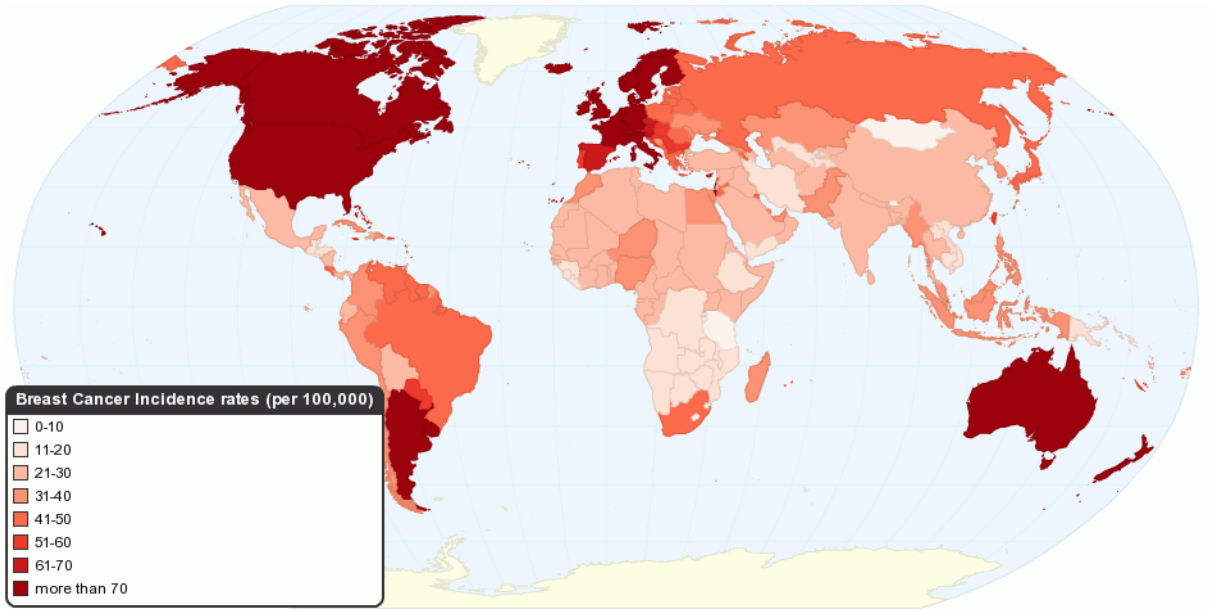
Several studies performed in Asian populations suggested that certain dietary patterns, for example, a western pattern or a diet characterized by vegetables, fruit, and soy, could influence the risk of breast cancer among Asian women.

Various aspects of diet, including selected micronutrients, may influence the risk of breast cancer. A meta-analysis of published studies indicated that the risk of breast cancer was inversely related to vegetable and fruit consumption but also to measures of intake of selected micronutrients, including b-carotene and vitamin C. Other carotenoids which may favourably influence breast-cancer risk include a-carotene, lycopene, b-cryptoxanthin and lutein/zeaxanthin; a similar anti-oxidant mechanism has been suggested for a-tocopherol (Fabio levis*etal*., 2012)

Consumption of a diet high in fruits, vegetables, whole grains, and poultry and low in red meat and refined foods may positively influence a woman's overall health and prevent other cancers and chronic diseases (Marilyn and Kwan, 2008).

Hence the present study aimed to find out the dietary pattern of the person suffered from breast cancer.

Global prevalence of Breast cancer: (WHO, 2017)



2. MATERIALS AND METHODS

2.1.Selection of area:

Kerala historically known has Kerala is a state in south India The state formed by the merger of the former kingdoms of Travancore.Kerala is the thirteenth largest state by population and it's divided into 14 districts with the capital being Thiruvananthapuram with highest sex ratio of 1084 women per 1000 men.

The study was conducted in Kerala, the selection of area has a 3 districts. The research belongs to the districts and familiar with the topography as well as with the governmental and non-governmental organization in the state. The patient for the study was selected from government and non-government hospitals. Reason to select the study area as it would be very easy to meet cancer patients and gathered information from them easily. A wide range of medical as well as clinical facilities were also available and this was utilized with the assistance of medical personnel's.

2.2.Data collection:

A pre-designed interview schedule was used as tool for present study, the interview schedule consisted of the following sections, 24 hrs dietary Pattern. Data was collected by personally interviewing the subjects.

Dietary recall is an interview in which the respondent is asked to describe all the foods and beverage consumed in the previous 24 hours recall method has the advantage of giving a qualitative evaluation of diet in a short time and it is the most commonly used assessment (Mohan 2001).According to Swaminathan (2005) dietary survey constitutes an essential part of complete study of nutritional status of individual providing essential information on nutrient levels food habits and attitudes.

A 24-hours recall method was used to find out the amount and type of food consumed which was used to calculate the amount of nutrient intake using the nutritive value of Indian foods by Gopalan et al.,(2004). Intake of five selected nutrients namely Energy, carbohydrate, protein, fat, vitamin c, iron, calcium and sodium were calculated using Microsoft excel data analysis. The mean intake of various foods and nutrients were computed and compared with the dietary allowances recommended by (ICMR 2010)

3. DISCUSSION

3.1.Dietary pattern of the selected respondents

Dietary habits and dietary pattern of people vary from person to person. Through the food frequency assessment of individual dietary habits and dietary pattern could be identified. This will act as a guiding estimating the amount of nutrient intake of the individual

The majorities (67 percent) of the respondents were Non-vegetarians and 33 percent were Vegetarians. The above shows that, 11 percent of the respondents were taking 2 meals /day, 49percent of the respondents were taking 3 meals/day, 39 percent of the respondents were followed 4 meals/day respectively and only 1 percent of the respondent were taking 5 meals/day.

The nearly 14 percent of the respondents were skipping of meals. Among them 1 respondents were skip their breakfast, none of them were skipped lunch and only 17percent were skipped dinner.

Only (5 %) percent of the respondents were skipped their meals due to dislike towards food, 2 percent did so for lack of appetite, 2 percent skipped their meals due to lack of interest. About 5 percent skipped meals as they had religious reasons.

3.2.Nutrient Intake of the selected respondents

The diet should provide adequate amounts of all nutrients to maintain good health and physical efficiency. A single 24 hours dietary recall was done to calculate the daily nutrient intake of the selected respondents and the results are presented in the table

Nutrient Intake of the selected respondents

Nutrients	RDA	Actual intake	Deficit	%Deficit
Energy (kcal)	2330	2200	30	1.0
Carbohydrate (g)	450	445	5	0.8
Protein (g)	55	45	10	13.6
Fat (g)	25	15.12	10	29.64
Calcium (mg)	600	129	471	58.8
Vitamin C (mg)	40	50	10	18.75
Iron (mg)	35	15.76	19.24	41.2

It can be observed that intake of energy was found 1.0 percent deficient, comparing the Recommended Dietary Allowances (RDA). 13.6 percent deficient protein intake the daily life similarly calcium, vitamin were also less. Intake of carbohydrate found to be equal than RDA.

A single 24 hours dietary recall will not provide adequate information on the food preferences of the respondents. Therefore the selected respondents were administered a food frequency of consumption of food groups and the results are given in the table

3.3.Frequency of food consumption among selected respondents

Food Stuffs	Daily	Weekly Twice	Weekly Thrice	Rarely	Monthly	Never
Cereals						
Bajra	-	-	-	45	8	22
Jowar	-	-	-	45	14	16
Maize	-	-	-	29	32	14
Ragi	7	11	14	18	12	13
Rice	100	-	-	-	-	-
Wheat	64	11	-	-	-	-
Pulses And Legumes						
Whole Bengal gram	10	19	22	24	-	-
Bengal gram dhal	-	13	29	33	-	-
Black gram dhal	23	31	-	14	7	-
Green gram dhal	16	25	28	6	-	-
Red gram dhal	8	22	27	2	16	-
Leafy Vegetables						
Agathi	7	2	10	28	12	16

Amaranth	-	-	6	13	21	18
Cabbage	-	3	28	8	14	22
Coriander	3	16	10	11	18	17
Curry leaves Drumstick	61	-	-	3	5	6
Fenugreek	5	1	11	13	23	5
Mint	6	5	17	15	17	15
Parrupukeerai	4	-	1	18	7	45
Spinach	2	-	10	5	12	46
Ponnakanni	-	-	-	-	-	-
Roots&Tubers						
Beetroot	17	25	11	15	2	5
Carrot	23	25	22	3	2	-
Potato	30	22	13	1	9	-
Raddish	9	23	12	17	14	-
Sweetpotato	5	3	14	18	33	2
Yam	12	14	19	17	13	-
Other Vegetables						
Bitter gourd	2	13	46	10	3	1
Bottle gourd	4	15	44	10	2	-
Brinjal	1	21	28	16	9	-
Broad bean	3	2	21	4	3	-
Cauliflower	17	24	11	12	11	-
Cucumber	41	23	5	3	1	2
Drumstick	25	8	25	13	3	1
Ladies finger	29	11	8	19	8	-
Raw mango	22	3	5	14	26	5
Onion	58	8	2	5	4	-
Greenpeas	3	36	14	5	15	2
plantain green	9	2	2	38	15	9
Snakegourd	29	10	10	12	8	6
Tomato	62	9	2	2	-	-
Nuts&Oil Seeds						
Coconut fresh	62	6	7	-	-	-
Ground nut	33	4	11	15	-	-
Mustard	28	5	1	27	-	-
Soyabean	8	5	11	2	2	33
Fruits						
Amla	4	11	12	10	20	16
Apple	11	18	4	21	18	3
Banana	48	3	2	13	9	-
Dates	40	18	10	1	6	-
Grapes	13	14	18	11	17	2

Guava	23	5	3	26	13	5
Jackfruit	21	6	9	24	14	1
Mango	6	2	9	17	35	6
Orange	19	3	4	25	24	-
Papaya	17	8	5	12	30	3
Pineapple	20	7	11	12	24	1
Pomegranate	11	8	10	14	25	7
Sapota	9	13	5	32	10	6
Watermelon	6	2	8	11	36	12

The above table shows that, all the respondents were consumed rice as their staple food in regularly, 64 of them were consumed wheat once in a week, 18 members have consumed ragi rarely, 45 members also occasionally take bajara, 32 percent have included maize in their diet monthly once.The 24 percent respondent consumed whole Bengal gram dhal in rarely,33 percent consumed Bengal gram dhal rarely, the majority 31 percent of the respondent consumed black gram dhal weekly twice,28 percent consumed green gram dhal in weekly thrice,27 percent consumed weekly thrice in the red gram dhal. Agathikeerai has consumed rarely by 28 percent of the respondents, 21 percent consumed amaranth kerrai monthly once, weekly twice 28 percent consumed cabbage leaves, 35 percent of the women regularly included coriander leaves and drumstick leaves in their diet, 23 percent and 17 percent were monthly once included fenugreekleaves and mint leaves in their diet, 18 percent were rarely consumed parupukerrai,, 60 percent were added spinach leaves in their diet at rarely once.

The 25 percent and 25percent of the respondents were weekly twice consumed beetroot and carrot, potato has daily consumed by 30 percent of the samples, 22 percent were weekly twice consumed radish, 33 percent rarely consumed sweet potato,19 percent weekly thrice consumed yam in the diet. 46 percent were consumed bitter gourd in weekly thrice,44 percent also added bottle gourd and brinjal in weekly thrice,42 percent consumed broad bean rarely in the diet,24 percent respondent consumed cauliflower in weekly twice, 41 percent consumed cucumber in the daily diet,25 percent and 28 percent consumed drumstick and ladies finger in monthly once,26 percent added the raw mango rarely in the diet, Majority(58%) percent were consumed onion in daily ,36 percent consumed plantain green in weekely twice,29 percent consumed snake gourd in daily,62 percent consumed tomato in daily diet. Majority (62) percent were daily consumed coconut fresh in the diet,33 percent consumed ground nut oil in the daily diet,28 percent consumed mustard oil in the daily diet,33 percent added the soya been in monthly once in the diet for cooking

The 20 percent were consumed amla in monthly once in the diet, The 21 percent were rarely take apple, 48 percent weekly once consumed banana, 40 percent were regularly consumed dates, 17 percent were monthly once added grapes, 26 percent and 21 percent were monthly once added guava and jack fruit in their menu. 35 percent of the respondents were included mango in monthly once, 25 percent were monthly once consumed orange and papaya,25 and 24 percent consumed pineapple and pomegranate in monthly once in the diet,

Hailu et al., (2014) stated from the finding of this study revealed that respondents had poor knowledge of risk factors, early detection measures and early warning signs of breast cancer. In this study, 760 students participated making a response rate of 96%. The finding of this study showed that respondents with good knowledge score for risk factors, early detections measures and warning

signs of breast cancer was 1.4%, 3.6% and 22.1% respectively. The majority 477 (62.8%) of participants practiced self-breast examination. Of the respondents who practiced breast self-examination, 201 (71.0%) reported that they practiced monthly. This implies that the health care system particularly policy makers, health care managers, health care professionals and community based health extension workers are giving limited attention to non-communicable disease like breast cancer despite their public health burden. Moreover, very few of the respondents have practiced self and clinical breast examination.

4. CONCLUSION

The present study focused on the nutritional profile of the breast cancer women in Kerala. The nutritional status denoted the higher percentages of respondents were under weight, and the risk factors of breast cancer such as inadequate food consumption. Fruits and vegetables more important foods in Brest cancer patients, the in proper meal pattern and life style categories are more affected the selected respondents. The nutrition education to the adolescent girls and young adult women's awareness on breast cancer will reduce the breast cancer incidence in future.

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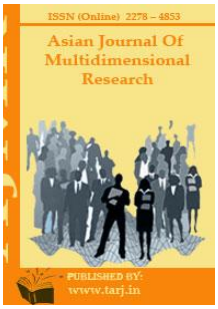

Asian Journal of Multidimensional Research (AJMR)

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PHYTOCHEMICAL, ANTIOXIDANT, ANTIMICROBIAL AND ANTICANCEROUS ACTIVITY OF LEUCAS ASPERA (WILLD) LINK AND PASSIFLORA EDULIS SIMS

Akhila.I*; M.Sylvia Subapriya**

*Guest Faculty,
Department of Home Science,
KAHM Unity Women's College,
Manjeri, Malappuram, Kerala, INDIA
Email id: akhilaittiyatt@gmail.com

**Professor,
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

A medicinal plant is a plant that has similar properties as conventional pharmaceutical drugs. Human beings have used plants for the treatment of diverse ailments for thousands of years. Cancer is a life-threatening disease and there is a quest for new anticancer compounds. This study aims to assess the phytochemical components, antioxidant, antimicrobial and anticancer us activities of the two plant leaves. The presence of phytochemicals such as alkaloids, terpenoids, phenol and tannin, reducing sugar, saponins, flavonoids, quinines, protein and steroids were determined from aqueous, methanol and acetone extracts. Best answering extract of both the plants was selected for further analysis. Antioxidant activity was determined by DPPH, total phenol, total flavonoids, FRAP, and H_2O_2 radical scavenging activity. Antimicrobial activity was determined using agar well diffusion method against selected bacteria. Plant with best potential was selected for MTT assay. The HeLa cells were used to assess the anticancer us activity of the methanolic extract of Leucas aspera. Both plant leaves contain phytochemicals such as alkaloids, terpenoids, phenols and tannins, protein and steroids in aqueous, methanolic and acetone extracts. Exception was the presence of saponins in L.aspera and quinines in P.edulis. Antioxidant activity was higher in L.aspera in assays such as DPPH, Total phenol, Total flavonoids, FRAP and H_2O_2. Leaves of L.aspera exhibited best antimicrobial activity against selected bacteria. Cytotoxicity study showed that cell death increased and cell viability decreased with increase in concentration of methanolic extract of L.aspera. Both

the plant leaves contained similar amounts of phytochemicals. L.aspera exhibited higher levels of antioxidant ($p < 0.01$) and antimicrobial activity and also highly impressive anticancer activity.

KEYWORDS: *Antimicrobial Activity, Anticancer Activity, Cytotoxicity.*

INTRODUCTION

The plant kingdom is a treasure house of potential drugs and in the recent years there has been an increasing awareness about the importance of medicinal plants. Drugs from the plants are easily available, less expensive, safe, and efficient and rarely have side effects. According to World Health Organization (WHO), medicinal plants would be the rest source to obtain variety of drugs. *Leucas aspera* (Willd) Link. is a medicinal herb that belongs to the family Lamiaceae. It is popular as "Thumbai" throught out the Indian sub continent. It is reported to have antifungal, prostaglandin inhibitory, antioxidant, antimicrobial and cytotoxic activities (Prajapathi *et al*., 2010). *Passiflora edulis* Sims. (Passion fruit) is a wild species belonging to the family Passifloraceae. The plant is a shallow rooted, perennial, tentril climbers. It is reported to possess cytotoxic, antioxidant activity, antimicrobial and antifungal activities (Johnson, *et al*., 2008).

Cancer is one of the most life-threatening diseases and causes serious health problems in both developed and developing countries (Gennari *et al*., 2007). Therefore, investigations for finding new anticancer compounds are imperative and interesting. According to Khan and Iqbal (2011), King and Young (1999) and Pettinelli (2009) the nutritional and phytochemical components of plants vary according to the crop species and variety, growing conditions like soil moisture level, temperature, soil texture and structure, soil pH, disease and insect problems, weather conditions and cultural practices. Keeping these points in mind an attempt has made to explore the phytochemical, antioxidant, antimicrobial, anticancerous activities of these two plant leaves.

METHODOLOGY

A. SELECTION AND AUTHENTICATION OF PLANTS

Adequate amounts of fresh leaves of two plants namely *Leucas aspera* (Willd.) Link. and *Passiflora edulis* Sims were collected from the local area of Attappadi, Palakkad District and Manjeri, Malappuram District of Kerala respectively. The plants were authenticated by Dr.G.V.S. Murthy, Scientist 'F', Botanical Survey of India, Tamil Nadu Agricultural University.

B. PREPARATION OF PLANT EXTRACT

The leaves were dried at 25ºC under shade and away from sunlight for one week and were ground into powder with the help of mechanical grinder. One gram of samples of the two plants were immersed separately in 20ml of deionised water and kept in orbital shaker for 24 hours at 60-80 rpm for the extraction and filtered using Whatmann No.1 filter paper to get pure extract. Similarly methanol and acetone extract were prepared (Razia *et al*., 2014).

C. QUALITATIVE AND QUANTITATIVE ANALYSIS OF THE LEAVES EXTRACTS

1. PHYTOCHEMICAL ANALYSIS: The qualitative phytochemical tests for the identification of alkaloids, terpenoids, phenol and tannin, reducing sugar, saponins, flavonoids, quinines, protein and steroids were determined for all the extracts by the method described by Sazada *et al* (2009). Finally from the results the best answering extract (methanol extract) was selected for both the plants for carrying out further analysis.

2. ANTIOXIDANT ACTIVITY: Quantitative determination of antioxidant content was determined by using DPPH Radical scavenging activity (Gunjan *et al*., 2011), Ferric ion Reducing Ability of Plasma (FRAP - as a measure of antioxidant power) Assay (Benzie and Strain, 1999), Hydrogen Peroxide Scavenging Capacity (Keser *et al*., 2012), Total phenol and Total Flavonids assays (Kumaran and Karunakaran, 2007).

3. ANTIMICROBIAL ACTIVITY

The antibacterial activity of the plant extracts were tested by agar well diffusion method as per Sen and Batra (2012). The nutrient agar prepared aseptically by mixing 28g of nutrient agar in 1000ml distilled water and was sterilized along with four set of petri dishes in an autoclave at 121ºC for 15 minutes. Then the nutrient agar was poured into the petri plates. The test microorganisms of *Bacillus subtilis* (gram positive), *Klebsiella pneumonia* (gram positive), *Pseudomonas aeruginosa* (gram negative) and *Escherichia coli* (gram negative) were taken aseptically by sterile micropipette using microtips of 40µl. The organisms were spread with cotton swab and the plates were allowed to dry at 10-15 minutes. After drying, well were made with cork borer (5mm), and samples such as 40µl of extracts of two plants, methanol (positive control) and distilled water (negative control) were poured aseptically into the well separately and one Tobramycin (10 mcg) disc also was placed as a standard. The plates were allowed to stand until extracts have been completely absorbed by the medium. The plates were incubated at 37ºC for 24 hours. The effectiveness of these extracts was recorded by measuring the diameter of inhibition zone against each microorganism.

4. ANTICANCER ACTIVITY (MTT ASSAY)

The anticancer activities of samples on HeLa Cells was determined by MTT [3-(4, 5-Dimethyl thiazole-2yl)-2, 5-diphyhyl tetrazolium Bromide] Assay (Horiuchi *et al*., 1988). The cells were grown in DMEM medium (Hi Media, Mumbai) supplemented with 10% fetal bovine serum (FBS) (Hi Media, Mumbai), 100 U/ml penicillin and 100 µg/m*l* streptomycin (Hi Media, Mumbai). Cells were incubated in a humidified incubator contain 5% CO_2 at 37 ºC. After 24hrs the cells were seeded in to 96 well The cell culture suspension was washed with 1 X PBS (Phosphate Buffered Saline) and then added with 200 µl MTT [3-(4, 5-Dimethyl thiazole-2yl)-2, 5-diphyhyl tetrazolium Bromide] solution to the culture flask. It was then incubated at 37ºC for 3 hours, removed all MTT solution, washed with 1 X PBS and added with 300 µl DMSO (Dimethyl Sulfoxide) to each culture flask and incubated at room temperature for 30 minutes until all cells get lysed and homogenous color was obtained. The solution was then transferred to centrifuge tube and centrifuged at top speed for 2 minutes to precipitate cell debris. Debris was dissolved using DMSO. OD was measured at 540 nm using DMSO blank. Then the percentage viability and cell death was calculated using the following formula.

% Viability = [OD of Sample/ OD of Control] X 100

% Cell death = [(OD of Control - OD of Sample) / OD of Control] X 100

RESULTS

TABLE I
PHYTOCHEMICAL STATUS OF LEUCAS ASPERA AND PASSIFLORA EDULIS

Phytochemicals	Inference	*Leucas aspera*			*Passiflora edulis*		
		Acetone	Methanol	Aqueous	Acetone	Methanol	Aqueous
Alkaloids	Formation of yellow colour	+	+	+	+	+	+
Terpenoids	Formation of grayish colour	+	+	+	+	+	+
Phenol and tannins	Formation of blue green/ black colour	+	+	+	+	+	-
Reducing sugar	Formation of red colour	-	-	-	-	-	-
Saponins	Foam formation	-	+	+	-	-	-
Flavonoids	Formation of pink scarlet colour	-	-	-	-	-	-
Quinines	Formation of blue green/ red colour	-	-	-	+	+	-
Protein	Formation of yellow colour	+	+	+	+	+	+
Steroids	Formation of red colour residue	+	+	+	+	+	+

Key: + Positive, - Negative

The phytochemical screening of *Leucas aspera* revealed the presence of alkaloids, terpenoids, phenols, tannins, protein and steroids in acetone extract. The methanol and aqueous extract showed the presence of alkaloids, terpenoids, phenols, tannins, saponins, protein and steroids. *Passiflora edulis* showed the presence of alkaloids, terpenoids, phenols, tannins, quinines, protein and steroids in acetone extract as well as in methanol extract. The aqueous extract showed the presence of alkaloids, terpenoids, protein and steroids. So from the results, methanol extract of *Leucas aspera* and *Passiflora edulis* was selected as the best extract for further analysis.

TABLE II
ANTIOXIDANT ACTIVITY (%) OF LEUCAS ASPERA AND PASSIFLORA EDULIS

Antioxidant tests	*Leucas aspera* (Methanol extract)	*Passiflora edulis* (Methanol extract)	***t value***
DPPH	97.89 ± 2.46	74.12 ± 1.90	42.36**
Total phenols	33.05 ± 1.89	12.85 ± 0.76	51.19**
Total flavonoids	99.11 ± 4.56	96.93 ± 3.84	1.43^{NS}
FRAP	38.82 ± 1.69	13.78 ± 1.17	34.15**
H_2O_2	82.29 ± 2.40	11.48 ± 0.87	124.78**

** - Significant at 1% level; * - Significant at 5% level

Plant leaves of *L.aspera* exhibit 97.89 per cent DPPH radical scavenging activity. Leaves of *P.edulis* have less DPPH radical scavenging activity (74.12 per cent). *L.aspera* had a total phenol content of 33.05 per cent, whereas leaves of *P.edulis* possessed 12.85 per cent total phenolic content. Leaves of *L.aspera* contained 99.11 per cent total flavonoids and leaves of *P.edulis* had 96.93 per cent of total flavonoids. It is clear that both the plants have comparably high level of flavonoids content. The plant leaves of *L.aspera* showed 38.82 per cent Ferric Ion Reducing Antioxidant Power. Leaves of *P.edulis* showed a significantly lower ($p < 0.01$) level of 13.78 per cent Ferric Ion Reducing Antioxidant Power. In the present study the plant leaves of *L.aspera* towered above ($p < 0.01$) those of *P.edulis* in terms of hydrogen peroxide scavenging activity (82.29 and 11.48 per cent respectively). Hence it is clear that *L.aspera* exhibited good antioxidant activity than *P.edulis.*

TABLE IV
ANTIMICROBIAL ACTIVITY (ZONE OF INHIBITION in mm) OF LEUCAS ASPERA AND PASSIFLORA EDULIS

Bacteria	**Distilled water**	***L.aspera* (Methanol extract)**	***P.edulis* (Methanol extract)**	**Methanol**	**Disc (Tobramycin)**
Bacillus subtilis	Nil	3	2	1	9
Klebsiella pneumonia	Nil	12	Nil	9	9
Pseudomonas aeruginosa	Nil	4	3	Nil	8
Escherichia coli	Nil	10	7	10	8

The zone of inhibition produced by the methanolic extract of *L.aspera* (3mm) against *Bacillus subtilis* was found to be less than that of standard disc (9mm) and it was higher than the positive control methanol (1mm). For *P.edulis* the zone of inhibition developed was 2mm against *Bacillus subtilis* which was found to be less than standard disc (9mm). *L.aspera* exhibited zone of inhibition (12mm) against *Klebsiella pneumonia* and it was higher than standard disc (9mm) and positive control methanol (9mm). The zone of inhibition of methanolic extract of *L.aspera* was 4mm against *Pseudomonas aeruginosa* and it was 3mm for the methanolic extract of *P.edulis.* For *Escherichia coli* the zone of inhibition was 10mm for methanolic extract of *L.aspera* and it was greater than standard disc (8mm) and similar to that of positive control methanol (10mm). The methanolic of *P.edulis* exhibited 7mm zone of inhibition against the same bacteria and which was less than standard disc (8mm) and positive control methanol (10mm). When examining the activity of both plant extracts against the four microorganisms the methanolic extract of *Leucas aspera* showed highest activity against *Klebsiella pneumonia* and *Escherichia coli*, and the inhibition potential was

higher than the standard. Antimicrobial activity of *Passiflora edulis* was found to be low except against *Escherichia coli*.

TABLE IV
ANTICANCER ACTIVITY OF LEUCAS ASPERA (WILLD) LINK

Concentration (µl)	OD Sample (L.aspera)	OD Control	Cell Death		Viability	
			%	r value	%	r value
25	0.197	0.372	47.04	0.987**	52.96	0.992**
50	0.167		55.10		44.90	
75	0.134		63.98		36.02	

** - Significant at 0.01 level

It was observed that cell death increased and cell viability decreased with increase in concentration of the methanolic extract of *L.aspera*. For 25µl concentration the cell death and cell viability was 47.04 per cent and 52.96 per cent respectively. For 50µl concentration the cell death and cell viability was 55.10 per cent and 44.90 per cent respectively. For 75µl concentration of leaf extract 63.98 percent cell death and 36.02 per cent cell viability was observed. High positive correlation (r = 0.987 at p< o.o1) was observed between counteraction of plant extract and percentage cell death. Similarly high negative correlation (0.992 at p< 0.01) was recorded between counteraction of plant extract and percentage cell viability.

CONCLUSION

The present study thus authenticates that the leaves Thumbai (*Leucas aspera*) and Passion fruit (*Passiflora edulis*) contains almost similar amounts of phytochemicals. *L.aspera* exhibited significantly higher levels of antioxidant (p< 0.01) and antimicrobial activity. Moreover *L.aspera* exhibited highly impressive anticancer activity as revealed by the cell death and cell viability of HeLa cells treated with the plant extract. While cell death showed a positive relationship, cell viability decreased with increase in concentration of *L.aspera* leaf extract.

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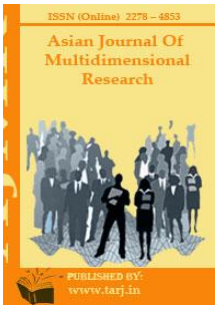

Asian Journal of Multidimensional Research (AJMR)

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FORMULATION OF HEALTH BENEFITS NUTRITIOUS CAKE

P.Boopathy*; M.Megala**

*Department of Home science,
Government Arts College for Women,
Sivagangai, Tamil Nadu, INDIA
Email id: kskboopathy@gmail.com

**Department of Home science,
Government Arts College for Women,
Sivagangai, Tamil Nadu, INDIA

ABSTRACT

Nowadays, cake manufacturers face a major problem of lipid oxidation which limits the shelf life of their products. In facts several attempts have been made to produce cake from different type of composite flours. The wheat, ragi, walnut, green gram were sieved through fine sieves to avoid the dirt and unwanted particles. The batter obtained was poured in greased baking mould and even setting was done using spreader. The result of this study showed that when the incorporation of ragi, walnut and green gram increase carbohydrate, protein, fat, fiber, ash content. Meanwhile the oven is preheated at 200^0C for 20 min. Not only wheat flour but also other flour types have been investigating for developing cakes of lower cost and better quality in terms of consumer acceptance. However the term may mean mixing of different flours from roots and tubers, legumes, cereals or other raw materials into a composite with wheat for many purposes. The oil from the nut could serve as a source of energy for growing seedlings and for the formulation of wood varnish vulcanized oil (Ajaiyeoba, 2006). The microbial count of the cake samples after 15 days of storage in pack with paper board. It was observed that there was no growth in the 15 days.

KEYWORDS: *Oxidation, Microbial, Manufacturers, Vulcanized*

INTRODUTION

The current study was carried out to study the nutrition parameters of cakes made from wheat flour fortified with Ragi powdered, green gram powdered and walnut. Formulation and developed of nutritious cake product from local and readily available raw material have received a lot of attention in many developing countries due to malnutrition which has been known as a major problem especially to infants as a result of lack of several essential nutrients in the food product.

Composite flours have been used extensively in the production of baked goods. In facts several attempts have been made to produce cake from different type of composite flours. In countries where malnutrition poses a serious problem especially among children, composite flours which have better nutritional quality would be highly desirable (L.C.okpala., 2013).

Bakery products are widely consumed and are becoming a major component of the international food market. Cake is one of the most common bakery products consumed by people in the world. Nowadays, cake manufacturers face a major problem of lipid oxidation which limits the shelf life of their products. Bakery products such as cakes particularly those with high lipid content tend to become rancid after prolonged storage owing to the oxidation of polyunsaturated fatty acids (Ray and Husain, 2002; Smith *et al*., 2004). Foods containing higher content of polyunsaturated fatty acids are more prone to oxidation (van Aardt *et al*., 2004).

Walnut seed flour has a good potential for use as a functional ingredient agent in bakery products because of its high water absorption capacity, solubility, bulk density and rapid viscosity characteristics (Ndie at., 2010). This shows that the flour in rich in protein and fat and can serve as a protein supplement. The oil from the walnut could serve as a protein supplement. The oil from the nut could serve as a source of energy for growing seedlings and for the formulation of wood varnish vulcanized oil (Ajaiyeoba, 2006).

Composite flour is a mixture of different flours from cereals, legumes or root crops that is created to statistify specific functional characteristic and nutritious composition. It refers to the process of mixing baked and fried foods products like breads, cake buns and chin-chin. However the term may mean mixing of different flours from roots and tubers, legumes, cereals or other raw materials into a composite with wheat for many purposes. FAO reported that replacing wheat with 20% non-wheat flour for the manufacture of bread products would results in an estimated savings in foreign exchange of us and 20% million for developing countries.

The objective of this study, therefore was to determine the sensory properties of wheat- walnut cake

- To preparation of composite flour.
- To standardize the cake.
- To analysis the MNPSS

(**M**icrobial content, **N**utrient content, **P**hysical characteristics, **S**ensory score & **S**elf life)

METHODOLOGY

THE STUDY SELECTION

Cakes are popular and are associated in the consumers mind with a delicious sponge product with desired organoleptic characteristic. Cake is one of the most popular bakery products. The formulation of health benefits nutritious cake was selected health benefits of growing children, teenagers, pregnant women, lactating women, and anaemic patients.

COLLECTION OF RAW MATERIALS

Ingredients used in the preparation of cakes included: Essential ingredients of whole wheat, Ragi, green gram, walnuts, sugar and optional ingredients of egg, baking powder, venila flavor, butter were purchase from local super market of sivagangai.

PREPARATION OF FLOUR

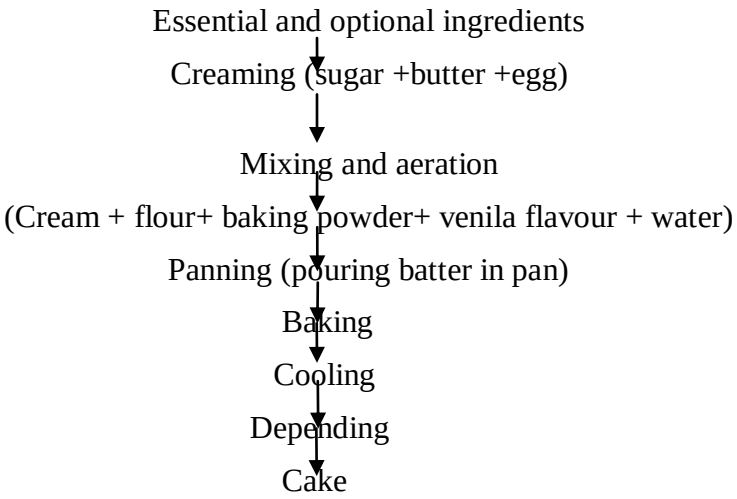
Not only wheat flour but also other flour types have been investigating for developing cakes of lower cost and better quality in terms of consumer acceptance. Wheat flour, ragi, walnut, green gram, eggs, butter, sugar, were the raw material was properly measured according to the ratio required in cake. The wheat, ragi, walnut, green gram were sieved through fine sieves to avoid the dirt and unwanted particles. Meanwhile the oven is preheated at 200^0C for 20 min. The weighed sugar and melted butter were beaten properly using beater for 10min. It was further processed by addition of weighed flour and baking powder and again proper beating was done for 10min. The batter obtained was poured in greased baking mould and even setting was done using spreader. After the setting of batter it was baked in preheated oven at 150-180^0C for 20min.

COMPOSITE FLOUR FORMULATION

Different composite flour sample were prepared by combining 100%, 80%, 60%, 40% wheat flour, 0%, 10%, 20%, 30% Ragi flour, 0%, 5%, 10%, 15% walnut flour and green gram flour respectively (table1) showing blends of wheat flour, Ragi flour, walnut flour, and green gram flour used in composite flour formulation.

Sample code	Wheat flour (%)	Ragi flour (%)	Walnuts flour (%)	Green gram flour (%)
C0 (control)	100	0	0	0
C1	80	10	5	5
C2	60	20	10	10
C3	40	30	15	15

IMPROVE NUTRITIOUS QUALITY OF CAKE MAKING PROCESS:



ANALYSIS QUALITY OF CAKE:

From the varieties of developed cakes were analysed for microbial, nutrient, physical, sensory and self life by using the standard procedures.

RESULTS

MICROBIAL ANALYSIS OF CAKE

The microbial count of the cake samples after 15 days of storage in pack with paper board. It was observed that there was no growth in the 15 days. The growth observed could be due to pre and post processing not contamination.

NUTRIENT ANALYSIS OF CAKE

The nutrient composition decreased with increased the ragi flour, walnut, and green gram flour in cake sample. The carbohydrate content in cake sample (20%, 21%, 28%, and 35%). The control cake sample Co low amount of carbohydrate. The highest value of carbohydrate content present in 40% wheat, 30%, of ragi15% of and 15% of green gram.

The protein content of cake increased when the incorporation of ragi, walnut and green gram increased from the protein of the cake sample 7.16%, 8.2%, 8.17%, and 8.75%. The cake sample 40% wheat, 30% ragi, 15% walnut and 15% green gram had higher protein 8.75% and control sample only wheat flour 100% had low in protein 7.16%.

The cake sample content fat 1.2%, 1.8%, 1.8%, and 3.4%. The fiber content of sample prepared with ragi, walnut, green gram was increased when the incorporation of ragi, walnut and green gram increases fiber content 2.6%, 2.18%, 12.37%, and 2.87%. The cake sample C3 highest fiber content 2.87%. The C3 cake sample contains 40%, wheat 30%, ragi 15%, and walnut 15%, green gram. The lowest value control sample C0 incorporation of wheat 100%. The ash content of cake sample 1.26%, 1.47%, 1.56%, and 1.84%. The highest value ash content sample C3 (1.84) and lowest value sample C0 (1.26).The incorporation of ragi, walnut and green gram increase and nutrient value had increased.

PHYSICAL ANALYSIS OF CAKE

The physical characteristics of cakes are the height of sample C0, C1, C2, C3 with 6.5cm, 7cm, 7cm and 7.5cm. The weight of sample C0, C1, C2,and C3 with 200g, 200g, 200g, and 180g. The height of sample C3 was greater than other sample. Hence the spread ratio of the control is the highest 100% of the wheat flour. The lowest spread ratio sample C1 and C3.

SENSORY ANALYSIS OF CAKE

The mean scores for the sensory evaluation of the cakes were light difference in appearance, taste, aroma, color, texture and over all acceptability sample C3 (40%:30%:15%:15% wheat, ragi, walnut, and green gram flour cake) had the highest sensory score value of overall acceptability 4.9 when compared to control C0 and sample C1 and C2 and CO, C1, C2, value of overall acceptability 4.2, 3.7, and 3.6. There was a general decrease in the acceptability of cake with increase in ragi walnut and green gram flour.

SELF LIFE ANALYSIS FOR CONSUMER ACCEPTABILITY

The mean acceptability scores for each quality attribute evaluated (appearance, taste, texture, aroma, taste, colour and over all acceptability)of the cake samples prepared from the wheat, ragi, green

gram and walnut flour are presented table 6. The score also indicated that cake store 15 days from C3 sample was more acceptable 4.9 score than that from other samples.

DISCUSSION

The cake prepared with the formulation of wheat with Ragi flour, walnut and green grams were rich in carbohydrate, protein, fat, fiber, and ash. The result of this study showed that when the incorporation of ragi, walnut and green gram increase carbohydrate, protein, fat, fiber, ash content. The cake sample of 30% ragi flour, 15% walnut and 15% green gram contain higher amount of carbohydrate (35%), protein (8.95%), fat (3.4%), fiber (2.81%) and ash (1.84%). The control C0 sample contain low amount of carbohydrate, protein, fat, fiber, and ash. This sample only wheat flour based cake. The C3 sample over all acceptability highest point and 1st rank.

SAMPLE CODE	APPEARANCE	TASTE	AROMA	COLOUR	TEXTURE	OVER ALL ACCEPTABILITY
C0	**4.5**	**4.5**	**4.4**	**4.6**	**4.6**	**4.2**
C1	**4.2**	**3.8**	**3.8**	**4.2**	**3.4**	**3.7**
C2	**3.7**	**3.6**	**3.5**	**4.2**	**3.5**	**3.6**
C3	**4.8**	**4.9**	**4.7**	**4.7**	**4.9**	**4.9**

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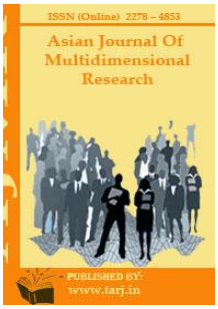

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ENVIRONMENTAL AND CLIMATE IMPACTS ON FOOD SECURITY CLIMATIC CHANGES: IMPACT ON DISEASE DEVELOPMENT AND PRODUCTION IN CHICKPEA (CICER ARIETINUM L) IN MAJOR GROWING AREAS OF TAMIL NADU

Murali Sankar, P*; Vanitha, S*; Kamalakannan, A*; Anantha Raju, P; Jeyakumar, P*****

*Department of Plant Pathology,
Tamil Nadu Agricultural University,
Coimbatore, INDIA
Email id: muralisankar58@gmail.com

**Department of Pulses,
Tamil Nadu Agricultural University,
Coimbatore, INDIA

***Department of Crop Physiology,
Tamil Nadu Agricultural University,
Coimbatore, INDIA

ABSTRACT

Chickpea (Cicer arietinum L.) is one of the most important legume crop in India and cultivated on during November (Rabi) season. It's a cool winter season pulse crop and prominently their production was reduced due to biotic and a biotic stresses. In Tamil Nadu, chickpea was cultivated in four major districts viz., Coimbatore, Dindigul, Dharmapuri and Tiruppur. In the present study was conducted for the influence of climatic factors and impact in wilt disease development, severity and production loss in above the four districts during two consecutive years viz., 2015-16 and 2016-17. Among the two years of vast survey, the incidence of wilt disease recorded maximum 57.33% and 33.67% in Tiruppur district with highest rainfall of (312.1 and 238.6mm) and production loss at 70.67% followed by 67.33 per cent with 'r' value 0.58. The soil temperature was not influenced the disease development and severity it's indirectly proportional ('r' value 0.84) to the disease severity and production loss.

KEYWORDS: *Chickpea, yield loss, Atmospheric temperature, Relative humidity and Rainfall.*

INTRODUCTION

Chickpea or Bengal gram (*Cicer arietinum* L.) is third most important grain legume crop in the world after common pea (*Phaseolus vulgaris*) and peas (*Pisum sativum*) belonging to *Leguminosae (Redden and Berger, 2007). India accounts for 75% of world's chickpea production* on 13.98 million ha area with production 137.3 lakh tonnes and productivity 982 kg/ha (Thaware, *et al*., 2016). In Tamil Nadu, chickpea was cultivated in a area of 6820 hectares with a production of 4177 tonnes and a productivity of 645 Kg / ha. There are four major districts where cultivated in Tamil Nadu *viz*., Tiruppur (2441 ha), Dharmapuri (2110 ha), Coimbatore (892 ha) and Dindigul (537 ha) (Parthasarathy *et al*., 2017). Currently, the production area and yield loss was drastically reduced upto 10 to 100 per cent due to climatic factors *viz*., eratic rainfall, soil temperature, relative humidity and evapotranspiration (Dubey *et al*., 2011). In case these abnormal epidemiological conditions favoured with pest and diseases especially wilt and root rot and causing severe yield loss in chickpea (Saremi *et al*., 1999). The optimum temperature for 24ºC to 28ºC, rainfall >298mm and relative humidity >70% favoured the wilt disease (Mina and Dubey, 2010).

In the present study was carried out for influence of climatic factors associated with wilt disease and yield loss in major chickpea growing districts of Tamil Nadu.

MATERIALS AND METHODS

Survey and occurrence of wilt disease in chickpea

An extensive survey was undertaken in major chickpea growing districts of Coimbatore, Dharmapuri, Dindigul, and Tiruppur districts in Tamil Nadu during Rabi, 2015-16 and 2016-17. In each district two to three villages were selected for a view to assess the wilt incidence. In each village three fields were selected and in each farmers field 0.1 ha area was selected at random. Total and infected plants were counted in all the selected areas and the wilt incidence was calculated by using the following formula and impact of disease incidence categorized into classes *viz*., (0% - Nil, 0.1 - 1.0 % - low, 1.1 – 20.0% - moderately high, 20.1-50.0% - high and >50.0% - very high) (Traperos-Casas and Jimenez-Diaz, 1985).

$$\text{Per cent disease Incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plants}} \times 100$$

Influence of climatic factors for wilt disease and production (Collection of data)

During based on the occurrence of wilt disease incidence the climatic weather factors *viz*., rainfall, soil temperature, were collected and analysed from Department of Agro Climatic Research Centre, Tamil Nadu Agricultural University, Coimbatore.

RESULTS AND DISCUSSION

Survey and occurrence of wilt disease in chickpea

A survey results showed that the maximum wilt disease incidence was recorded (57.33%) in Tiruppur district and the minimum incidence was recorded (34.67%) in Coimbatore district in cv. CO4 during 2015-16 and 2016-17, the highest wilt disease incidence was recorded (33.67%) in Tiruppur district and the lowest incidence was recorded (13.67%) in Dharmapuri district in commonly used JAKI-9218 variety (Table 1). A similar reports for occurrence of the disease extend of 25-48% in Central (Madhya Pradesh and Chhattisgarh) and Southern India (Andhra Pradesh and

Karnataka) during 2010-11 by Ghosh *et al*. (2013). Patra *et al*. (2017) reported that a mean disease incidence ranging from 13.90 to 27.76% in West Bengal during 2014-15 and 2015-16.

Influence of climatic factors for wilt disease and production

During two consecutive years of Rabi, (2015-17) the rainfall (312.1 and 238.6mm) was positively correlated with wilt incidence of "r" value of 0.58 and soil temperature (26.7ºC and 28.4ºC) were significantly influenced the disease development and prevalence with negatively correlated with disease incidence of "r" value by 0.84. and the per cent of production reduction in 70.67 and followed by 67.33 per cent in (Table 1; Fig 2.). A similar reports were documented by Pande *et al*. (2011) the annual rainfall ranging from 600-1000mm with erratic and intermittent distribution of rainfall induced sudden increasing of the high soil moisture and modified the soil topography and pH suppressed the plant germination and induced biotic stress of wilt disease develop and severe at soil temperature (25-30ºC) but most favourable at (22-26ºC) the infection not attained < 20ºC (Navas-Cortes *et al*., 2007; Landa *et al*., 2006).

CONCLUSIONS

The changing in climatic factors during before crop cultivation and crop period are more associated with crop pathogens impact in survive, disease development and severity were increased and causing more production loss especially rainfed chickpea in Tamil Nadu.

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Department of Plant pathology, Tamil Nadu Agricultural University, Coimbatore-3

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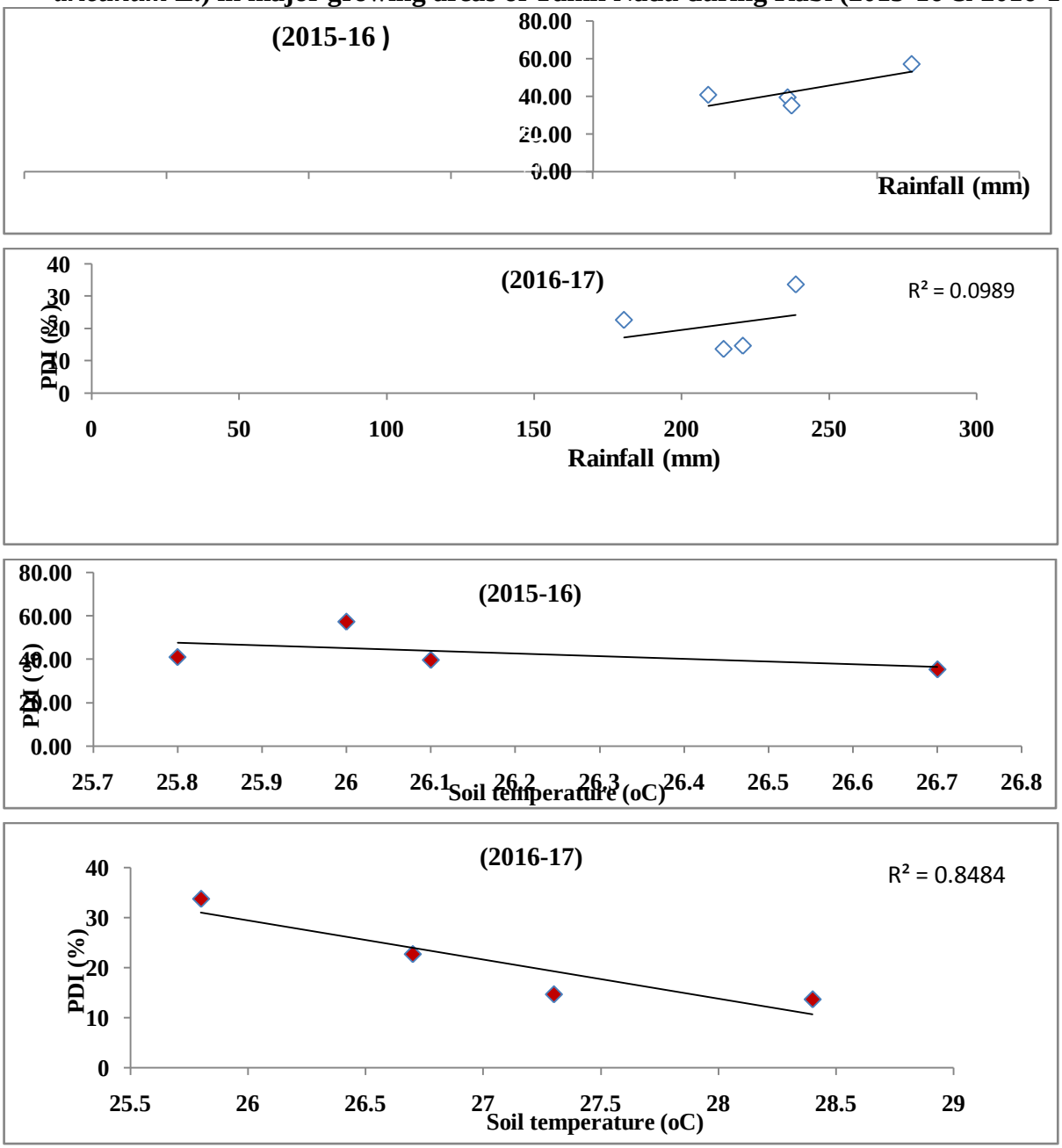
TABLE 1 INFLUENCE OF CLIMATIC FACTORS FOR DISEASE OF WILT IN CHICKPEA (*CICER ARIETINUM* L.) DURING 2015-17

S. No	Districts	Total cultivated Area (ha)	Rainfall (mm)		Soil temperature (^{o}C)		Per cent disease incidence (PDI)*		Production loss (%)	
			2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17
1.	Coimbatore	892	240.6^{d}	180.5^{d}	25.8^{d}	26.7^{c}	41.00^{b}	22.67^{b}	61.33^{b}	49.67^{b}
2.	Dharmapuri	2110	269.9^{b}	214.2^{c}	26.7^{a}	28.4^{a}	35.33^{d}	13.67^{d}	34.99^{d}	37.47^{d}
3.	Dindigul	537	268.5^{c}	220.7^{b}	26.1^{b}	27.3^{b}	39.67^{c}	14.67^{c}	57.67^{c}	27.66^{c}
4.	Tiruppur	2441	312.1^{a}	238.6^{a}	26.0^{c}	25.8^{d}	57.33^{a}	33.67^{a}	70.67^{a}	67.33^{a}

* Maximum disease incidence in the surveyed districts.

Figure 1. Influence of climatic factors for the occurrence of wilt disease of chickpea (*Cicer arietinum* L.) in major growing areas of Tamil Nadu during Rabi (2015-16 & 2016-17).



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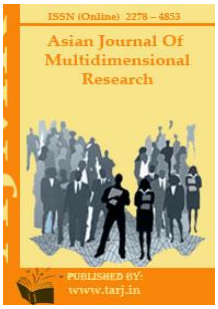

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EFFECT OF SELECTED ANTIVIRAL HERBAL EXTRACT SUPPLEMENTED DIET AGAINST SHRIMP WHITE SPOT SYNDROME VIRUS (WSSV)

S. Sujithra*; D. Beula shiny; Dr. T. Kumaran*****

*Research Scholar,
PG and Research Department of Zoology,
Muslim Arts College, Thiruvithancode,
Kanyakumari, Tamil Nadu, INDIA

**Assistant Professor,
PG and Research,
Department of Zoology, Muslim Arts College,
Thiruvithancode, Kanyakumari, Tamil Nadu, INDIA

***Manonmaniam Sundaranar University,
Abishekapatti, Tirunelveli, Tamilnadu, INDIA
Email id: kumaranmac@gmail.com

ABSTRACT

The herbal active compounds may inhibit or block the transcription of the virus to reduce the replication in the host cell.Antiviral herbals such as Acalypha indica, Picrorhiza kurooa and Eclipta erecta were selected and extracted using different solvents. Further the combination (1:1:1) of the three methanolic herbal extracts were incorporated in artificial feed and made the diet such as 100, 200, 400 and 800 mg. kg^{-1}. These diets were fed to the shrimp Penaeus indicus weighed of 8 ± 0.5 g for 30 days. After a 30 days interval, they were challenged with WSSV and studied the hematological, biochemical and immunological changes. Among the different diets fed, P. indicus the 400 and 800 mg. kg^{-1} diet were highly resistance against the WSSV infection, improved hematological and immunological parameters.

KEYWORDS: *Antiviral; Herbals; WSSV; Penaeus indicus*

INTRODUCTION

White spot syndrome virus (WSSV) is an economically significant shrimp disease, which causes high mortalities and severe damages to shrimp culture. In cultured shrimp WSSV infection can cause a cumulative mortality of up to 100% with in 3 to 10 days. Infected animals show gross signs of lethargy, such as lack of appetite and slow movement. Characteristic for infected shrimps are the white spots on the exoskeleton (Vlak *et al*., 2005). Several products have been experimentally tested for the control of viral diseases on shrimp due to their potential to stimulate the invertebrate non specific immune system.

Medicinal plants have a variety of chemical constituents, which have the ability to inhibit the replication cycle of various types of DNA or RNA viruses. Strategies for prophylaxis and control of WSSV theoretically include improvement of environmental conditions, stocking of specific pathogen free shrimp post larvae and enhancement of disease resistance by using immunostimulants. Immunostimulants are the substances, which enhances the non specific defense mechanism and provide resistance against pathogenic organism. Perusal of the literatures indicated the immunostimulants are proven very successfully in treating /preventing microbial diseases in culture shrimp fishes (Citarasu *et al*., 2006).

Historically plants have provided a source of inspiration for novel drug compounds as plant derived medicines have made large contribution to human health and well being. Many herbs have been used for millennia as home remedies and some of these have potent anti-viral properties. A few have been found to have anti- viral activity against fish viruses in tissue in culture (Direkbusarakom, 1996). Most of these plants and plant extracts do not act by non-specifically stimulating specifically the immune system of the shrimp (Direkbusarakom, 1996). Citarasu *et al.* (2002) described the positive effect of the herbal active principles such as antibacterial, antiviral, immunostimulant and antistress effect in shrimp aquaculture. The present focus on the influence of herbal extracts having antiviral properties against WSSV in *Penaeus indicus.*

MATERIALS AND METHODS

Three herbs having the antiviral and immunostimulant characteristics such as *Acalypha indica*, *Picrorhiza kurooa* and *Eclipta erecta*, were selected following Nadkarni. The details of the antiviral herbs are given in the Table 1. The dried powders were extracted with the above mentioned solvents by percolation extraction. The extracts were filtered, centrifuged and concentrated in rotatory evaporator under reduced pressure at the temperature of 45^0C to 50^0C. Aqueous extract was concentrated using lyophilizer and stored 4^0C. 500 mg of condensed plant extracts were dissolved in 100 ml of NTE buffer as stock for bioassay studies. 5 µ1 of viral suspension (300 µg of total protein) were mixed with 10 µ1 of plant extract and incubated at 29^0C for 3 h.

After 3 h, the mixture was injected intramuscularly into *P. indicus*, weighed 8.0 ± 0.5 g. Mortalities were recorded for each day and the experiment was carried out up to 10 days. Control and experiment all groups were also maintained as for the mixture of 25 µ1 NTE buffer and 5 µ1 viral suspensions. Based on the initial antiviral screening, herbal extracts were purified through silica column chromatography (60 - 120µm mesh size). Approximately 2 gm of Plant extract was loaded as dried slurry of the top of silica gel column and eluted with the different combinations of non-polar and polar solvents. Elution was collected, condensed and concentrated and stored 4^0C.

The fractions were incubated with WSSV again and the mixture was injected intramuscularly into *P. indicus* and mortalities were recorded until 7 days. Herbal extract supplemented diets were prepared

using equal concentrations of the active fractions of the all herbal methanolic extracts. Ingredients and formulation of the basal ration were done followed by Boonyaratpalin. The basal diet contained 45.1% protein; 7.2% lipid; 14.6% ash; 7.1% moisture and 3% fibre. Four test diets were prepared at the concentration of 100, 200, 400 and 800 mg/kg. A control diet, devoid of herbal active principle was also prepared.

Healthy shrimps, *P. indicus* weighing approximately 8.0 ± 0.5 g were purchased from a local shrimp farm at Manakudy, Tamilnadu, India. They were stocked in a fibre glass tank (5000 l capacity) in the laboratory. The shrimps were acclimatized to ambient laboratory condition. The culture water was first chlorinated with 25 ppm of sodium hypochlorite and de chlorinated by vigorous aeration. Uniform size of *P. indicus* were selected from the stock and transferred in individual experimental fibre glass tanks (1000 l capacity) of four experimental groups and a control group in triplicate (n = 50 X 3 = 150) with continuous flow-through water and constant aeration system. The shrimps were fed thrice a day at 7.00, 12.00 and 18.00 h at 10% of the body weight. Uneaten food and waste matters were removed before feeding. The water quality parameters such as temperature (27 ± 1.0 ^{0}C), salinity (28 ± 1.5‰), and pH (8.2± 0.1) were maintained every day.

After termination of the experiment, 50 shrimps from each dietary group were injected intramuscularly with WSSV filtrate which is prepared from infected shrimps (300 µmg of total protein per animal) in the second abdominal segment. The blank control was injected with 0.1 ml of Phosphate buffered saline. Survival was monitored until 7 days and haemolymph samples of experimental and control shrimps were tested by the haematological parameters such as coagulation time of the haemolymph, total haemocyte count (THC) and oxyhaemocyanin were calculated after challenging the experiment. The coagulation time of the haemolymph was determined by capillary method. Total haemocyte count (cells ml^{-1}) was performed using Burker haemocytometer.The concentration of oxyhaemocyanin was calculated following the method of Hagerman.

RESULTS

The percentage survival of the *P. indicus* was given in the Table 2, after the viral suspension incubated herbal extracts injection. Among the different solvent extractions, methanol extract was very effectively suppressed the WSSV and replication. There is no mortality was observed in this treatment after 7 days. There are 50 to 60 % of the survivals observed in the hexane and ethyl acetate extract treatments respectively. The cumulative mortality of the control groups and different concentrations of the herbal extracts incorporated diets fed shrimp; *P. indicus* is given in Figure 1. Only 20 % CMI was observed in the blank control with in 20 days. This was significantly increased ($P < 0.05$) to 100 % in the control groups. The survival of shrimps was increased significantly ($P < 0.05$) when they fed on increasing concentrations of immunostimulants. Within 10 days of challenging experiment with WSSV, the control group of shrimp fed on diet devoid of immunostimulant succumbed to death (100%) within 5 days. One way ANOVA revealed that variation in the survival of *P. indicus* fed with control and immunostimulant supplemented diets was statistically significant ($P < 0.05$).

The haemolymph coagulated in 164 seconds when no immunostimlants was given in the diet. The time for coagulation decreased significantly ($P<0.01$) to 120, 114, 104, and 91 seconds in the 100 to 800 mg/Kg diets fed groups respectively. The decreased time for coagulation is responsible for the decreased viral load in the haemolymph. The Total Haemocyte Count (THC) of 23.5 X 10^6 cells/ml were observed in the control group. The THC was significantly ($P<0.01$) increased to 30, 37, 42 and 45 X 10^6 cells/ml in 100 to 800 mg/Kg diets fed groups respectively. The lowest oxyhaemocyanin

level, (0.82 (mmol l^{-1})) was observed in the control diets fed *P. indicus*. The level of oxyhaemocyanin significantly (P<0.01) increased to 0.9, 0.91, 1.11 and 1.0 (mmol l^{-1}) in the 100 to 800 mg/Kg diets fed groups respectively (Table 3).

The prophenol oxidase activity (pro PO) value observed was higher in the herbal immunostimulants incorporated diets fed groups than the control group in different days of challenging. The less value was observed (0.157) in the control group within 5 days. The value was significantly (P<0.01) increased to 0.28, 0.712, 0.83 and 1.12 in 100, 200, 400 and 800 mg/Kg diets fed groups respectively after 10 days (Figure 2).

DISCUSSION

Plants have been rich sources of medicine because they produce a variety of bio active molecules most which are probably evolved a chemical defense against prediction or infection. Medicinal plants contain active constituent like terpenes, alkaloids , steroids ,saponins, tannins, phenols, quinines and flavonoids (Leven *et al* ., 1979 ; Harborne,1982; Bever ,1986; Kumaran and Citarasu 2015). The present study, the extracts such as *Picrorhiza kurooa*, *Eclipta erecta* and *Acalypha indica* were effectively suppress the WSSV in the *in vivo* systems of the *Penaeus indicus* the viral suspension incubated *E. erecta* herbal extract cent percent suppress the WSSV and no mortality observed. The methanol extract of *Picrorhiza kurooa* leaves was tested for antiviral activity against various fish pathogenic viruses namely, Infectious Haematopoietic Necrosis Virus (IHNV), Infectious Pancreatic Necrosis Virus (IPNV) and *Oncorhynchus masou* virus (OMV) (Direkbusarakom *et al*., 1993).

The present study different concentrations of the herbal extracts incorporated diets were highly influence on the *P. indicus* against WSSV infection. The diets helps to decreased cumulative mortality, i.e. increase resistance against, improved haematological parameters such as coagulase activity, Total haemocyte count and oxyhaemocyanin level. Also Yogeeswaran(2007), antiviral and immunostimulant characteristics such as *Acalypha indica*, *Cynodon dactylon*, *P. Kurooa*, *Withania somnifera* and *Zingiber officinalis* were extracted with polar and non-polar solvents and screened against WSSV by incubating with WSSV infected haemolymph of shrimp and injected to the shrimp. The screening results revealed that, the methanolic extracts of all herbs were very effective against the WSSV. This practice will reduce the side effects of applying the synthetic compounds, less cost and eco-friendly.

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TABLE 1.DETAILED DESCRIPTION OF THE HERBS HAVING ANTIVIRAL AND IMMUNOSTIMULANT PROPERTIES

Sl.No	Botanical name	Family	Distribution	Useful parts	Active principles	Biological Effect
1	*Acalypha indica*	Lagumin asae	South or west India in the Ganges vally and in Bengal	Bark leaves, flowers,gu m, root, bark & fruits	Tannin	Antiviral, Antidiarrho ea
2	*Picrorhiza kurooa*	Acanthac eae	India	Leaves	Legnin	Antiseptic, anitiviral, antidiabetic
3	*Eclipta erecta*	Astraceae	Throughout India mainly in Himalya	Leaves,Flo wer	Ecliptine	Antiparasiti cs, Antiviral

TABLE 2 PERCENTAGE SURVIVALS OF *P. INDICUS* TREATED WITH WSSV INCUBATED WITH HERBAL EXTRACTS AFTER 7 DAYS

Sl. No	Antiviral Herbs	Survival (%) of different organic solvent Extraction		
		Hexane	Ethyl acetate	Methanol
1	*Acalypha indica*	60	75	100
2	*Picrorhiza kurooa*	75	75	100
3	*Eclipta erecta*	50	75	100

TABLE 3 HAEMATOLOGICAL CHANGES IN THE HAEMOLYMPH OF *P.INDICUS* FED ON HERBAL ANTIVIRAL DIETS AND CONTROL DIET AFTER CHALLENGE WITH WSSV

Treatments	Haematological Changes		
	Coagulase activity (Sec)	Total Haemocyte Count ($X10^6$ cells ml^{-1})	Oxyhaemocyanin (mmol l^{-1})
D-0	163^a ± 6.01	21.33^a ± 1.24	0.79^a ± 0.01
D-1	118.66^b ± 0.94	30.66^b ± 0.94	0.88^a ± 0.002
D-2	114.66^b ± 3.68	37.66^c ± 1.24	0.91^a ± 0.02
D-3	104.66^c ± 7.31	42.00^d ± 0.81	1.11^b ± 0.09
D-4	91.00^d ± 5.88	45.33^d ± 1.24	1.00^b ± 0.47

Means with the same superscripts (a-d) do not differ from each other (P < 0.01).

Figure1. Cumulative mortaliy of *P. monodon* fed on herbal antiviral diets after challenged with WSSV

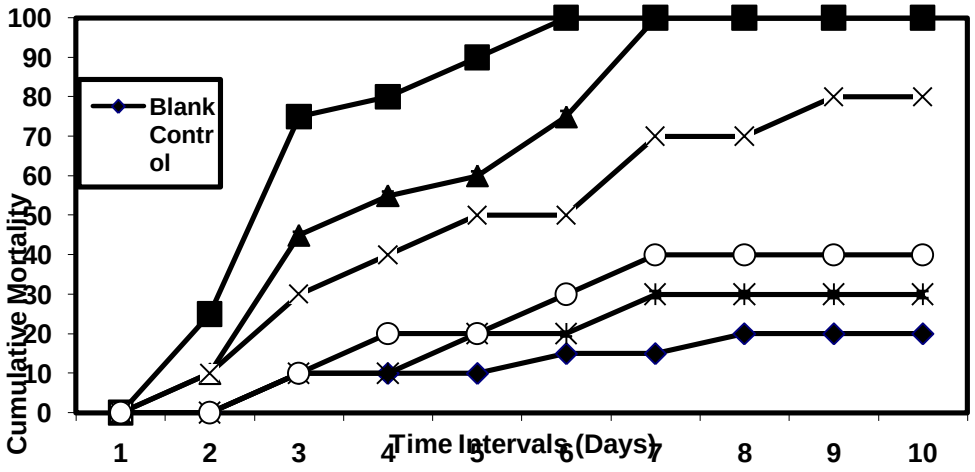
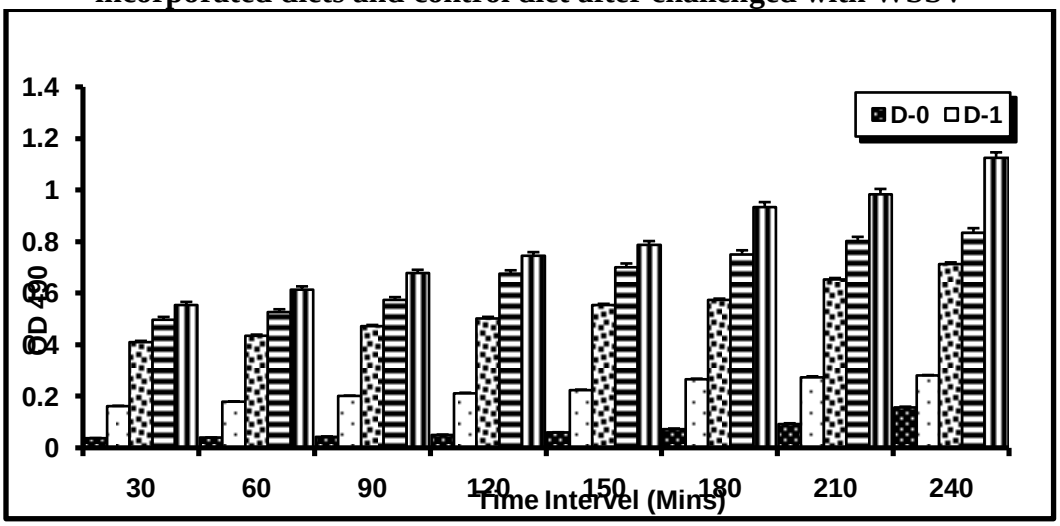


Fig. 2 Pro Phenoloxidase activity (ProPO) of haemocytes of *P. indicus* fed on herbal extract incorporated diets and control diet after challenged with WSSV



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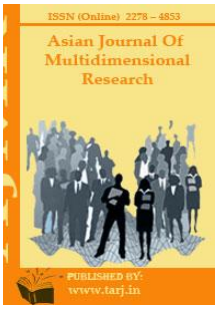

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EFFECT OF CONCENTRATION, BRIX AND PH ON VISCOSITY OF HYDROCOLLOIDS (CARBOXYMETHYL CELLULOSE)

Viswanath C*; Kavita Waghray; K N Jayaveera***; Govindarajula Yadav M******

*Research scholar,
Department of Food Technology,
JNTUA, Ananthapuramu, A.P, India
Email id: visu.dinu@gmail.com

**Dean,
Department of Food Technology,
UCT, Osmania University, Hyderabad,
Telangana, INDIA

***Professor of Chemistry, Director (R&D),
VEMU Institute of Technology,
Chittoor, A.P, INDIA

****Department of Food Technology and Process Engineering,
Arbaminch University, ETHIOPIA

ABSTRACT

Hydrocolloids are widely used in many food industries to improve product quality and stability. Thickening property is common to all hydrocolloids but the extent of thickening varies with the type and nature of hydrocolloids.The study determined the activity of hydrocolloid (Carboxy methyl cellulose) on different factors. Carboxy methyl cellulose (CMC) was prepared in different concentrations like 0.10%, 0.25%, 0.50%, 1.00% and 1.50%. Brix will play a key role on beverages to maintain the sensory attributes. To know the effect of brix on CMC in different concentrations, dry sugar was added to maintain brix at various levels like 12.50, 13.00, 13.50 and 14˚b. PH is one of most important parameter on beverages. In this study different pH levels was maintained like 3.0, 3.5, 4.0 and 4.5 to know the effect of pH on CMC.Without homogenisation will not get a uniform output of the product. In this study homogenisation also considered as one of the factor. Effect of brix on CMC solution was very less. By decreasing the pH 4.5 to 3.0 noticed viscosity also decreased. The effect of homogenisation on CMC solution was noted significant difference.

KEYWORDS: *Hydrocolloids, Thickening property, CMC, Homogenisation.*

INTRODUCTION:

Hydrocolloids are water soluble biopolymers consisting of high molecular weight polysaccharides know as viscosity builders, jellification agents and stabilizers of food systems (Nissim et al., 1993) [1]. The term Hydrocolloid is derived from the Greek word Hydro – water and kolla – glue. Hydrocolloids includes two basic properties of food system namely a) Flow behaviour (viscosity) and b) Mechanical solid property (texture) (Dipjyothi et al., 2010)[2]. Hydrocolloids beneficial effect was related to the ability of hydrocolloid to interact with water and change its rheological properties.

Hydrocolloids are macromolecular hydrophilic substances. Some of them are water soluble and form colloidal solutions others are only able to swell in the water and can be dispersed by means of shear forces. Hydrocolloids are used as fat and gluten substitutes, stabilizers, crystallization inhibitors, thickeners and gelatinization substances (Mikus et al., 2011)[3].

Carboxy methyl cellulose (CMC) is an anionic water soluble polymer capable of forming viscous solutions. CMC is a white to cream colored, tasteless odourless and free flowing powder (Maryam et al., 2011) [4]. CMC is generally prepared through the reaction of alkali cellulose with monochloroacetate or its sodium salt in an organic medium (Karolina et al., 2011)[5]. CMC has lower cost than pectin and it creates more viscous solution therefore pectin is going to be substituted with CMC in food industries (Nafise et al., 2015)[6].

MATERIALS AND METHODS:

Collection of raw materials

Carboxy methyl cellulose (powder) were procured from approved supplier and stored in cool and dry place. Lab grade sugar and citric acid were used for the study.

Preparation of Hydrocolloid (CMC) solution:

Carboxy methyl cellulose was weighed in different concentrations (0.10%, 0.25%, 0.50%, 1.00% and 1.50%) accurately by using electronic weighing balance. Treated water was heated up to 70-75˚c by using water bath. Pre-cleaned glass wares and utensils were used for preparation CMC solution.

Pre-weighed CMC powder was slowly added into pre-measured hot water without any lumps formation. Mix gently without bubble formation and also maintain the hot water temperature until completely dissolves. After dissolves 2-3 minutes contact time given for CMC solution. Same procedure repeated for remaining concentration samples.

Before going to apply with other factors actual viscosity was measured for CMC solutions by using Brookfield Viscometer. Results were recorded on table 1.

TABLE 1: ORIGINAL VISCOSITY OF CMC SOLUTION

S. No.	Spindle No.	RPM	Time	Concentration	Viscosity (Cp)
1	S62	100	2 minutes	0.10%	21.5
2	S62	100	2 minutes	0.25%	64.3
3	S64	100	2 minutes	0.50%	363.9
4	S64	100	2 minutes	1.00%	1504
5	S64	100	2 minutes	1.50%	4599

Addition of dry sugar to maintain brix on CMC solution:

The prepared CMC solution of each concentration was divided into 16 parts. Each 4 parts was considered as one group like 4 groups was subdivided. For each individual group dry sugar was

added to maintain brix level like 12.50˚B, 13.00˚B, 13.50˚B & 14.00˚B by measuring with Refractometer.

Addition of citric acid to maintain pH on CMC solution:

To know the pH contribution on CMC solution, prepared citric acid solution was added drop by drop to each individual samples until desired pH level obtained. Each individual group four different pH maintained like 3.00, 3.50, 4.00 and 4.50 by measuring with pH meter.

TABLE NO.2: CMC CONCENTRATION 0.10% OF VISCOSITY VALUES

Sample code	Spindle No.	RPM	Time	Brix	pH			
					3.00	3.50	4.00	4.50
G1	S62	100	2 minutes	12.50	13.1	14.5	16.4	18.5
G2	S62	100	2 minutes	13.00	13.3	14.4	16.9	19.4
G3	S62	100	2 minutes	13.50	13.5	15.1	17.2	19.9
G4	S62	100	2 minutes	14.00	13.8	16.7	18.4	20.3

TABLE 3: CMC CONCENTRATION 0.25% OF VISCOSITY VALUES

Sample code	Spindle No.	RPM	Time	Brix	pH			
					3.00	3.50	4.00	4.50
G5	S62	100	2 minutes	12.50	33.4	37.2	45.5	54.1
G6	S62	100	2 minutes	13.00	34.1	38.7	47.2	55.6
G7	S62	100	2 minutes	13.50	34.9	38.9	47.8	57.1
G8	S62	100	2 minutes	14.00	35.7	39.4	48.2	58.2

TABLE 4: CMC CONCENTRATION 0.50% OF VISCOSITY VALUES

Sample code	Spindle No.	RPM	Time	Brix	pH			
					3.00	3.50	4.00	4.50
G9	S64	100	2 minutes	12.50	211.1	222.6	268.2	282.9
G10	S64	100	2 minutes	13.00	213.8	227.4	270.5	288.4
G11	S64	100	2 minutes	13.50	215.6	232.2	274.4	290.3
G12	S64	100	2 minutes	14.00	218.8	236.5	277.1	291.8

TABLE 5: CMC CONCENTRATION 1.00% OF VISCOSITY VALUES

Sample code	Spindle No.	RPM	Time	Brix	pH			
					3.00	3.50	4.00	4.50
G13	S64	100	2 minutes	12.50	1334	1376	1416	1458
G14	S64	100	2 minutes	13.00	1341	1383	1423	1466
G15	S64	100	2 minutes	13.50	1354	1389	1431	1470
G16	S64	100	2 minutes	14.00	1356	1394	1438	1477

TABLE 6: CMC CONCENTRATION 1.50% OF VISCOSITY VALUES

Sample code	Spindle No.	RPM	Time	Brix	pH			
					3.00	3.50	4.00	4.50
G17	S64	100	2 minutes	12.50	4162	4219	4324	4402

G18	S64	100	2 minutes	13.00	4174	4226	4336	4422
G19	S64	100	2 minutes	13.50	4189	4237	4358	4456
G20	S64	100	2 minutes	14.00	4201	4252	4376	4474

Effect of Homogenisation on CMC solution:

To know the homogenisation effect on CMC solution the prepared individual samples was subjected to homogenisation at 1st stage 100 bar and 2nd stage 20 bar. CMC concentration 0.10% and 0.25% was not considered for homogenisation due to lesser viscosity.

TABLE 7: AFTER HOMOGENISATION OF VISCOSITY VALUES

CMC Conc.	**0.50%**				**1.00%**				**1.50%**			
Brix	**pH**											
	3.00	3.50	4.00	4.50	3.00	3.50	4.00	4.50	3.00	3.50	4.00	4.50
12.50	98.2	107.6	136.2	140.5	642.4	678.2	691.5	709.8	1976	2012	2094	2186
13.00	100.7	109.3	138.8	142.9	655.1	682.8	699.4	717.7	1984	2021	2110	2194
13.50	103.4	112.1	140.3	145.6	668.2	690.5	702.8	725.4	1996	2038	2119	2212
14.00	105.8	113.5	144.2	148.5	671.9	694.4	708.6	731.5	2014	2045	2127	2224

CONCLUSION:

The primary beneficial effect was related to the ability of the hydrocolloids to interact with water and changes its rheological properties. The thickening effect of CMC depends on various factors such as concentration, pH, Brix and temperature. After addition of sugar to CMC solution to increase the brix percentage it shown viscosity levels was slightly increased. The different pH levels was studied from 4.50 to3.00 pH and results shown that decreasing the pH also decreases viscosity of the samples. Homogenisation effect on viscosity shown significant difference.

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SPECIAL ISSUE

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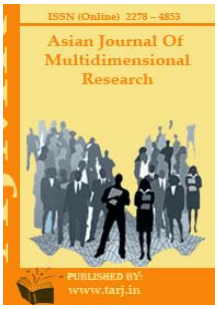

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ANTIBACTERIAL EFFECT OF AGATI GRANDIFLORA LEAF EXTRACT SUPPLEMENTED FEED AGAINST FISH PATHOGEN IN CARASSIUS AURATUS

G. Sindhu kumara*; Dr. T. Kumaran**

*Research Scholar,
PG and Research Department of Zoology,
Muslim Arts College,
Thiruvithancode, Kanyakumari, Tamilnadu, INDIA

**Assistant Professor,
PG and Research Department of Zoology,
Muslim Arts College,
Thiruvithancode, Kanyakumari, Tamilnadu, INDIA

***Manonmaniam Sundaranar University,
Abishekapatti, Tirunelveli, Tamilnadu, INDIA
Email id: kumaranmac@gmail.com

ABSTRACT

Plants are the chief source of natural compounds used for medicine, in which medicinal plants have attracted considerable interest and most attention for their wide variety of bioactive metabolites. Natural remedies from medicinal plants are found to be safe and effective. Agati grandiflora extract contains a wide spectrum of activity against a group of bacteria that are responsible for the most common bacterial diseases. The present study focus find out the better active principles and phytochemical of the Agati grandiflora herb. This research offers summarized information about A. grandiflora extract incorporated diet fed Carassius auratus useful to solve the problems of Aeromonas hydrophila infection in ornamental fish industry.

KEY WORDS: *Agati grandiflora; phytochemical; Carassius auratus; Aeromonas hydrophila*

1. INTRODUCTION

Medicinal plants have been explored therapeutically in traditional medicines to alleviate human ailments for several millennia. Medicinal plants are defined as those which produce one or more active constituents capable of preventing or curing an illness. Natural products play a major role as active substances, model molecules for the discovery and validation of drug targets. Leaf extract of *Agati grandiflora* is used in the treatment of various bacterial infectious diseases such as pneumonia, diarrohea, urinary tract infection and even some skin disease.

A. hydrophila causes a disease known as haemorrhagic septicaemia or ulcer disease in fish, and belongs to the most common bacteria present in aquatic environments throughout the world. The bacterium is naturally found in the intestinal tract of the fish, and does not cause the disease under natural conditions (Swann and White 1989). *Agati grandiflora* extract contains a wide spectrum of activity against a group of bacteria that are responsible for the most common bacterial diseases. Thus, the plant possesses an abundant of the antibacterial compounds. The aim of the present study was to investigate the photochemical and antimicrobial activities of the extract from *A. grandiflora* using experimental animal models.

2. METHODOLOGY

Ten gram dried powders of *Agati grandiflora* plant leaf material filtering the extracts were prepared. In order to study the functional groups of the active extracts, they will be analysed through Phytochemicals, TLC and FTIR. After structural elucidation of the active compounds, they will be incorporated to the artificial diets with different concentrations and combinations such as 100, 200 and 400 mg Kg^{-1} feeding to the fish culture experiments. After a regular interval such as 20, 40, 60 and 80 days random sampling will be made and challenge and monitor the cumulative mortality, haematological and biochemical diagnosis and improvement will be analyzed.

3. RESULTS

The result of the phytochemical analysis showed that the *A. grandiflora* had the presence of tannin, saponin, steroids and flavanoids (Table.1). Thin layer chromatographic analysis of the hot water extract of *A. grandiflora* revealed that, the R_f value spot 0.164, 0.275 and 0.611 (Fig.1) was confirmed as the active compounds. The active fraction of *A. grandiflora* extract have the functional groups in the I-R spectrum. The broad peak around 2922 cm^{-1} may be the –OH stretching or -NH stretching the one peak at 1041 cm^{-1} may be due to C-O stretching. The one at 673 cm^{-1} may be due to C≡C-H. The one at 1624 cm^{-1} may be due to $RONO_2$. The observation revealed that it may be inferred that the compound is alkenes or ketones. Thus the extract may contain a free carbonyl group where the OH group is hydrogen bonded. The extract is also suspected to contain a carbonyl species in conjugation with O= bond (Fig 2)

The antibiogram studies of the *Aeromonas hydrophila* against the selected Antibiotics (zone of inhibition in cm) the maximum values were got for strain by using the antibiotic Chloramphenicol at 1.5 cm in diameter. *A. grandiflora* were effectively suppressed the pathogens at 0.7, 0.8 and 2 cm of zone of inhibition to *A. hydrophila* (Fig 3). The goldfish *C. auratus* succumbed to death cent percent within six days after *A. hydrophila* challenge when no vaccination was given. The *A. grandiflora* extract incorporated diet fed fishes survived of 90 % after ten days of challenges in *A. hydrophila* respectively in 25 days of post (dpv) vaccination (Fig 4).

The biochemical parameters including serum albumin, globulin and proteins of treated *C. auratus.* The serum albumin level of vaccinated groups was increased from the control fishes. The amount of

globulin was found to be higher in all the *A. grandiflora extract* incorporated diet fed groups when compared with the control group. The total serum protein analysis was performed in the control and vaccinated groups. The total serum protein was increased in the experimental groups. The RBC level was decreased in the control groups (no vaccination) when compared to the *A. grandiflora extract* incorporated diet fed groups (Table.2). This diet may be useful to solve the problems of *A. hydrophila* infection in ornamental fish industry.

4. DISCUSSION

Nowadays the chemical and synthetic vaccines have some demerits including high cost and some side effects. The antibacterial compound from herbal origin are advisable in aquaculture operations due to its versatile characterizers are safety, eco-friendly and create no side effects (Kumaran and Citarasu 2016). In the present study, the phytochemical analysis of the *A. grandiflora* leaf extracts revealed the presence of saponin, steroid, tannin and flavanoids. The major active constituents of root extract *A. grandiflora* are steroidal saponins namely shatavarins apart from alkaloids, flavonoids, sterols and terpenes (Kumaran and Citarasu, 2015). The extract of *A. grandiflora* was separated into its constitutive fractions by preparative thin layer chromatography (TLC). The R_f value obtained was 0.164, 0.275 and 0.611 and the fractions may be active compounds. The FTIR study revealed that, *A. grandiflora* had primary or secondary amine or an amide or substituted amide, olefininc band, cumulated system, C-F and C-Br bond (Bremer and Geesey, 1991).

Phytochemicals with adequate antibacterial efficacy can be used for the treatment of bacterial infections (Pathak *et al.*, 2010). The herbal antibacterial compound along with the *A. hydrophila* helped to increase the survival in juveniles of *C. auratus* after 25 dpv. The better weight gain (90 mg day^{-1}) was achieved in the highest doses antibacterial compound with inactivated *A. hydrophila* treated groups (Citarasu *et al.*, 2006). The influences of the *A. grandiflora* extract improve the survival of the treated fishes by 90%. Like the serum biochemical parameters, the hematological parameters also improved the same way. In the present study, the high quality of *A. grandiflora* extract incorporated diet helped to enhance the hematological parameters after the 25 dpv vaccination.

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TABLE 1 PHYTOCHEMICAL ANALYSIS OF HOT WATER EXTRACT OF A. GRANDIFLORA BY STANDARD PROTOCOLS

Sl.No	Phytochemical constituents	Hot water extract
1	Alkaloid	-
2	Saponin	+
3	Steriods	+
4	Tannin	+
5	Terpenoids	-
6	Flavonoids	+

TABLE 2 BIOCHEMICAL PARAMETERS OF THE GOLD FISH C. AURATUS TREATED WITH A. GRANDIFLORA HERBAL ANTIBACTERIAL DIET AND CHALLENGED WITH A.HYDROPHILA AFTER 25DPV

Sl. No	Treatment & Challenge	Biochemical parameters (µg/ml)		
		Serum albumin	Serum globulin	Serum protein
1	Blank control	232.45 ± 0.09	218.31 ± 0.06	436.23 ± 0.1
2	Control	224.69 ± 0.12	202.14 ± 0.1	432.74 ± 0.09
5	*A. grandiflora* extract incorporated diet	241.78 ± 0.06	230.34 ± 0.09	461.20 ± 0.1

Fig 1 Thin Layer chromatogram of the *A. grandiflora* extract by iodine development

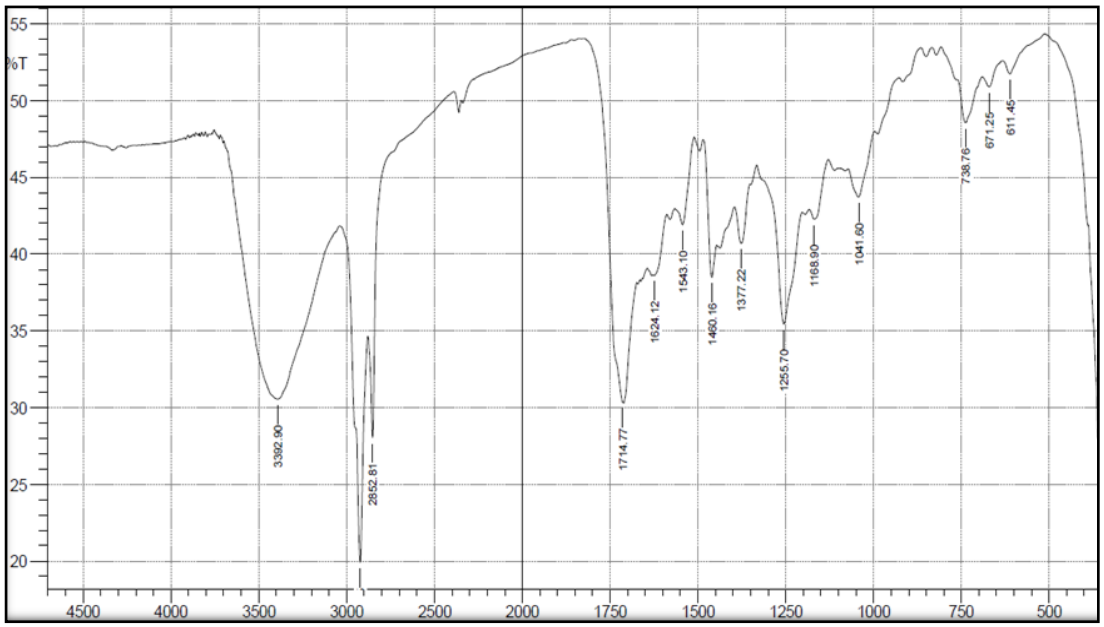

Fig 2 Fourier Transform Infrared Spectroscopy analysis for the *A. grandiflora* extract

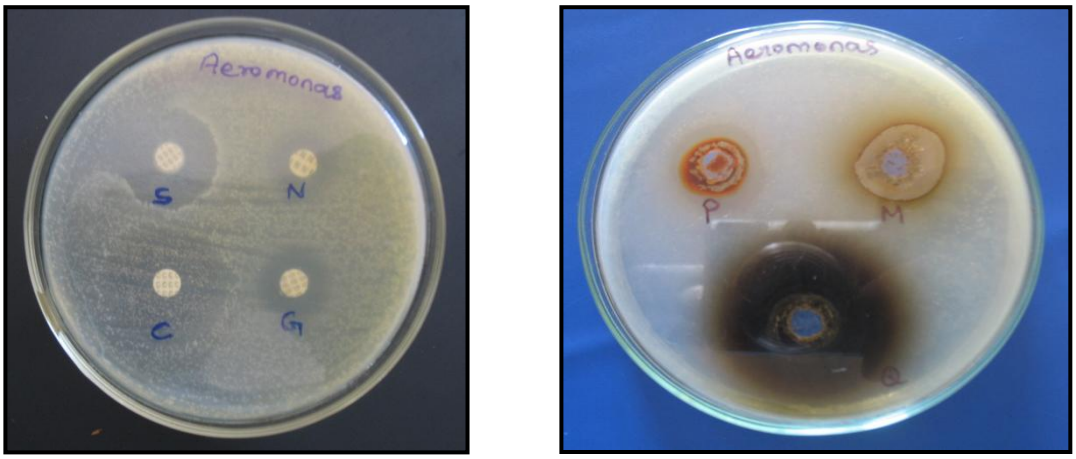

Fig 3 Antibacterial activity (zone of inhibition mm) of the antibiotics and *A. grandiflora* extract

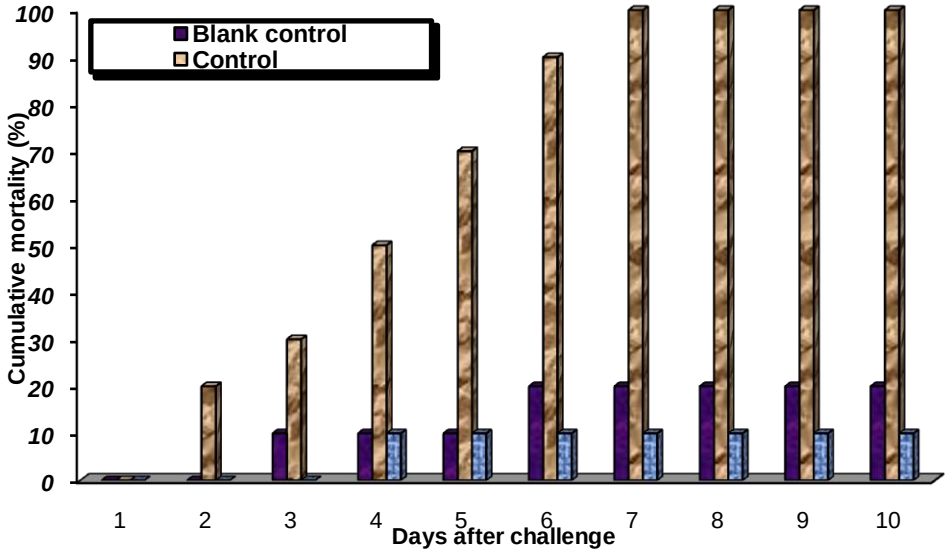

Fig 4 Cumulative mortality (%) of *A. grandiflora* herbal antibacterial diet fed *C. auratus* challenged with *A. hydrophila*

SPECIAL ISSUE

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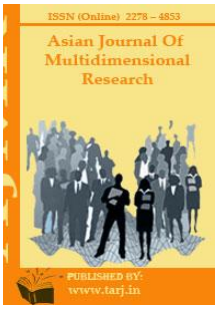

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FOOD BORNE ILLNESS CAUSING AEROMONAS HYDROPHILA ISOLATED FROM FISH FARMS AND EVALUATION OF THE POTENTIAL VIRULENCE FACTOR

R. Rajila*; T. Kumaran**

*Research Scholar,
PG and Research Department of Zoology,
Muslim Arts College,
Thiruvithancode, Kanyakumari, Tamil Nadu, India

**Assistant Professor,
PG and Research Department of Zoology,
Muslim Arts College,
Thiruvithancode, Kanyakumari, Tamil Nadu, India

***Manonmaniam Sundaranar University,
Abishekapatti, Tirunelveli, Tamil Nadu, INDIA
Email id: kumaranmac@gmail.com

ABSTRACT

Aeromonas hydrophila, a normal inhabitant of aquatic environments, is an opportunistic pathogen of a variety of aquatic animals including carp sp. The diseased fish, Cyprinus carpio koi selected in the present study had the symptoms of hemorrhagic skin, ulcerations, loss of scales, tail rot and dropsy in the abdomen due to virulent A. hydrophila infection. The present study, A. hydrophila was isolated from various tissues of infected Cyprinus carpio koi samples, based on morphological and biochemical confirmative tests. Also the virulence factors such as protease, proteolytic activity, haemolytic activity and challenge studies proved the virulence strain.

KEYWORDS: *Aeromonas Hydrophila; Virulence Factor; Cyprinus Carpio Koi; Haemolytic Activity*

INTRODUCTION

Infectious diseases are mainly caused by microorganisms ie, bacteria, fungus and virus. They cause serious infections in tropical and sub-tropical countries of the world. Infectious diseases in fresh water fish aquaculture are crucial factors which inhibit the expansion and socio-economic development. As aquaculture production becomes more intensive, the incidence of diseases including various microbial infectious diseases has increased leading to significant economic losses (kumaran *et al.*, 2010). Among microbial diseases, pathogenic bacteria, virus and fungus cause severe damages and economic loss in the hatchery as well as grow out ponds (Citarasu, 2012).

Outbreaks of motile aero monad septicemia usually occur whether fish are immune compromised due to unpleasant environment or predisposing factors leading to stresses such as temperature, overcrowding, organic pollution, and hypoxia. In China an outbreak of imported koi (*Cyprinus carpio koi*) with the mortality of 80 % upward was examined and *A. hydrophila* was one of two bacteria that were causative agents (Liu *et al.*, 2002). *A. hydrophila* is also associated with aquaculture diseases and accounted for more than 50 % of the isolated aeromonads from crusian carp in Zeijiane province of china (Nielsen *et al.*, 2001).

Potential virulence factors of *A. hydrophila*, which contribute to their pathogenicity, include the production of endotoxins, extra cellular enterotoxins, hemolysin, cytotoxins and protease, the ability to adhere the cells, and the possession of certain surface proteins (Howard and Buckley, 1985). The ability of a pathogen to locate, to attach, and subsequently infect a susceptible host is a primary step in the development of the disease. The factors produced by motile aeromonads, which can facilitate contagion, are important elements of bacterial virulence. The present study, *A. hydrophila* was isolated from infected *Cyprinus carpio koi* samples; identify the strains by various methods and characterizing the virulence factors.

MATERIALS AND METHODS

Isolation of *Aeromonas hydrophila* from infected fishes

Infected fish samples were obtained from local fish farms including Sabari farm and Suba fish farm in Kallidai kurichi from Tirunelveli District. Koi carp, *Cyprinus carpio koi* samples were used to isolate the *A. hydrophila* strains in the present work. Infected fish samples such as tissue, intestine, body fluid and gills were dissected out and homogenized in 10 ml sterile alkaline peptone water. Homogenates were serially diluted upto 10^{-6} in sterile normal saline solution and 100 µl aliquots of each dilution were plated on Tryptic Soy Agar (TSA) medium using spread plate technique in triplicate. Typical green colonies of 2-5 mm in diameter were subjected to biochemical and genotypic tests for identification of A. *hydrophila*. The cultures were stored at -8 0 ^{o}C in 15 % (V/v) glycerol for further studies.

Aeromonas hydrophila isolation and identification

The dominant colonies ware isolated from the hemorrhages as well as the body fluids of the infected fish. The selected isolates were identified by morphological, physiological and biochemical confirmations based on the characteristics described in Bergey's Manual of Systematic Bacteriology (Holt *et al.*, 1994). The pure cultures isolated from *C. carpio koi* were named as *Aeromonas hydrophila* further it was stored in nutrient agar slants at 4^{0}C for further experiments.

Virulence factor LD_{50} study

Virulence studies for *C. carpio koi* having the body weight ranging between 30 to 40 g were used for the LD_{50} studies. *A. hydrophila* of a cell count ranging between 10^5to10^9 cfu/ml in PBS (pH 7.2) was intraperitoneally injected to the fish at the rate of 0.1 ml/fish. Control group was injected intraperitoneally with 0.1ml of PBS (pH 7.2) without bacterial cells. The injections were maintained for all experimental and control group of fishes and the mortality rate was observed for a period of 7 days from the date of injection and the lethal dose (LD_{50}) was determined.

Proteolytic activity

Proteolytic activity was determined on the surface of skim milk agar, in which skim milk was added just before pouring the medium into the petri plates. The plates were incubated at 28 °C for 24 – 48 hrs. After the incubation period, the clear zones of hydrolysis were measured and recorded. The presence of a transparent zone around the colonies indicated protease activity (Gudmundsdottir, 1996).

Hemolytic activity

The *A. hydrophila* strains were tested for hemolytic activity by streaking them onto Blood agar plates containing 2 % or 5 % (V/v) human blood for 48 hrs at 37 °C incubation. Hemolytic activity for the *A. hydrophila* strains was categorized as alpha, beta, or gamma Beta hemolytic zones of 2 mm or more around the colonies were regarded as the sign of positive hemolytic activity (Guven and Mutlu, 2009).

Challenge test

The virulence study of the isolated strains, fresh culture of different *A. hydrophila* isolates were diluted into 0.5 % NaCl and injected intraperitoneally to *C. carpio koi* in a dose of 3×10^7cfu/ ml. Each group had 10 fishes in triplicate and a control group was also maintained. The control group was injected with 100 µl sterile 0.5 % NaCl without *A. hydrophila*. The fish were observed up to 7 days and any dead specimens were removed for routine bacteriological examination.

RESULTS

Isolation of *A. hydrophila* from infected fish samples

Three major dominant bacterial colonies were isolated from infected fish *Cyprinus carpio koi* samples. The colonies had the morphological feature of yellow to green colored raised mucoid colony in Aeromonas isolation medium. Among the dominant micro biota Aeromonas sp was isolated the higher percentage (82 %). The other micro biotas are Vibrio sp (12 %) and Bacillus sp (6 %) respectively (Fig 1).

Biochemical characterization of *A. hydrophila*

The morphological, biochemical and physiological confirmative tests of the five *A. hydrophila* strain were given in the table 1. *A. hydrophila* were motile, Gram negative and rod shaped. The *A. hydrophila* were positive for indole, methyl red, voges proskauer, citrate, oxidase, catalase and nitrate reduction. They ferment carbohydrates including glucose, sucrose, lactose, mannitol and maltose etc. They also hydrolyse the starch and gelatin etc.

Virulence factor LD_{50} study

The virulence factors of the *A. hydrophila* strain were isolated from infected fish was given in the table 2. The *A. hydrophila* strain injected at the rate of 2.5×10^5 Cfu/ml to *C. carpio koi* succumbed to death cent percent mortality respectively after 7 days. The *A. hydrophila* strain had strong virulence based on the higher mortality rates in *C. auratus* after seven days. The non virulent *A. hydrophila* injected *C. carpio koi* survived only 80 % after seven days due to less virulence and the strain.

Proteolytic activity

The *in vitro* proteolytic activity screened on skim milk agar of the *A. hydrophila* strain was given in the table.3. The results revealed that, *A. hydrophila* had maximum zone formation around the culture. The maximum zone formation around the culture indicated that, there is high proteolytic activity of the *A. hydrophila* strains.

Hemolytic activity

The *in vitro* hemolytic activity was screened on the blood agar of the *A. hydrophila* strain had maximum zone formation around the culture. The non virulent *A. hydrophila* had moderate zone formation around the culture. The maximum zone formation around the culture indicated that, there is high hemolytic activity of the *A. hydrophila* strain (Table.3).

Cumulative mortality of *C. carpio koi* after challenge

The cumulative mortality of *C. carpio koi* after being challenged with virulent *A. hydrophila* was given in the figure 18. The fish *C. carpio koi* survived 90 % when no pathogenic *A. hydrophila* challenge was given whereas the pathogenic *A. hydrophila* challenged fishes succumbed to death 100 % after seven days from challenge. Two way ANOVA revealed that, the cumulative mortality of *C. carpio koi* caused by A. *hydrophila* strain were significantly differed from each other.

DISCUSSION

Generally the bacterial or viral infections happened in fishes; the heavy microbial load interrupted the damage of blood cells leading to suppressed immune system. The extra cellular toxin secreted from the pathogens altered the hematological and biochemical parameters and damaged the internal organs in the fishes. Diffused necrosis in several internal organs and the presence of melanin-containing macrophages in the blood were also observed during a systemic *A. hydrophila* infection in channel catfish (Ventura and Grizzle, 1988) and rainbow trout (Peters *et al*., 1988).

In the study, the biochemical characters of the virulent bacterial isolates were confirmed as *A. hydrophila* from infected fishes, as identified by Bergy *et al.* (1984). The identification point of view, the major isolated colonies are green to yellowish color and raised mucoid colony in the Aeromonas isolation medium. All five colonies were motile, Gram negative rod shaped, positive for indole, methyl red, voges proskauer and ferment carbohydrate. Nordmann and Poirel (2002) reported that Aeromonas sp. are Gram-negative, rod shaped, mainly motile, facultative anaerobic, oxidase positive and glucose fermenting bacteria. The virulence LD_{50} studies revealed that, *C. auratus* to which the *A. hydrophila* was injected at the rate of $2.5x10^5$ cfu/ml succumbed to death 100 % within seven days. The 100 % mortality in the fishes reflected that the two strains had strong virulent power with highest virulence factor secretion. Kou (1973) found that many of the virulent, avirulent and attenuated aeromonads, that he studied, possessed hemorrhagic factors and lethal toxins.

The physicochemical parameters are highly influenced to the production of microbial virulence factors. The physical parameters including NaCl, temperature, pH and the chemical parameters of carbon sources, nitrogen sources, metal ions and surfactants are highly responsible for the production and optimization of the A. *hydrophila* virulence factors such as protease and hemolysin. The present study maximum zone formation around the culture indicated that, there is high proteolytic and hemolytic activity of the *A. hydrophila* strain. Multiple virulence-associated biological activities, including enterotoxic, cytotoxic, cytolytic, and proteolytic activities, have been detected in culture supernatant fluids of clinical and environmental isolates of *A. hydrophila* (Ljuagh and Wadstrom, 1983).

The extracellular products from selected pathogenic *A. hydrophila* strains were lethal for rainbow trout and displayed proteolytic, hemolytic, and cytotoxic activities (Santos *et al*., 1968). The *A.hydrophila* injected intraperitoneally is pathogenic to *Clarias batrachus* fingerlings, causing 93% mortality in fish infected with 10^7 cfu/ml, with peak mortalities occurring on days 14 and 15. (Thune *et al*., 1982). The present challenge experiments the virulent strain responsible for cent percent mortality till the end of *A. hydrophila* challenged experiment against the fish *C. carpio koi*. Carp that had been intramuscularly injected with *Aeromonas hydrophila* showed both hemolysis and anasarcous changes (Kanai and Takagi 1986). These changes were caused by toxic substances produced by the bacterium.

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TABLE 1 PHENOTYPIC IDENTIFICATION OF VIRULENT A.HYDROPHILA STRAIN ISOLATED FROM INFECTED FISH.

Sl. No	**Biochemical test**	***A.hydrophila***
1	Motility	Motile
2	Gram staining	-
3	Cell shape	rod
4	Indole	+
5	Methyl Red	+
6	VogesProskauer	+
7	Citrate	+
8	Oxidase	+
9	Catalase	+
10	Nitrate reduction	+
11	Carbohydrate Fermentation	
	Glucose	+
	Sucrose	+
	Lactose	-
	Mannitol	+
	Maltose	+
12	Gelatin hydrolysis	+

TABLE 2.LETHAL DOSE (LD_{50}) VALUES CAUSED BY *A. HYDROPHILA* STRAIN IN *C. CARPIO KOI* BY INTRAPERITONEAL INJECTION

Sl.No	*A. hydrophila* strains	LD_{50}		Virulence
		Cells (Cfu/ml)	Mortality (%)	
1	Control	-	-	-
2	*A. hydrophila* - A	$2.5x10^5$	100	Strong
3	*A. hydrophila* - B	$2.5x10^5$	20	Medium

LD_{50} values represent 50% mortalities over 96 hr.

TABLE.3.VIRULENCE FACTORS SCREENING FROM EXTRA CELLULAR PRODUCT'S (ECP) ENZYMATIC ACTIVITY FROM A. HYDROPHILA STRAINS

Sl. No	*A. hydrophila*strains	Virulence factors	
		Proteolytic	Hemolytic
1	Control	-	-
2	*A. hydrophila* - A	++++	++++
3	*A. hydrophila* - B	++	+

Fig. 1 Dominant microbiota isolated from the infected fish *C. carpio koi.*

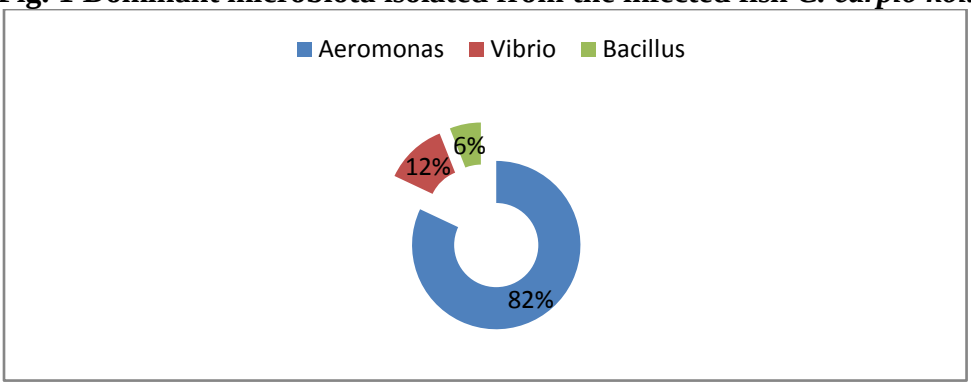
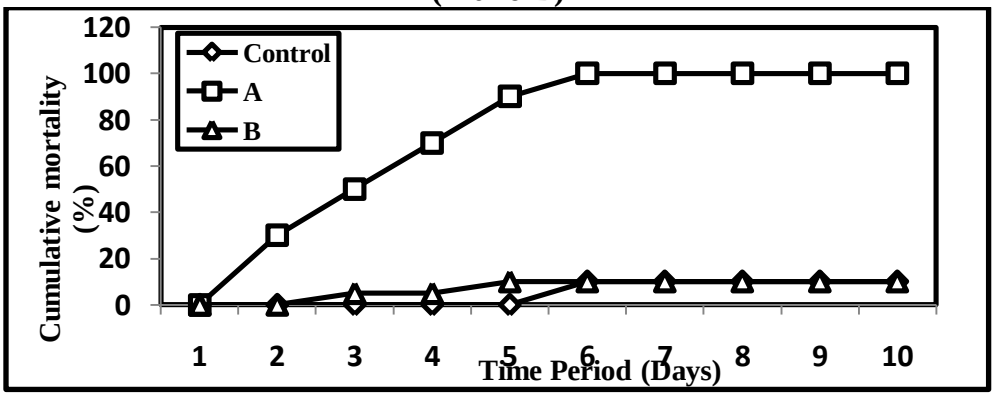


Fig 2 Cumulative mortality of *C. carpio koi* by challenging with virulent *A. hydrophila* isolates (A and B)



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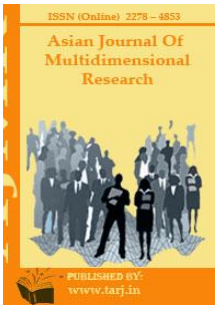

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ANALYSIS OF CHLORELLA VULGARIS - A PROMISING FOOD

Deepika M*; Balasasirekha.R**

*Research scholar,
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

**Assistant Professor,
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: balasasirekhar@yahoo.co.in

ABSTRACT

Chlorella vulgaris an unicellular algae is a promising food with essential nutrients and positively affect the health of humans and animals and are extremely effective in augmenting body's mechanism for fighting diseases. The study aimed to analyse the proximate composition, phytochemicals, antimicrobial activity of Chlorella vulgaris and to find out the safety of Chlorella vulgaris for human consumption. Quantitative analysis of the proximate principles was determined using dye and calorimetric method and qualitative analysis of phytochemicals using standard procedures. The antimicrobial activity was determined using agar well diffusion method and safety was tested by determining the level of toxic components using HPLC and liquid chromatography. Results revealed that macronutrient composition of Chlorella vulgaris constitute protein (49.58g) and among the micronutrients the highest contribution is by iron, 23.8 g. The aqueous extract of Chlorella vulgaris showed the presence of tannin, phenol, saponin, quinone, glycoside, coumarin, sterol and flavonoid. The methanolic extract showed the presence of tannin, terpenoid, phenol, saponin, glycoside, sterol and flavonoid. Tannin, phenol, saponin, glycoside and sterol was found to be present in ethanolic extract. The aqueous extract of Chlorella vulgaris was found to contain a zone of inhibition of 8 mm against E.coli and 10 mm against Staphylococcus aureus. The control showed a higher zone of inhibition than the Chlorella vulgaris extract. The antifungal activity of aqueous extract of Chlorella vulgaris with Aspergillus niger and Aspergillus flavus showed a zone of inhibition of 9 and 13 mm respectively. The present study showed a higher antifungal activity of

Chlorella vulgaris than the control. The aflatoxin content of Chlorella vulgaris is 14 ppb and ochratoxin is found below detectable level. Chlorella vulgaris was found to be a good source of protein with highest phytochemical activity in aqueous extract. Chlorella vulgaris is a good antifungal agent when compared to the antibacterial activity.

KEYWORDS: *Chlorella Vulgaris, Proximate Principles, Phytochemicals, Antimicrobial Activity, Aflatoxin, Ochratoxin*

INTRODUCTION

Chlorella vulgaris is a unicellular green micro algae that has been widely used for centuries as a food source with complete nutrients, such as carbohydrate, protein, vitamins and minerals, and is marketed commercially as health supplement or incorporated in food along with cereals (Halperin *et al*., 2003). *Chlorella vulgaris* has been shown to have anti-atherogenic, anti-cholesterolemic, anti-inflammatory, and antitumor effects (Hasegawa *et al*., 2000). The most significant health benefits is that it wraps itself around even stubborn toxins residing in our bodies, such as lead, cadmium, mercury and uranium, and keeps them from being reabsorbed. Regular consumption can even help keep heavy metals from accumulating in our bodies' soft tissues and organs (Shim *et al*., 2009 and Queiroz *et al.,* 2003). *Chlorella* enhances the natural killer cell activity and produces interferon-γ and interleukin-12 as well as interleukin-1β, the Th-1 cell-induced cytokines in healthy people (Kwak *et al.,* 2012). In addition, purified peptides from *Chlorella vulgaris* have demonstrated significant protective effects against cellular damage (Sheih *et al., 2009).* The most important substance in *Chlorella* is β-1, 3-glucan, which is an active immunostimulator, a free radical scavenger and a reducer of blood lipids. *Chlorella* can also be used as a food additive owing to the taste and flavour adjusting actions (Spolaore *et al., 2006).*

Compounds in *Chlorella vulgaris* like antioxidants and a glycoprotein have an antagonistic effect on the tumor producing factors. Apart from the importance of macroalgae in healthcare and medicine, *Chlorella*, a green microalga, has gained more attention in the pharmaceutical industry because of its ability to enhance the nutritional content of conventional food preparations and positively affect the health of humans and animals (Raghavendran, 2013). The highest phenolic content, hydrogen peroxide radical scavenging activity was also obtained by Manivannan *et al*., (2012). Aarstad *et al*., (2012), reported that green algae *Chlorella* constitute up to 70 % dry weight protein; these micro algae have an amino acid profile that compares well with egg, notably containing all of the essential amino acids (EAA) that humans cannot synthesize and must obtain from foods. Enyidi, (2017) found that the microalgae *Chlorella vulgaris* has good-quality protein with amino acids rich in methionine, lysine and alanine. The **OBJECTIVES** of the present study was to analyse the proximate composition, phytochemicals present, and the antimicrobial activity and to find out the safety of *Chlorella vulgaris* for human consumption.

METHODOLOGY

Procurement of the sample - *Chlorella vulgaris* was procured in the form of dry powder from Divy Agro Industries; New Delhi. Divy Agro Industries produces the best quality *Chlorella vulgaris* with affordable price.

Analysis of proximate principles

Chlorella vulgaris was analysed for the following, namely, proximate principles including ash, protein, fibre, total carbohydrate, starch, vitamin C, calcium, phosphorous, iron, and vitamin B_{12} using standard procedures of AOAC, 1990.

Phytochemical analysis

Preparation of phytochemical extracts - Aqueous extract and solvent extract including methanol and ethanol extracts of the *Chlorella vulgaris* was prepared using the standard procedure of Doughari *et al.*, 2012.

Antimicrobial activity - Paper discs impregnated with specific antibiotics or the test substances were placed on the surface of the Muller Hinton Agar or Rose Bengal chloramphenicol inoculated with the target organisms. The plates were incubated and the zones of inhibition around each disc were measured. Zone of inhibition was measured with the help of a meter scale and compared with the given standard chart (Bauer *et al.*, 1966).

All the tests was done in triplicates in order to remove any deviations and to have concordant values in the result.

Analysis of toxic substances

Chlorella vulgaris is analysed for determination of toxic substances. The toxic substances analysed are mycotoxins such as *Aflatoxin* and *Ochratoxin* the common mycotoxins found in food.

a. Determination of Aflatoxins

Principle of LC/MS: HPLC, with the detection power of mass spectrometry. Even with a very sophisticated MS instrument, HPLC is still useful to remove the interferences from the sample that would impact the ionisation. Interface that will eliminate the solvent and generate gas phase ions, then transferred to the optics of the mass spectrometer (FSSAI, 2012).

b. Determination of Ochratoxin

Principle: Test portion is extracted by blending with acetonitrile–wa-ter. The extract is cleaned up by passing through an immunoaffinity column. Ochratoxin a (OTA) is eluted with methanol, further purifed and identified by LC, and quantified by fluorescence (Entwisle *et al.*, 2000).

RESULTS AND DISCUSSION

Proximate composition of *Chlorella vulgaris*

Table I reveals the mean proximate composition of *Chlorella vulgaris* powder.

TABLE I PROXIMATE COMPOSITION OF CHLORELLA VULGARIS

Proximate principles	Composition/ 100 g
Ash (g)	9.00±1.00
Protein (g)	49.58±0.72
Fibre (g)	10.73±0.11
Total carbohydrate (g)	38.80±0.58
Starch (g)	2.42±0.05
Calcium (mg)	552.00±4.00
Phosphorus (mg)	1066.60±23.09
Iron (g)	23.80±0.23
Vitamin B_{12} (µg)	28.80±2.00
Vitamin C (mg)	54.58±1.01

Each value represents the mean ± SD of three determinations on dry weight (DW) basis

From the table it is evident that mean ash content of the *Chlorella vulgaris* is 9 g. The macronutrient composition of Chlorella vulgaris constitute highest composition of protein (49.58g), followed by the total carbohydrate (38.8 g), fibre (10.73 g) and starch (2.42 g). And among the micronutrients analysed the highest contribution is by iron, 23.8 g which is phosphorus (1066.6 mg), calcium (552 mg), vitamin C (54.58 mg) and the least is contributed by the vitamin B12, 28.8 µg.

The protein and fibre content is correlated with the findings of Ramraj *et al*., (2016) with 48.8g and 17.8 g per cent respectively. In the present study the total carbohydrate content of *Chlorella vulgaris* is 38.8 g which is lower than its protein content and the starch contribute to 2.42 g /100 g dry weight. Similarly Habib *et al*., (2008) analysed for carbohydrate in *Chlorella vulgaris* (30.8 g) and starch 17 per cent of the total nutrients (Bruno *et al*., 2012). The vitamin B_{12} content present in *Chlorella vulgaris* is 28.8 µg / 100 g dry weight and vitamin C contributes to 54.58 mg. The vitamin B_{12} in *Chlorella vulgaris* was 29.87 g (Kumudha *et al*., 2015) and 161 mg vitamin C (Klinghartacedemy.com).

Phytochemicals of *Chlorella vulgaris*

Chlorella vulgaris was analysed for the phytochemicals namely tannin, terpenoid, phenol, saponin, quinone, glycoside, coumarin, sterol, flavonoid and alkaloid in aqueous, methanol and ethanol extract.

Table II shows the phytochemicals present in *Chlorella vulgaris.*

TABLE II PHYTOCHEMICAL ANALYSIS OF *CHLORELLA VULGARIS*

Phytochemicals	Aqueous extract	Methanolic extract	Ethanolic extract
Tannin	+++	++	+
Terpenoid	_	+	_
Phenol	+++	++	++
Saponin	+++	+	++
Quinone	+	_	_
Glycoside	+	+	+
Coumarin	+++	_	_
Sterol	+	++	+
Flavonoid	+++	+	_
Alkaloid	-	-	-

+++: Highly present, ++: moderately present, +: Low, -: absent

The aqueous extract of *Chlorella vulgaris* showed the presence of tannin, phenol, saponin, quinone, glycoside, coumarin, sterol and flavonoid. Terpenoid and alkaloid was absent in aqueous extract of *Chlorella vulgaris*. Tannin, phenol, saponin, coumarin and flavonoid was highly present in aqueous extract and the presence of quinone, glycoside and sterol was found to be low.

The methanolic extract of the *Chlorella vulgaris* showed the presence of tannin, terpenoid, phenol, saponin, glycoside, sterol and flavonoid. Quinone, coumarin and alkaloid was absent in methanolic extract of *Chlorella vulgaris*. Tannin, phenol and sterol was moderately present and the presence of terpenoid, saponin, glycoside and flavonoid was found to be low. Tannin, phenol, saponin, glycoside and sterol was found to be present in ethanolic extract of *Chlorella vulgaris*. Phenol and saponin was moderately present in ethanolic extract and the presence of tannin, glycoside and sterol was found to be low. Terpenoid, quinone, flavonoid and alkaloid was absent in ethanolic extract of *Chlorella vulgaris*. Similarly Adhoni *et al*., (2016) analysed *Chlorella vulgaris* for its phytochemical content and found that alkaloids was absent in all the three extracts namely aqueous, methanol and ethanol. Tannins, glycosides, saponin and sterol is found to be is present in all the three extracts of *Chlorella vulgaris*. Terpenoid is found to be present only in methanolic extract. Geetha *et al.*, (2010) found the presence of quinones and coumarin in aqueous extracts of *Chlorella vulgaris.*

Antimicrobial activity of *Chlorella vulgaris*

Table III shows the antimicrobial (antibacterial and antifungal) activity of *Chlorella vulgaris.*

TABLE III ANTIMICROBIAL ACTIVITY OF CHLORELLA VULGARIS

Name of the organism	Zone of inhibition (mm)	
	Control	Aqueous extract
Bacteria		
E.coli	13	8
Staphylococcus aureus	12	10
Fungi		
Aspergillus niger	6	9
Aspergillus flavus	8	13

The above table presents the antimicrobial activity namely antibacterial and antifungal activity of *Chlorella vulgaris*. The bacteria selected are *E.coli* (Gram -ve) and *Staphylococcus aureus* (gram +ve). The aqueous extract of *Chlorella vulgaris* was found to contain a zone of inhibition of 8 mm against *E.coli* and 10 mm against *Staphylococcus aureus*. The control showed a higher zone of inhibition than the *Chlorella vulgaris* extract. The antifungal activity of aqueous extract of *Chlorella vulgaris* was tested with fungi like *Aspergillus Niger* and *Aspergillus flavus* and shows a zone of inhibition of 9 mm and 13 mm respectively. The present study showed a higher antifungal activity of *Chlorella vulgaris* than the control. The control showed the antifungal activity of 6 mm and 8 mm for *Aspergillus Niger* and *Aspergillus flavus* respectively.

Similarly the finding of Adhoni et al., (2016) is well correlated with the present study of antibacterial activity of *Chlorella vulgaris* that is 10 mm zone of inhibition for both *E.coli* and *Staphylococcus aureus*. Adhoni *et al.*, (2016) reported the antifungal activity of *Chlorella vulgaris* (aqueous extract) against Aspergillus niger with a zone of inhibition of 6 mm. In another study by Syed *et al*., (2015) the ethanolic extract of the *Chlorella vulgaris* showed highest antibacterial activity against *E.coli* with a zone of inhibition of 15 mm. In the present study it can be concluded that *Chlorella vulgaris* shows higher antifungal activity than the antibacterial activity.

Toxic substances in *Chlorella vulgaris*

Table IV presents the toxic substance (mycotoxins) composition in *Chlorella vulgaris.*

TABLE IV TOXIC SUBSTANCES IN CHLORELLA VULGARIS

Mycotoxins	**Composition**
Aflatoxin	14.0 ppb*
Ochratoxin	BDL**

Above values are approximately to 100 g, ppb*- parts per billion, BDL**- Below Detectable Level

The above table shows the composition of mycotoxins present in *Chlorella vulgaris* namely the aflatoxin and ochratoxin. The aflatoxin and ochratoxin are the common toxins found in food. The aflatoxin content of *Chlorella vulgaris* is 14 ppb and ochratoxin is found below detectable level. The US Food and Drug Administration (US FDA) has established maximum allowable levels of total aflatoxin in food at 20 µg/kg (Gupta, 2011). The aflatoxin content in *Chlorella vulgaris* are below the reference range and it is safe to consume the product.

CONCLUSION

Chlorella vulgaris is a good source of protein and iron hence can be recommended for deficiency diseases such as protein energy malnutrition, anaemia and for general health of the human being. Apart from the proximate composition *Chlorella vulgaris* is rich in phytochemicals and can be used as a therapeutic agent. Because of the good antibacterial and antifungal properties of the aqueous extract of *Chlorella vulgaris*, the shelf life of the food products developed using *Chlorella vulgaris* will be high. Since *Chlorella vulgaris* mycotoxins are in the permissible level, this can be used as a promising food with multiple benefits. Based on this data further study can be carried out for developing value added food products and for treatment of specific human diseases.

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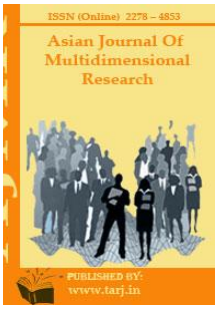

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UGC APPROVED JOURNAL

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A STUDY ON PURCHASE OF ORGANIC FARM PRODUCTS THROUGH CONSUMER GENERATED COMMUNICATION.

D. Arthi*; Dr.P.Santhi**

*Ph.D Scholar,
Department of Commerce,
Avinashilingam Institute for Homescience and,
Higher Education for Women, Bharathi Park Road,
Coimbatore, Tamil Nadu, INDIA
Email id: Arthi2592@gmail.com

** Professor,
Department of Commerce,
Avinashilingam Institute for Homescience and,
Higher Education for Women, Bharathi Park Road,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Organic farm products endowed with tremendous health benefits are experiencing astonishing growth over few decades .The term organic refers to the way agricultural products are grown and processed and the consumers mainly relate the term with vegetables and fruits to lead a healthy diet. The objective of the study is to analyse the factors influencing the respondents towards engaging in word of mouth communication regarding organic farm products. Primary data were collected from 150 respondents using structured questionnaire and the respondents were the consumers of organic farm products in Coimbatore city. Non-probability sampling method namely convenience sampling was adopted to select the sample respondents. The collected data were analysed using Descriptive statistics and Factor analysis. The results of the study depicts that No Chemical Residue was the key factor influencing the respondents towards engaging in word of mouth communication about organic farm products.

KEY WORDS: *Organic Farm Products, Word Of Mouth, Health Benefits, Purchase Decision*

INTRODUCTION

The high growth of life expectancies during the recent years increased the change in food consumption and the awareness about what they are consuming. The organic farm products were gaining momentum by providing the consumers a choice of healthy life. Organic is a labelling term used to indicate that the food or other agricultural product has been produced through approved methods that integrate cultural, biological and mechanical practices that foster cycling of resources, promotes ecological balance and conserve biodiversity (National Organic Program, 2016). In addition it is noted that the consumers of organic farm products are actively involved in word of mouth communication and providing recommendations to their family, friends and other acquaintances to purchase and consume organic farm products mainly for the health benefits (Roshni, et.al 2017). Though there are several means of communication, word of mouth, being the personal source of communication is an effective method of promotion as it is generally delivered from consumers by consumers and for consumers (Paul and Jery, 2007).

REVIEW OF LITERATURE

Health attributes and environment friendliness are the most important factors influencing the decision making process of organic food products (Tiziana and Gracia 2008). Consumers with high income, high educational qualification and older in age prefers to purchase more organic products (Shanmugapriya, et.al 2014). Labelling the organic products with well known certification logos achieves consumers trust (Meike Jassen, 2012). Trust and word of mouth leads to purchase intention of organic food products (Pandey and Khare 2017) and Word of mouth referrals have strong impact on new customer acquisition (Michael Trusov, et.al 2009).

Statement of the Problem

Chemical additives and Pesticides in the food products cause several harmful diseases which in turn reduces the life span and the chance of being alive. So inorder to safeguard from the polluted environment and to lead a healthy life style people nowadays are keeping themselves near to the nature and tends to purchase more organic farm products than conventional food products. Among other sources the purchasers of organic farm products have greater confidence in personal sources of information as they are consumer generated not marketer generated. So, the key aspects influencing the respondents towards word of mouth communication regarding organic farm products and the significant role of word of mouth recommendation towards the purchase of organic farm products was taken into consideration.

OBJECTIVES OF THE STUDY

The objectives of the study are

- To analyse the purchase decision of organic farm products by the respondents,
- To identify the effective source of information influencing the respondents purchase decision of organic farm products and
- To identify the factors influencing word of mouth communication about organic farm products.

RESEARCH METHODOLOGY

The study is descriptive and analytical in nature. Coimbatore city is selected as the study area because of the market availability of variety of organic farm products and growing number of organic food stores. The study was based on both primary and secondary data. Primary data were

collected using structured questionnaire from 150 respondents, who were the consumers of organic farm products. Secondary data were collected from various books, journals, articles and websites. Non-probability sampling procedure namely convenience sampling method was used to select the sample respondents. Accordingly, the collected data were analysed using Descriptive statistics and Factor analysis.

RESULTS AND DISCUSSION

The results of the data analysis were presented as follows.

Socio- economic Profile of the Respondents

On the basis of age, most of the respondents(52 %) belongs to the age group of 35-55 years, Female respondents (53.30 %) constitutes the majority, 98.70 percent of the respondents were married , most of the respondents were graduates (52.74%) and about 46 percent of the respondents were employed and earning a monthly income of Rs.1,00,000 to 2,00,000 (58%).With regard to the family of the respondents , majority of the respondents were living in nuclear families (74%) with more than three members (56%) and most of the respondents(52%) have two earning members in their family.

Purchase Decision of organic farm products by the respondents

Consumers interest to purchase a product or service always depends on the willingness to buy , ability to pay for the product, their needs, influence, motivation and how they perceive things to take decisions. Therefore the purchase decision of organic farm products by the respondents were analysed and presented in table 1.

TABLE 1
PURCHASE DECISION OF ORGANIC FARM PRODUCTS BY THE RESPONDENTS

Variables		No .of Respondents (n=150)	Percentage
Frequency of purchase	Daily	34	22.70
	Weekly once	**67**	**44.70**
	Once in a month	23	15.30
	Few times a year	26	17.30
Place of Purchase	Organic stores	150	100
Period of Consumption	Less than a year	19	12.70
	1-2 years	**108**	**72.00**
	More than 2 years	23	15.30
Kinds of organic products purchased	Fruits	113	75.30
	Vegetables	**142**	**94.70**
	Dairy	59	39.30
	Ready to eat	21	14.00
	Edible oil	52	34.70
	Grocery	58	38.70
	Beverage	53	35.30
Ranking of organic products	Very good	**137**	**91.30**
	Good	13	8.70

Source: Primary Data

On the basis of purchase decision of organic farm products, most of the respondents (44.70%) were visiting the organic stores weekly once and they preferred visiting organic stores to purchase the products rather than other retail outlets where the organic farm products are available. About 72 percent of the respondents were using the organic farm products for a period of 1-2 years, among which vegetables were preferred by 94.70 percent of the respondents and they ranked the products as very good products (91.30%).

Source of Information influencing the respondents towards purchase of organic farm products

The different sources of communication through which the consumers were informed about and influenced towards the purchase of organic farm products were analysed and presented in table 2.

TABLE 2
SOURCE OF INFORMATION INFLUENCING THE PURCHASE OF ORGANIC FARM PRODUCTS

Variables		No .of Respondents (n=150)	Percentage
Sources of Information	Word of mouth	**135**	**90.00**
	Advertisements	19	12.66
	News papers	24	16.00
	Events	27	18.00
	Social media	38	25.33
	Store display	93	62.00
Sources of Word of mouth	Family members	**63**	**46.66**
	Friends	35	25.92
	Colleagues	16	11.85
	Other customers	21	15.55
Suggestions Provided	Family &close friends	**79**	**52.66**
	Neighbours& peer group	44	29.33
	Other acquaintances	27	18.00
Mode of communication	Social media	4	2.70
	Face to face	**111**	**74.00**
	Oral reviews	35	23.30

Source: Primary Data

Based on the sources of information, majority of the respondents (90%) were informed about the organic farm products through word of mouth communication, especially from their family members (46.66%) and majority of the respondents suggests the organic farm products to their family members and close friends (52.66%) through face to face communication (74%). This shows that word of mouth is the effective source of communication influencing the respondents towards the purchase of organic farm products. Inorder to safeguard themselves and their near and dear ones in the polluted environment the organic farm products are purchased and its qualities were recommended to family members, friends, colleagues and other customers for the sake of their well being.

Factors Influencing respondents towards word of mouth communication regarding organic farm products

In order to have a thorough knowledge about the dominant factors influencing the respondents towards engaging in word of mouth communication on organic farm products, the key aspects regarding which the information sharing and receiving takes place were taken into consideration and the respondents intention were gathered through five point Likert scale. The variables used for factor analysis were analyzed and presented in table 4. Inorder to bring out the underlying factors, Varimax Rotation with Kaiser Normalization were used. The principal component analyses were used for extraction purpose. The criterions for selecting number of factors were based on Eigen value. All these factors which have Eigen value more than one were included. The KMO and Bartlett's bring out the sample adequacy and are highly significant as shown in table 3.

Table 3		
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.595
Bartlett's Test of Sphericity	Approx. Chi-Square	730.996
	Df	171
	Sig.	.000

Source: Computed Data

On factoring 19 variables totally seven key factors influenced the respondents towards engaging in word of mouth communication regarding organic farm products to the extent of 66 percent. Factor one ***Product without chemical additives*** consists of No chemical residue (.787), No additives (.787) and Suitable for all age group (.649) influenced 12.014 percent of word of mouth engagement regarding organic farm products. The organic products are mainly purchased by the respondents for its chemical free quality. The second factor ***Certificated Labels*** consists of Organic labels (.758), Speciality shop (.715) and Life style change (.669) influenced 11.287 percent of word of mouth engagement. The third factor named as ***Longer shelf life*** consists of Stay fresh for long time (.789) and Most flavourable (.702) influenced 10.037 percent of respondents towards engaging in word of mouth communication regarding organic farm products. Factor four ***Quality*** consists of Quality of the product (.757) and Taste (.747) influenced 9.778 percent of information sharing and receiving behaviour of respondents.

TABLE 4
FACTORS INFLUENCING RESPONDENTS TOWARDS WORD OF MOUTH COMMUNICATION

Variables	**Factors**							**Communalities**
	1	**2**	**3**	**4**	**5**	**6**	**7**	
Quality of the product	.152	.091	.008	**.757**	-.041	.003	.013	.607
Maintain good health	.343	.099	-.335	.491	.253	.104	-.010	.556
Taste	-.023	-.275	.180	**.747**	.166	-.182	.082	.734
Reasonable price	-.051	.221	.417	.519	.293	.367	-.105	.726

Stay fresh for long time	-.039	-.059	**.798**	.028	.043	.237	.020	.701
Grows in harmony with nature	.205	.036	-.109	-.035	.139	.254	**.782**	.751
Pure and safe	.011	-.012	.154	-.136	.083	**.758**	.015	.625
Organic labels	-.151	**.758**	.066	.022	.166	.165	-.239	.714
Life style change	.043	**.669**	.044	.000	.270	-.026	.062	.529
Specialty shop	.030	**.715**	-.116	.005	-.366	.104	.163	.697
Rich in nutrients	.005	.009	.499	.111	-.114	-.177	**.682**	.769
Trust worthy	.194	.334	.155	.172	-.075	.557	.186	.553
Suitable for all age group	**.649**	.198	.199	.252	.021	.241	.068	.627
Wide range	.484	.410	.195	-.180	.044	-.279	.196	.591
Most flavourable	.361	.125	**.702**	.079	-.062	.083	.031	.657
No chemical residue	**.787**	-.163	-.102	.029	-.302	.108	.098	**.770**
No additives	**.787**	-.106	.096	.107	.264	-.071	.038	.727
Protect the environment	.068	.287	.083	.059	**.727**	.160	-.127	.668
Peace of mind	-.029	-.099	-.162	.188	**.630**	-.073	.328	.582
Eigen value	3.404	2.206	1.922	1.713	1.215	1.114	1.013	
Variance (%)	12.014	11.287	10.037	9.778	8.174	7.607	7.348	
Cumulative Variance %	12.014	23.301	33.338	43.116	51.290	58.879	**66.245**	

Source: Computed Data

Factor five named as ***Environment protection*** consists of Protect the environment (.727) and Peace of mind (.630) influenced 8.174 percent of word of mouth communication by the respondents. Factor six ***Safety in consumption*** consists of Pure and safe (.758) alone influenced 7.607 percent of respondents towards word of mouth engagement and finally the seventh factor named as ***Harmony with Nature*** consists of Grows in harmony with nature (.782) and Rich in nutrients (.682) influenced 7.348 percent of information sharing and receiving behaviour of the respondents. The highest communality value of .770 indicates that ***"No Chemical Residue"*** quality of the organic farm products influenced majority of the respondents towards engaging in word of mouth communication and motivated them to purchase the products.

SUGGESTIONS

i) Inorder to attract younger generation towards organic farm products and to attain utmost benefits, strategies should be framed to wide spread the awareness about quality of the products and other related benefits of consuming organic farm products.

ii) Enhancing the taste of ready to eat products with quality retainment attracts more customers towards purchasing the products.

iii) Word of mouth communications accelerates the acceptance of organic farm products among new customers and reduce promotional expenses and it can be attained through providing good standard of products to the existing consumers, who were the unpaid sales persons.

CONCLUSION

Safeguarding themselves from the harmful chemical additives and leading healthy lifestyle are the key elements behind the consumption of organic farm products. Therefore the consumers depend on several sources of communication to keep them informed about the organic farm products, among which word of mouth has gained momentum. Encouraging word of mouth is just another aspect of nurturing

customers and the truth which cannot be ignored is what people were talking about the product or company. Therefore it is beneficial for every business concern to keep track of what is being communicated about their products. The present study proves that no chemical residue is the key aspect influencing the respondents towards sharing and receiving information about the organic farm products and reveals the significant role of word of mouth influence on the purchase of organic farm products.

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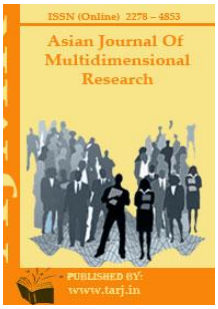

Asian Journal of Multidimensional Research (AJMR)

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UGC APPROVED JOURNAL

FOOD AND NUTRITION SECURITY FOR INFANTS; A CHALLENGE FOR WORKING LACTATING MOTHERS IN KARAIKAL DISTRICT OF PUDUCHERRY

Nidhi (Goyal) Katiyar*; Dr. P A Raajeswari **

*Asst.Professor& Head,
Dept. of Home Science,
Avvaiyar Govt. College for Women, Karaikal,
Puducherry, INDIA
Email id: nidhiruchirkatiyar@rediffmail.com

**Asst. Professor (SG),
Dept. of Food science and Nutrition,
Avinashilingam University for women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

EBF is a critical determinant of health and nutrition status of a child. These goals can only be achieved by adopting a sustainable strategy focused on infancy because during this period, growth & development of the body is at its peak in one's lifetime and growth faltering at this age is a major threat to nutrition security. Certainly SDGs aim of food and nutrition security for infants can only be achieved by reviewing the emerging work environment specifically for women and through a sustainable targeted technology driven interventions so as to address the root cause of food and nutrition insecurity from the very beginning of life and hence provide for a health nutritionally secured future generations. This situation is even more grimmer in unorganized sector where there is lot of job insecurity which included occupations like house maids, vegetable vendors, flower vendors, street fish sellers, sales women working in shops or field sales women, cooks in hotels/restaurants, construction workers and others.Hence it becomes imperative to focus on early years of life and the key areas to focus during this period are Exclusive breast feeding (EBF) for 6 months and weaning especially timely initiation and type of weaning foods.

KEYWORDS: *Unorganized, Interventions, Initiation, Nutritionally*

INTRODUCTION

Background:

The Sustainable Development Goals (SDG); 2.2 aims to end all forms of malnutrition by 2030, including achieving by 2025 the internationally agreed targets on stunting and wasting in children under 5 years of age with one of the proposed indicators as percentage of infants under six months exclusively breast fed. Further SDG 2.1also aims to end hunger and ensure access by all people, in particular the poor and people in vulnerable situations including infants, to safe, nutritious and sufficient food all year round. Furthermore SDG 3 aims to ensure healthy lives and promote well being at all ages and SDG 3.2 aims to end preventable deaths of newborns and under 5 years of age children with a target to reduce neonatal mortality by 2030 (1).

These goals can only be achieved by adopting a sustainable strategy focused on infancy because during this period, growth & development of the body is at its peak in one's lifetime and growth faltering at this age is a major threat to nutrition security. Moreover the first 1000 days spanning conception to the second birthday of the child, are very crucial as foundation is laid for growth, development and cognitive development for the entire life span (2). It is perhaps the most sensitive period for brain development. It is during this period when growth faltering happens. Malnutrition and faulty feeding habits during this phase of life may expose the child to various morbidities and eventually may result in mortality and hence pose a risk to the very goal of nutrition security right from the very beginning of life. Moreover health of infants is considered as a sensitive indicator of health and socio economic development of a country (3). Hence it becomes imperative to focus on early years of life and the key areas to focus during this period are Exclusive breast feeding (EBF) for 6 months and weaning especially timely initiation and type of weaning foods.

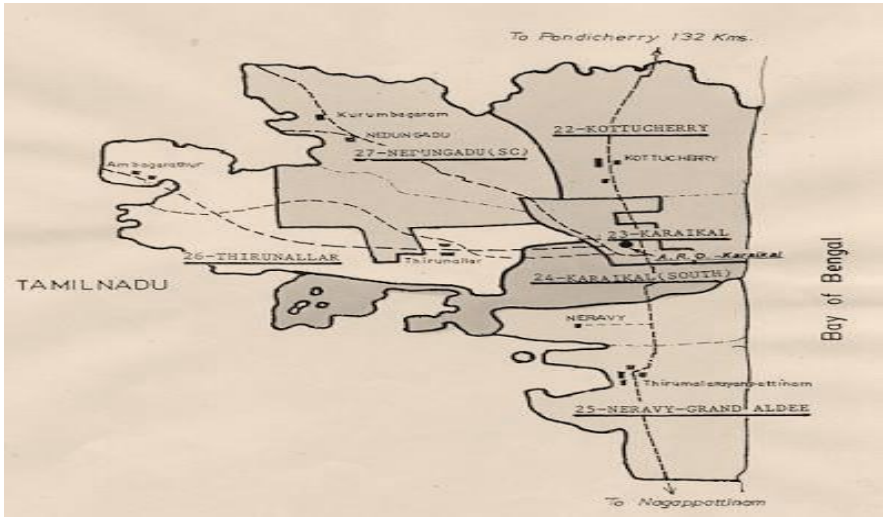
EBF is a critical determinant of health and nutrition status of a child. Breastfeeding provides the best nourishment to the baby and is the first immunization that the baby receives in the outer world. Among its other known health benefits are some protections against common childhood infections (4) Pre lacteal feeding are common cultural and religious practices followed across the communities which deprive infants the nutrients required for 6 months and also expose the newborn to pathogenic contaminants (5). However total benefits of breast milk depends upon the time of initiation, duration of feeding and initiation to weaning (6).For infants more than 6 months of age breast milk alone cannot meet the daily nutritional requirements and hence is to be supplemented with liquid, semi solid food (7). Also timely introduction of complementary feeding can prevent up to 6% of under 5 mortality (8).But EBF for 6 months and the timely initiation of weaning foods becomes a challenge for working women which is an emerging trend in the Indian society especially in small towns. This is even more difficult for women working in the unorganized sector due to paucity of any maternity leave unlike organized sector.

Hence it becomes imperative to study these infant feeding practices among working women in Karaikal. Karaikal region is the second important region in Union Territory of Puducherry. Karaikal region lays 130km south of Puducherry, spread over an area of 160.00 sq.km.

Karaikal had population of 200,222 of which male and female were 97,809 and 102,413 respectively (9).

Population	Numbers
Total	200,222
Male	97809
Female	102413
Child	22263

Fig.1 Map of karaikal district.



The child population is 22,263[11.12%] of which 11.56% are males and 10.7% are females. However the Infant Mortality Rate in karaikal is still 22/1000 live births. Further the Neonatal Mortality rate is 7.28/1000 live births and Infant deaths within 24hrs of birth is 9.7%. The causes of infant deaths vary from Pneumonia to sepsis to acute respiratory infections and diarrhea constitutes about 4% of the total causes. Only 68.1% Children under age 1 year are breastfed within one hour of birth (10). Work participation rate in the district is 34.1%. Male Work Participation rate is recorded as 54.3 while Female Work Participation rate registered as 14.8. Out of 68,301 total workers, 58,342 (85.4%) are main workers and 9,959 (14.6 %) are marginal workers.

Total workers, non workers and category of workers % (census, 2011)

	Total workers	%	Non Workers	%	Cultivators	%	Agricultural labourers	%	Workers HouseHold Industry	%	Other workers	%
Persons	68301	34.1	131921	65.9	2372	3.5	13077	19.2	1327	1.94	51525	75.44
Male	53139	54.3	44670	45.7	1984	3.7	9019	17	528	0.99	41608	78.3
Female	15162	14.8	87251	85.2	388	3.0	4058	26.7	799	5.27	9917	65.4

The non-working female population is estimated to be 85.2%. Women constitute 26.7% of the agricultural labour workforce and 65.4% are involved in other kinds of occupations. These occupations are labour intensive as well as very demanding with respect to time involved. Hence women not only work during their last trimester of pregnancy but also return to work post-delivery within a short time. This situation is even more grimmer in unorganized sector where there is lot of job insecurity which included occupations like house maids, vegetable vendors, flower vendors, street fish sellers, sales women working in shops or field sales women, cooks in hotels/restaurants, construction workers and others. These occupations apart from being temporary sometimes are on daily basis payment and if the woman takes a long break, she is at a risk of losing her job which is perhaps the only source of income. Hence these women start their work soon post-delivery leaving the newborn either at home with grandparents or with any elder sibling or relative thereby depriving the newborn, its most important food i.e. breastfeeding and also initiate weaning at an early age. These faulty infant feeding practices poses a major threat to nutrition security right from the very early years of life as appropriate infant and young child feeding practices are crucial in reducing early childhood morbidity, mortality as well as improving early childhood growth and development (11), thereby ensuring strong foundation from the beginning and nutrition.

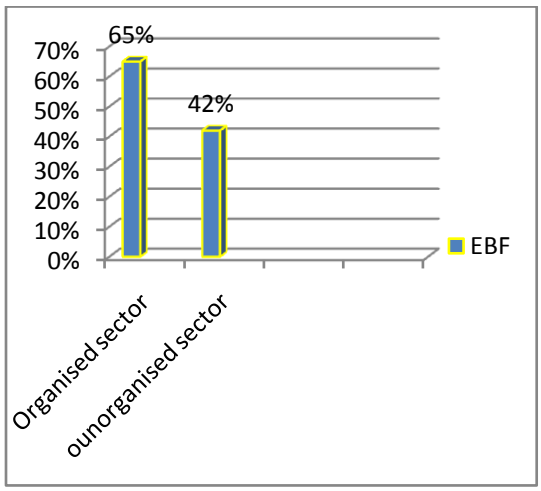
Rationale and objective of the study: Hence the present study was undertaken to assess the infant feeding practices among the working women in Karaikal district of Puducherry with the prime objective of assessing Infant feeding practices (0-9months) focusing on Exclusive breast feeding (EBF), Complementary feeding practices among working women in Karaikal.

METHODOLOGY: A longitudinal study of infant feeding practices among 100 Lactating Working mothers (0-9months); both organized and unorganized sectors attending pediatric ward of Government Hospital/Private hospital & pediatric clinic was undertaken on a pilot basis through a semi structured questionnaire. The data was statistically analyzed and following results were obtained.

RESULTS & DISCUSSIONS:

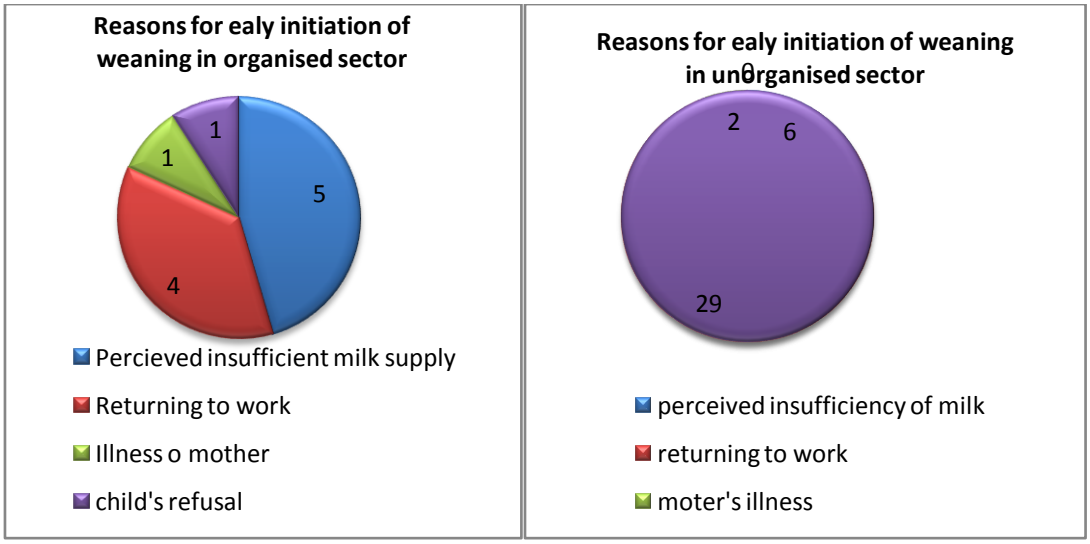
Out of the total 100 working lactating mother (0-9months), 34 belonged to the organized sector which primarily included women working in government jobs, public sector units (ONGC), banks, paramedical jobs etcwhereas 66 belonged to the unorganized sector which included house maids, vegetable vendors, flower vendors, street fish sellers, sales women working in shops or field sales women, cooks in hotels/restaurants, construction workers, coolies and others.

In the organized sector working women, incidence of EBF for 6 months was much higher 65% (22) as compared to the unorganized sector 42% (28). In 3% (1) and 2% (1) cases mother's milk was unavailable right from the time of birth respectively for organized working women and unorganized working women respectively and hence these women had to start with bottle feed from the very beginning and also started with weaning after 3 months of age.

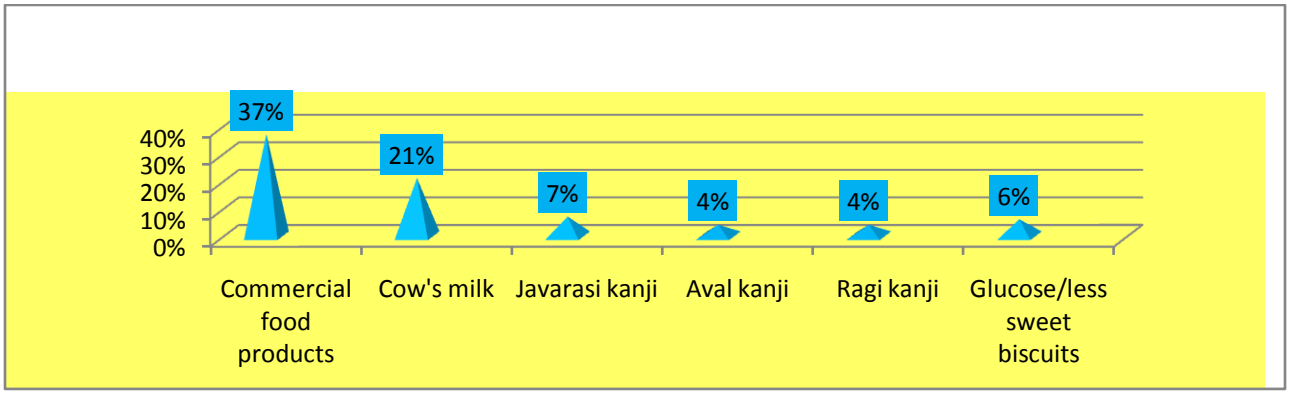


Incidences of EBF among working women. Further 48 mothers who had started with weaning after the 3 month, 11(32%) were from the organized sector and 37 (56%) were from the unorganized sector.

The reasons cited by organized sector working women for early weaning were mainly perceived insufficient supply 5, returning to work was second with 4 women citing it and 1 each had given mothers illness and child's refusal to drink as the reason for early weaning whereas in the unorganized sector primaryreason given was returning to work (29).



Further data regarding type of weaning revealed 37% of the ladies preferred commercial baby foods for supplementing followed by cow's milk (21%), javarasi kanji [7%], aval/ragi kanji 4% each, Glucose/Mary biscuit (6%), carrot juice (2%) and others (2%).



From the above data it is evident that in the changing scenario regarding working population, with increasing women participation, EBF for < 6months and early initiation of weaning are quite common feeding practices among working women and in fact pose a challenge to them to provide nutritionally secured and safe infancy period. These faulty feeding practices expose the infants to various health risks such as growth faltering diarrhea, respiratory tract infections etc [12]. Hence there is a need for sustainable awareness interventions regarding correct infant feeding practices to reduce the nutrition related morbidity patterns for nutritionally secured generations.

Early initiation of breastfeeding, exclusive breastfeeding for six months and timely introduction of age-appropriate complementary feeding are the key interventions to achieve the Millennium

Development Goal 1 and 4, which address child malnutrition and mortality components respectively. Certainly SDGs aim of food and nutrition security for infants can only be achieved by reviewing the emerging work environment specifically for women and through a sustainable targeted technology driven interventions so as to address the root cause of food and nutrition insecurity from the very beginning of life and hence provide for a health nutritionally secured future generations.

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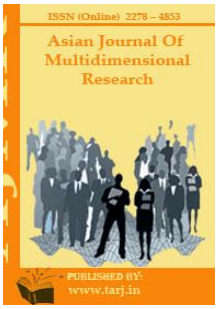

Asian Journal of Multidimensional Research (AJMR)

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BRINE SHRIMP LETHALITY BIOASSAY OF ALTERNANTHRA SESSILIS

K.S.Sasireka*; P.Lalitha; S. Santhiya*****

*Research Scholar,
Department of Chemistry,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: sasireka594@gmail.com

**Associate Professor,
Department of Chemistry,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

***Research Scholar,
Department of Chemistry,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Many medicinal and aromatic plants having industrial potential grow wild in this region and are used in pharmaceutical industry. The current study was carried out on the crude aqueous extract of Alternanthra sessilis for evaluating the cytotoxic effects. Cytotoxic activity of commonly used greens was investigated by brine shrimp (Artemia salina) lethality bioassay; potassium dichromate solution has been used as positive control. This lethality assay is considered as a preliminary tool for toxicity screening of plant extracts and is based on killing ability on a simple zoological organism. Cytotoxicity of the plant is due to some phytochemical constituents such as flavonoids, saponins, carbohydrates, terpenoids, phenolic, proteins and glycosides present in A.sessilis extract. The mortality rate of A.salina increased significantly with increasing concentrations and duration of exposure of extracts. After 6 hours the surviving brine shrimp nauplii were counted. LC_{50} was calculated to be<1000mg/mL and hence are non toxic. One-way ANOVA revealed lowest significance between the percentage mortality and concentration of the extracts. These results suggest that A. Sessilis aqueous extracts are not toxic at the concentrations studied and this method

can be used as a screening method for analyzing the cytotoxicity of various plant extracts or molecules.

KEY WORDS: *Brine Shrimp, Cytotoxicity, Alternanthra Sessilis, Phytochemicals*

1. INTRODUCTION

Numerous medicinal plants with industrial potential grow wild in our country. The plant kingdom consists of many medicinally valued compounds and are hence screened for their medicinal activity **(Bulul et al.,2011)**. The plant based chemical compounds are classified into primary metabolites are involved in growth and development and secondary metabolites which are involved in defense mechanism against harmful pests and infectious agents (**Amabye et al., 2015**).

The word "cytotoxicity" means, the quality of being lethal to living cells by altering morphology, adversely affecting the rate of cell growth or causing cells to die (**Mc Gaw et al., 2014**).The choice of assay to use to assess cytotoxicity depends on the nature of the test substance. These assays are classified as Metabolism reductase viability assays, Bioluminescent ATP assays, Enzyme Release-Based cytotoxicity assays and Brine Shrimp Lethality Assays (BSLA). Out of four BSLA is considered as useful tool for preliminary assessment of cytotoxicity of medicinal plants (**Meyer et al., 1982**). This method is very simple, inexpensive, highly reproductive, adaptable to laboratory conditions, flexible for nutrients sources and available at low cost. The shrimp eggs remain viable for years in the dry state, temperature, salinity tolerances and convenient as an in house general bioassay tool (**Solis et al., 1993**)**.** The present work relates to the brine shrimp cytotoxicity of aqueous extract of the *Alternanthera sessilis.*

Alternanthera sessilis (Amaranthaceae) is well known edible medicinal plant found in all seasons throughout India. The plant is used in the treatment of various illness and it is also used as an antioxidant (Borah et al., 2011), anti inflammatory (**Sathiti et al., 2011)** antibacterial, antifungal, anti malarial, anti-viral, anti proliferative and anti cancer activity (**Firdhouse et al., 2013, 2015**). The aforesaid activities are attributed to the presence of various phytochemical constituents such as flavonoids, saponins, carbohydrates, terpenoids, phenolic, proteins and glycosides present in *A.sessilis* extract (**Sathiti et al., 2011**).The paper focuses on potent cytotoxic activity of the aqueous extract in terms of lethality on brine shrimp.

2. MATERIALS AND METHODS

2.1. Collection and identification of plant materials

Alternanthra sessilis leaves were obtained from a vegetable retail shop in Coimbatore. The collected plant samples were subjected to cleaning, cut into small pieces and shade dried for 7 days. The dried leaves were pulverized and stored in an airtight container.

2.2.Preparation of plant extract

The pulverized leaf powder **(**20g) was boiled with doubly distilled water (100 ml) for 10 min, cooled, and filtered. Green extracts was centrifuged using ethanol, it reacts and automatically decolorizes the extract. Finally solid mass obtained and the crude aqueous extract was dried by freeze drier and preserved in refrigerator.

2.3. Brine shrimp lethality assay

Brine shrimp eggs were collected from collected from aquarium shop and hatched in artificial sea water (3.8% NaCl solution) for 48h at room temperature (26-30˚C) and kept in the illuminated part of the tank (**Meyer et al., 1982**).Constant oxygen supply was maintained throughout the hatching time. Thirty brine shrimps were transferred with addition of test solution (positive control-$K_2Cr_2O_7$) and different concentrations (mg/mL) of extracts. The tests were performed in triplicate. At various time intervals the beakers were observed with a magnifying glass and the mortality rate, survival rate and Lethal Concentration (LC_{50}) were calculated.

2.4. Statistical analysis

Microsoft office Excel (2007) was used as statistical tool for calculating the percentage smortality for both extracts and control groups. The LC_{50} values were obtained from the best-fit line by linear regression analysis. Furthermore, One-way ANOVA was also used in determining the significant difference between lethality levels of the different concentrations. A probability level $p< 0.05$ was considered to indicate statistical significances.

3. RESULTS AND DISCUSSION

3.1. *In-vitro* cytotoxicity assay

In this research work the brine shrimp nauplii were incubated with the aqueous extract of *A.Sessilis* (AAS). Potassium dichromate was used as reference standard. Cytotoxicity on *A. Salina,* depicted in table 1and Figure 1 indicate the percentage mortality of dead nauplii. The percentage shrimp lethality was found to be directly proportional to the concentration of the extract (AAS) ranging from the lowest concentration 1.6mg/mL and 3.1mg/mL.

Ali et al., (2014) and Saima et al.(2017) have suggested significant activity of AAS extract (Table 1) after 6 hrs exposure.

In brine shrimp lethality test (BSLT), the plant extract is considered as bioactive when LC_{50} is <1000µg/ml. (**Meyer et al., 1982)** The LC_{50} value (Table 1 and figure 2) for AAS were found to be -0.085mg/mL,0.564mg/mL, 0.213mg/mL, 0.049mg/mL and -0.521 mg/mL for different time intervals (2h-6h) respectively for the crude extract revealing its bioactive nature.

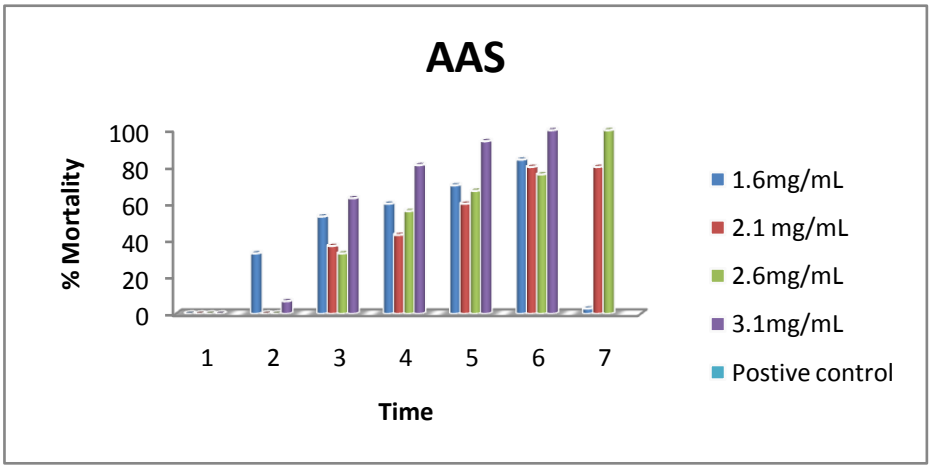

Figure 1 Percentage mortality of brine shrimp of at various time intervals with various concentrations of AAS extract

Phytochemical screening revealed that the presence of flavonoids and phenolics, which indicates AAS to have antioxidative action in biological systems acting as scavengers of free radicals and with very effective anti cancer activities (**Zeashan et al., 2011, Bulbul et al, 2011**). The presence of saponins, carbohydrates, terpenoids, proteins and glycosides in ASS extract justified their potency as antitumor and anti cancer properties based on the LC_{50} values (**Musa et al., 2012**).

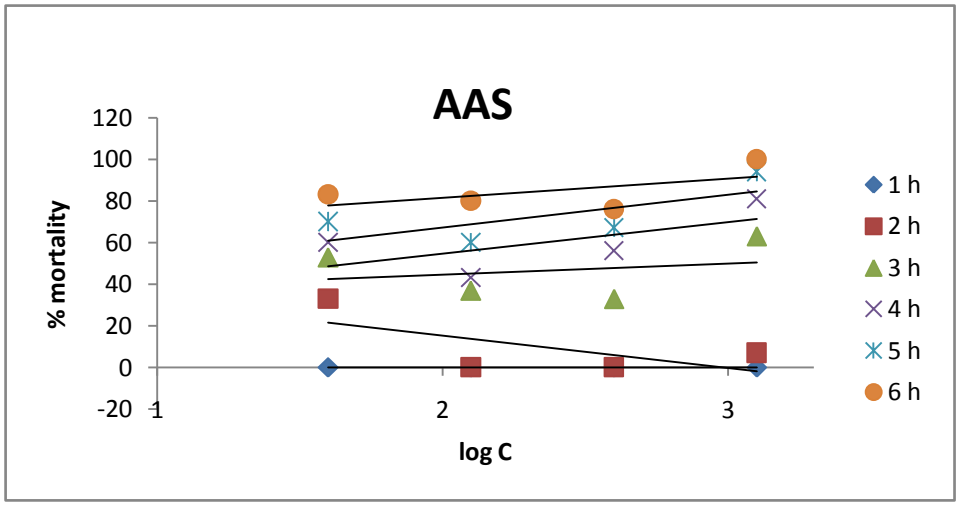

Figure 4 Determination of LC_{50} values for AAS from linear correlation between logarithms of concentration verse percentage brine shrimp mortality

TABLE 1 MORTALITY AND LC_{50} VALUES OF AAS BRINE SHRIMP CYTOTOXICITY ASSAY

Conc. mg/mL	Log C	Time	% mortality	Regression analysis	R^2	LC_{50} (mg/mL)	Status Cytotoxicity Saima et al., 2017
1.6	0.204	1	-	-	-	-	No
2.1	0.322		-				
2.6	0.414		-				
3.1	0.491		-				
1.6	0.204	2	33	-90.34x+42.32	0.506	-0.085	Low
2.1	0.322		-				
2.6	0.414		-				
3.1	0.491		7				
1.6	0.204	3	53	17.00x+40.41	0.022	0.564	Moderate
2.1	0.322		37				
2.6	0.414		33				
3.1	0.491		63				
1.6	0.204	4	60	69.39x+35.	0.295	0.213	good
2.1	0.322		43				
2.6	0.414		56				

3.1	0.491		81	17			
1.6	0.204	5	70	73.88x+46.31	0.382	0.049	good
2.1	0.322		60				
2.6	0.414		67				
3.1	0.491		94				
1.6	0.204	6	83	39.81x+70.75	0.218	-0.521	significant
2.1	0.322		80				
2.6	0.414		76				
3.1	0.491		100				

3.2. Statistical analysis

The results of one-way ANOVA reveal (Table 2) a low significant difference ($p<0.05$) between the extracts and percentage of extract. These results suggest the plant extract with high amount of bioactive substances and at high concentrations to show more cytotoxicity effects.

TABLE 2 ONE –WAY ANOVA FOR ANALYSIS OF CONC VS. % MORTALITY OF AAS

Sample Name	Source of variance	Sum of squares	Degree of freedom	Mean Squares	F test	Level of significance
AAS	Between the groups	23298.833	5	4659.76	27.40	P<0.000000008
	With in groups	3060.5	18	170.02		
	Total	26359.33	23			

CONCLUSION

Brine shrimp lethality assay serves as an simple and inexpensive screening test for assessing the cytotoxicity of extracts. The results obtained in this study reveal AAS to possess cytotoxic principles and have significant cytotoxic activities at higher concentrations. Hence it can be concluded that plant has contains the antitumor and anti cancer phytochemicals which are responsible for cell line toxicity. However at low concentrations these are non-toxic. The confirmatory phytochemicals and toxicity data obtained by conducting brine shrimp lethality assay gives an insight into the cytotoxic nature of the extracts at different concentrations of the extracts which are attributed to the different secondary metabolites in it. At low concentrations are extract is non-toxic.

Further fractionation of the extracts in order to isolate and identify the bioactive compounds are in progress in our laboratory.

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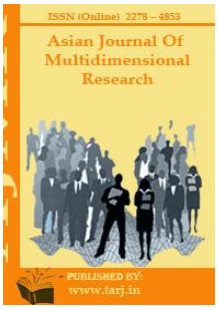

Asian Journal of Multidimensional Research (AJMR)

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STUDY ON THE USE OF ETHNOMEDICINE IN MENSTRUAL DISORDERS AMONG YOUNG ADULTS (18-22 YEARS): A PROMOTIONAL ASPECT OF SUSTAINABLE FOOD SYSTEMS

Shincy Tomy John*; Thilakavathy S**

*II M.Sc,
Food Science and Nutrition,
Avinashilingam Institute for Home science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: shincy96@gmail.com

**Assistant Professor,
Department Of Food Science and Nutrition,
Avinashilingam Institute for Home science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

In India, it is reported that traditional healers use 2500 plant species and 100 species of plants that serve as regular sources of medicine. The demographic data included details like name, age, place, educational qualification, occupation and marital status, and for growth measurements height, weight and BMI were recorded. Through the knowledge obtained about Ethno medicine from elders, even the younger generations have found it more comfortable to adapt to Ethno medicinal treatments for Menstrual disorders as it is easily available, affordable and safe to use without any side effects. The preparation and dispensing of herbal medicines is one of the most common forms of Indigenous Medicine practiced in different parts of the world. Thus it could be concluded that there was prevalence of menstrual disorders among young adults. Every Traditional System of Medicine has a methodology of its own and a body of knowledge preserved through many centuries and is typically passed on orally from generation to generation.

KEYWORDS: *Dispensing, Prevalence, Indigenous, Educational Qualification,*

INTRODUCTION

Ethno medicine is a study or comparison of the traditional medicine practiced by various ethnic groups, especially by indigenous peoples. The word ethno medicine is sometimes used as a synonym for traditional medicine.[1]

Some ethno-medicinal studies have been conducted to study the role of phototherapy in women's health and reproductive health problems. Some common gynaecological problem among women which are treated by plant medicines are Amenorrhea or stoppage of menstrual flow, Dysmenorrheal or period pains, Oligomenorrhea or irregular menstrual flow, Leucorrhoea or excessive menstrual flow, fertility problem, problem of lactation etc.

Every Traditional System of Medicine has a methodology of its own and a body of knowledge preserved through many centuries and is typically passed on orally from generation to generation.

The preparation and dispensing of herbal medicines is one of the most common forms of Indigenous Medicine practiced in different parts of the world.[2]Plants and their extracts have been used therapeutically and even today plant-based medicines continue to play an essential role in world health care.

In India, it is reported that traditional healers use 2500 plant species and 100 species of plants that serve as regular sources of medicine.[3]As the knowledge has been passed verbally from one family to the descendants it doesn't have any proper documentation or scientific explanation.[4] With this in view, the present study was undertaken to study the use of Ethno medicine in menstrual disorders among young adults in three districts of Tamil Nadu with the following

OBJECTIVES:

- To find the prevalence of menstrual disorders among young adults of 18-22 years.
- To study the use of Ethno medicines in menstrual disorders.
- To compare the use of Ethno medicines among three different places in Tamil Nadu – Metropolitan city, Urban and Semi Urban.

METHODOLOGY

The area selected for the study were, metropolitan city, urban and semi urban area namely Chennai, Coimbatore and Nilgiris. These places were selected for the study in order to compare the use of ethno medicine among young women for menstrual disorders. A total of 200 unmarried subjects, belonging to the age group 18-22 years were selected for the study.

A questionnaire was formulated to elicit the required information. The questionnaire comprised of 31 questions, with 28 multiple choice questions, two fill ups and one open ended question.

The demographic data included details like name, age, place, educational qualification, occupation and marital status, and for growth measurements height, weight and BMI were recorded. The questionnaire also dealt with the sleep pattern, leisure time activities and physical activity along with dietary recall through food frequency method.

Details on Menstrual Health comprising of the regularity of menstruation, menstrual cycle, length of the cycle, menstrual disorders and symptoms experienced, treatment /medications used, its preparation, administration and consumption methods and the outcome of the medications were collected. Also the preference over the type of treatment and the ethno medicines used were noted.

The collected data was consolidated, tabulated and analysed to infer on the use of Ethno medicine for menstrual disorders among three districts of Tamil Nadu.

RESULTS AND DISCUSSION

Out of 200 selected subjects 99 subjects suffered from Dysmenorrhoea at different degrees with Mild, Moderate and Severe pain. Followed by 47 subjects who had Menorrhagia, 31 subjects who had premenstrual syndrome and 13 subjects who had Oligomenorrhoea, five subjects who had Amenorrhoea and five subjects who had Hypo menorrhoea. Thus it could be concluded that there was prevalence of menstrual disorders among young adults.

Among the 200 subjects, 130 subjects inclusive of all three districts preferred home remedies as treatment for their menstrual problems, while 30 subjects opted for allopathic treatment, 27 did not prefer any treatment and 13 preferred naturopathy The subjects were concerned about treating menstrual problems and hence were comfortable with home remedies which were easy to afford, easily available, comfortable to use and most of all it gave relief to the pain.

TABLE – I DRUGS/HERBS/FUNCTIONAL FOODS USED AS REMEDIAL MEASURES TO TREAT MENSTRUAL PROBLEMS

MENSTRUAL SYMPTOM/DISORDER	DRUGS	HERBS / INGREDIENT
Dysmenorrhoea (painful menstruation)	Meftal spas, crocin, paracetamol, baralgin, camylofin	Ginger, fenugreek seeds, buttermilk, curd, turmeric with milk, alovera, cumin seeds in water, pomegranate, neem leaves
Menorrhagia (Excess/Heavy bleeding)	T.styplon,	Aloevera, chandanasava, coriander seeds, cinnamon, ginger, shankaravalli, fig, plantain flower
Irregular bleeding	-	Papaya, aloevera, pomegranate juice, tomato with sugar, sugarcane juice, pineapple juice, cumin seeds
Amenorrhoea (absence of bleeding)	-	Sesame seeds, urad dal, tomato juice,papaya
Hypomenorrhoea (scanty bleeding)	-	Sesame, ginger, papaya, fennel,
Premenstrual syndrome (symptoms occurring before menstruation)	-	Fenugreek seeds, sweets, pomegranate juice,pineapple

Majority of the subjects used ethno medicines or foods with functional properties to treat menstrual disorders and symptoms.

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TABLE – II COMPARISON BETWEEN THE THREE DISTRICTS ON THE USE OF REMEDIAL MEASURES TO TREAT MENSTRUAL DISORDERS

DYSMENORRHOEA	CHENNAI	COIMBATORE	NILGIRIS	TOTAL
Ginger	12	14	8	**34**
Fenugreek seed	16	25	15	**51**
Buttermilk	2	-	-	**2**
Turmeric	8	-	6	**14**
Aloevera	-	-	7	**7**
Cumin seed	1	3	-	**4**
Lime	4	8	5	**17**
Coriander seed	-	1	1	**2**
Castor oil	-	2	1	**3**
Neem leave	-	2	4	**6**
Baralgin	2	1	-	**3**

MENORRHAGIA	CHENNAI	COIMBATORE	NILGIRIS	TOTAL
Aloevera	-	8	14	**22**
Coriander seed	6	12	-	**18**
Cinnamon	1	4	3	**8**
Ginger	10	23	13	**46**
Plantain flower	-	2	3	**5**

OLIGOMENORRHOEA	CHENNAI	COIMBATORE	NILGIRIS	TOTAL
Papaya	2	2	1	**5**
Cumin seeds	-	3	1	**4**

AMENORRHOEA/ HYPOMENORRHOEA	CHENNAI	COIMBATORE	NILGIRIS	TOTAL
Sesame seed	-	5	3	**8**
Urad dal	-	3	-	**3**
Ginger	2	1	2	**5**
Papaya	-	3	2	**5**
Fennel	1	-	2	**3**
PREMENSTRUAL SYNDROME	**CHENNAI**	**COIMBATORE**	**NILGIRIS**	**TOTAL**
Fenugreek seed	8	10	12	**30**
Pineapple	1	1	-	2

Among the three districts, subjects from Coimbatore and Nilgirs used more of ethno medicinal treatment for their menstrual disorders than Chennai.

TABLE – III METHOD OF PREPARATION AND CONSUMPTION OF ETHNO MEDICINE

FOOD	PART	FORM	PROBLEM	PREPARATION	CONSUMPTION
Lemon	Fruit	Tea Juice	Fatigue Nausea Dysmenorrhoea	Lemon juice is added to tea Lemon juice is diluted with water	B/A food B/A food
Ginger	Root	Tea Powder	Nausea Dysmenorrhoea Menorrhagia Amenorrhoea/ Hypomenorrhoea	It is dried, powdered and consumed with water or it is boiled with water to make tea	Before food, Empty stomach
Cumin	Seed	Seed with water	Nausea Dysmenorrhoea Oligomenorrhoea	It is boiled with water and consumed	B/A food
Aloevera	Leaf	Gel Juice	Acne Dysmenorrhoea Oligomenorrhoea	It is used for external application or consumed in liquid form by extracting the gel and diluting with water	Empty stomach/ Before food
Fenugreek	Seed	Seed	Dysmenorrhoea Premenstrual syndrome	It is consumed with plain water or added to water and boiled	Empty stomach
Coriander	Seed	Seed	Dysmenorrhoea Menorrhagia	It is added to water and boiled	Empty stomach
Plaintain	Flower	Flower	Menorrhagia	It is consumed raw	Empty stomach
Papaya	Fruit	Fruit Juice	Menorrhagia Oligomenorehoea	It is consumed in its ripe form or blended in to the liquid form	After food
Pineapple	Fruit	Fruit Juice	Oligomenorrhoea Pre menstrual syndrome	It is consumed in the ripe form or blended into the liquid form	B/A food
Sesame	Seed	Seed	Amenorrhoea Hypomenorrhoea	It is consumed as sesame balls	B/A food

CONCLUSION

The salient findings of the study revealed that, among the three districts there was prevalence of menstrual disorders and majority of the subjects preferred home remedies and used Ethno medicinal form of treatment thereby reporting partial cure in majority. Through the knowledge obtained about Ethno medicine from elders, even the younger generations have found it more comfortable to adapt to Ethno medicinal treatments for Menstrual disorders as it is easily available, affordable and safe to use without any side effects.

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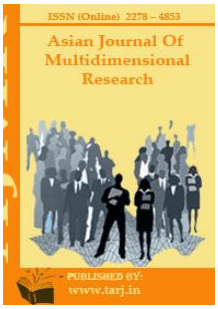

Asian Journal of Multidimensional Research (AJMR)

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FORMULATION AND SHELF LIFE ANALYSIS OF NON-LACTOGENIC MILK, AN ALTERNATIVE TO DAIRY BASED DRINKS

Swarnalakshmi.C.S*; Lovelin Jerald.A**

*Department of Food processing and Preservation Technology,
School of Engineering,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: swarnalakshmics@gmail.com

**Department of Food processing and Preservation Technology,
School of Engineering,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

The beverage industry has developed over past few centuries in all the countries. The two major categories of beverages include alcoholic and non-alcoholic. The dairy based drinks come under non-alcoholic beverage. The people suffering from lactose intolerance are unable to consume the dairy based beverages since this condition has no cure. This research aims at developing a beverage that can be consumed by all the people. In this research, the coconut milk is made to be available in ready to drink form. The composition and process condition of Spiced Coconut Milk were optimized using Box Behnken Design of Response Surface Methodology. The Engineering properties and biochemical analysis of the Spiced Coconut Milk and the control sample Coconut Milk were determined. The developed Spiced Coconut Milk were stored under refrigeration and room temperature to determine the shelflife. The control sample is taken as plain coconut milk to compare the results with SCM. The pH and microbial load varies during the period of storage. The coconut milk can be an alternative to dairy based drink. It can provide various nutrients thereby give number of health benefits.

KEYWORDS: *Coconut milk, Response Surface Methodology, Optimization, Engineering properties, Biochemical analysis, Shelf life studies.*

I. INTRODUCTION

Coconut is one of the tropically grown crops in the world. The botanical name of coconut is *Cocos nucifera*. It is called as "tree of heaven" because of its various uses. All the parts of the coconut tree can be utilized in one or more ways. Around 93 countries cultivate coconut in an area of 12 million hectares. India is the third largest producer of coconut in the world with 10.56 million tonnes of coconut per year. The complete grown Coconut tree will be 30m long with pinnate leaves of 4-6m long and pinnae 60-90 cm long. The three layers of Coconut fruit are the exocarp, mesocarp and endocarp. The husk is formed by the exocarp and mesocarp. It has many commercial and traditional uses. The hard shell which has three germination eyes that are clearly visible on its outer surface is the endocarp of the coconut. The white albuminous endosperm or 'coconut meat' is the edible part of it. The inner cavity is filled with a clear sweet refreshing liquid called 'coconut water'. A full sized matured coconut weighs about 1.44 kg. Coconut milk is derived from the coconut meat. The milk can be extracted by grating the coconut flesh and squeezing either mechanically or manually. It is one of the major ingredient in the Indian recipes and taken as a base for the cuisines. The bottled and canned coconut milk is available in the supermarkets. The taste and the health benefits of the coconut milk increases its usage in day to day life. Coconut milk contains vitamin C, vitamin E, vitamin K, vitamin B6, niacin, folate and thiamine. It is also a good source of calcium, iron, magnesium, potassium, phosphorus, zinc, manganese, copper and selenium. Apart from this, coconut milk is a rich in fat content and in this saturated fat level is high which provides instant energy to the body. These saturated fats which are short and medium chain fatty acids and are not stored by the body as fats. The lauric acid is present as a major fat in coconut milk. It exhibits antibacterial, antifungal and antiviral properties. The immune system can be boosted up by this fatty acid and it has the ability to fight diseases. Lauric acid can also be helpful in maintaining the elasticity of the blood vessels and in keeping them clean, which can lower the risk for conditions like, atherosclerosis and heart disease. Coconut milk contains several antioxidant compounds, which can provide protection against the harmful free radicals and their damaging effects on the body cells and tissues. It can improve the health of the digestive system and promote digestion. It helps in relief from stomach ulcers and acid reflux disease as well. 22% of the recommended daily allowance of iron is available in the coconut milk. With such a high level of iron, it can help to treat anaemia caused by iron deficiency. Apart from these, coconut milk may help to relax the nerves and the muscles, control blood sugar level, lower blood pressure and reduce joint inflammation. It is an excellent source of Vitamin E and therefore nourishes the skin when applied externally. Coconut milk improves hair growth and also reduces mouth ulcers. . In traditional medicines, it is used as anticeptic, local anaesthetic and antioxidant. It also plays a health promoting and disease preventing role.

II. LITERATURE REVIEW

Coconut milk is composed of carbohydrates, protein, fat and minerals. In addition to this, coconut milk contains lauric acid which is an excellent antiviral and antibacterial agent. Lauric acid is one of the saturated fat but can be digested by the body easily. Coconut milk (with no addition of water) contains 56.3% moisture, 33.4% fat, 4.1% protein, 1.2% minerals and 5.0% carbohydrates (Gonzalez, 1990). It has been reported that 25% of the world's output of coconut is consumed as coconut milk (Gwee and Seow, 1997) A. M. Marina and S Dawane *et al.*, 2010 carried out an experiment on Utilization of tender coconut (*Cocosnucifera L.*) milk in the preparation of pudding found that coconut milk was richer in fat content than dairy (buffalo) milk. Gunathllake *et al.*, 2005 studied that fat is the major nutrient in coconut and thus serves as the main source of energy.

Pritam G. Bafna, 2012 have done the experiment for the Optimization of Process Parameters for Extraction of Kokum (Garcinia Indica) Fruit Pulp using Response Surface Methodology and obtained the optimized values for pulp recovery and Hydroxycitric acid as 92.15% and 14.50g/100g respectively. Lee *et al.*, stated that RSM has been used extensively for optimizing processes in the tropical fruit juice production. Balasubramanian *et al.*, 2012 have optimized the process conditions for the development of tomato foam by Box-Behnken Design and obtained the values for carboxy methyl cellulose, egg albumin, whipping time as 11.45 %, 0.33 % and 5.21 minutes respectively. Burton *et al.*, 1999 stated that thermal treatments are given to fluid foods to kill pathogenic micro-organisms and degrading enzyme in order to increase shelf life, product quality and product safety. Seow *et al.*, 1997 reported, Pasteurization process has been found to be a short-term preservation process in which the coconut milk is heated to pasteurization temperature of 72-75˚C for 20 min. Anjaya *et al.*, 1996. claimed that increase in temperature of water during extraction of coconut milk does not have positive effect but the repeated extractions increase the quantity of milk by 11.01%. Gwee *et al.*, 1998 reported that coconut milk pasteurized in soft plastic bags has been found to be fresher and more convenient for cooking with a shelf life of not more than 5 days.

III. METHODOLOGY

The product composition and process time is optimized using Response Surface Methodology. The standard procedures are practiced for evaluating the biochemical composition and functional properties of the product.

A. Preparation of coconut milk

The matured coconuts were selected for the extraction of coconut milk. The coconuts are shelled and paring is done to separate coconut meat from the brown testa which impart brown color with a bitter taste. The shelled coconut meat is grated mechanically. Sarah, 2014 prepared 306.3 g grated coconut is mixed with 200 ml of warm water to extract the milk. The pH of fresh coconut milk varies from 5.5 to 6.2. The sieve of 0.18 mm size is employed for the filtration of coconut milk. The residue obtained is discarded. The extracted coconut milk was preheated at 95˚C for 5min to inactivate the microbes initially.

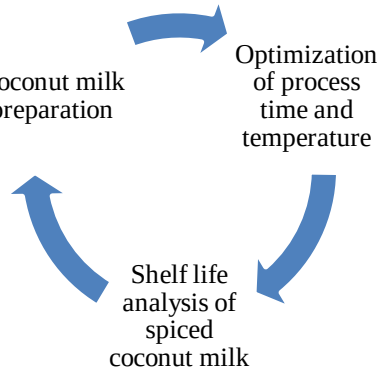

Fig 1: Flow diagram for SCM preparation and processing

B. Optimization

The composition varies for each run of the experimental design with the ingredients jaggery, FA_1, and FA_2 .Based on these independent variables the response changes i.e., the results of sensory evaluation. The word lack of fit refers to the fact that the simple linear regression model may not adequately fit the data. While the goodness of fit for quadratic model implies that the lack of fit of model is not significant. Fisher's value and p- value indicates that the model system was statistically significant. The optimization part in Design Expert software version 6.0.8 searches for a combination of factor levels that simultaneously satisfy the requirements placed (i.e. optimization criteria) on each one of the responses and process factors(i.e. multiple response criteria). Graphical optimization methods were used in this research by selecting desired goals for each factor and response. In a graphical optimization with multiple responses, the software defines region where requirements simultaneously meet the proposed criteria. The shaded area on the overlay plot Fig. 2 & 3 is the region that meets the proposed criteria. The optimum value obtained from the overlay plot are reported in Table 2

Variable name	Value of parameter	Unit
Jaggery concentration	7.01	g
Nutmeg concentration(FA_1)	1.74	g
Cardamom concentration(FA_2)	0.75	g
Temperature	115.63	˚C
Time	4.22	min

Table 1 Optimized values for composition and process conditions of Spiced Coconut Milk

C. Retort processing

Retort processing was done in a forced steam/ air type retort. It is one of the type of "overpressure" retort of 50 pouch capacity producing a pressure of $2kg/cm^2$. The bottled samples were subjected to thermal treatment at various temperature and time as per the values obtained in the RSM. The samples after each process conditions were tested for pH readings. The optimized process condition was selected based on the responses and results obtained in RSM.

IV. RESULTS AND DISCUSSION

The biochemical analysia and shelf life studies were conducted. The optimized values are plotted in the overlay plot. The engineering properties are also discussed in this section.

A. Overlay plot

The verification of the model equation for predicting the optimum response values was tested using the obtained optimal values in the RSM. This is done to check the accuracy of the experimental values with optimum values obtained in overlay plot.

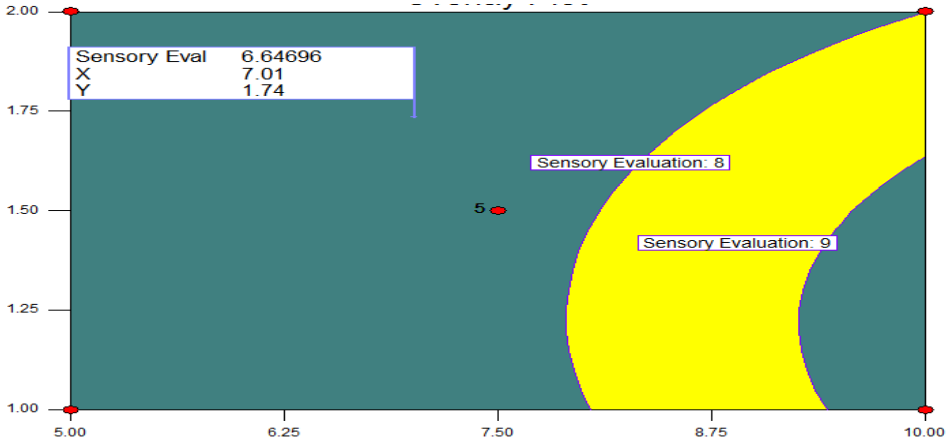

Fig 2: Overlay plot for composition

S. no.	Response label	Optimum value obtained from overlay plot	Experimental value
1.	Sensory evaluation	6.6469	7.01
2.	pH	5.8347	5.92

Table 2: Difference between predicted values and actual values obtained from preparation and processing of SCM

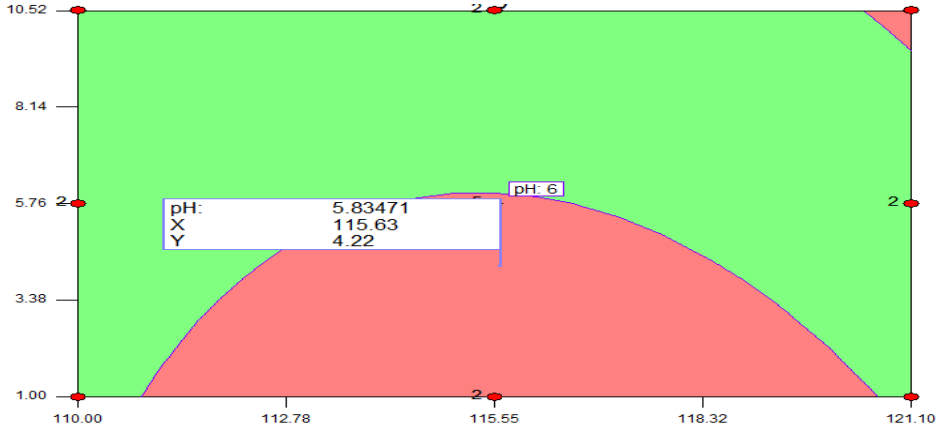

Fig 3 Overlay plot for process

The experiments were conducted in triplicates at optimum conditions i.e. Jaggery of 7.01g, FA_1 of 1.74 g, FA_2 of 0.75g, temperature of 115.63˚C and time of 4.22 min obtained from the overlay plot. The mean of these three values were calculated in order to determine the difference between predicted values and actual values. Table 4.8 illustrates the differences between predicted values obtained from optimization and the experimental values at these conditions were negligible. Good correlations between the predicted and actual values confirmed that the response model was adequate to reflect the expected optimization.

B. Determination of engineering properties

i. Moisture content

The mc is determined by AOAC method. The control sample CM shows a mc of 70.57 % while the mc for SCM were 75.7 %. SCM shows a slight increase in mc value than CM, this can be due to the change composition. The moisture content plays a vital role in the shelflife of the product. It is also one of the most important characteristics in consumer sensory perception of food.

ii. Ash content

The samples subjected to the determination of ash content shows the values of 0.96g for CM and 0.98g for SCM. Ash content is essential to a food's nutrition and longetivity. The selection of packaging can be done based on the results obtained in ash content and mc.

iii. Titrable acidity

The titrable acidity for the samples were analysed and the values obtained were 0.23% for CM and 0.27% for SCM. The keeping quality and the heat stability of the product depends on its acidity. The addition of jaggery may affect the acid value of the SCM.

C. Determination of Biochemical and microbial analysis

i. Carbohydrate value

The carbohydrate value for the samples determined by AOAC method 2012 were 21.19g for SCM and 2.85 g for CM. The control sample is plain coconut milk which shows carbohydrate value of 2.85g per 100g but the value is high in SCM, this can be due to the jaggery content and spices incorporated in it.

ii. Protein

The protein content in the SCM and CM were analysed using AOAC method, 2012. The values found were 2.02 g for CM and 2.48 g for SCM. The protein content for SCM is higher than CM. Proteins are the building blocks of bones, muscles, cartilage, skin and blood. It also helps to stabilize the blood sugar levels.

i. Fat

The fat content was determined using AOAC method, 2012. The coconut is a rich source of fat, usually medium chain saturated fats (MCFA) in the form of lauric acid. The total fat of SCM were found to be 24g per 100g and for CM, it was 21.3 g. The saturated fat, poly unsaturated fat, & mono unsaturated fat for SCM were 0.0014g, 0.0g, 0.0007g per 100g respectively and for CM, it were 0.18g, 0.233g, 0.907g per 100g respectively.

ii. Calories

The calories of the products were calculated using AOAC method, 2012. The values obatined during the analysis were 249.89 Kcal for SCM & 219.608 Kcal for CM.

iii. Calcium

The calcium content for the control sample were found to be 19 mg per 100 g. the SCM shows 21mg per 100g of calcium content. Calcium is essential for bone growth and it is available in all the milk based products.

iv. Vitamin C

The Vitamin C were determined using AOAC method, 2012. The CM shows 1.5 mg of Vitamin C while the SCM gives 209 mg per 100g of the product. The jaggery present in the composition may increase the vitamin C content of the product.

v. Free Fatty Acid as Lauric acid

The FFA as Lauric acid were analysed by AOAC method, 2012. The control sample shows 0.167% and SCM shows 0.177% of lauric acid content.

vi. Colour value

The colour of the products were found using Lovibond tintometer. The L- 77.4, a- -39.67 and b- 4.56 values were obtained for CM. The L, a, b values for SCM were found to be 75.6, -0.42 and 28.06 respectively.

vii. Total Soluble Solids

The Total soluble solids for the products were found using the refractometer readings. The CM had a TSS value of 10˚brix and for SCM, it was 18.5 ˚brix.

iii. pH

The pH were analysed using digital pH meter. The CM had a pH value of 6.2 and 6 for SCM. The products were subjected to storage and shelflife was determined using pH values of the products.

iv. Total Plate Count

The total plate count for the CM were 1 cfu/ml and 2 cfu/100 ml for SCM. The microbial analysis were also done during storage to determine shelflife of the products.

D. Determination of pH and conducting storage studies

The pH at room temperature and refrigerated temperature for 14 days has been determined for the samples SCM_1, SCM_2, CM_1, & CM_2. The SCM_1 & CM_1 were the samples kept at room temperature while SCM_2 & CM_2 were the samples kept at refrigerated temperature. The Fig 4.5 gives the pH values for the samples SCM_1, SCM_2, CM_1, & CM_2 at room and refrigerated temperature. From the graph it can be concluded that the pH at initial stage was 6.2 for SCM_1, SCM_2 & 6 for CM_1, CM_2.

The SCM_1 and CM_1 shows a drastic reduction in pH value and this could be due to the denaturation of proteins present in it. The samples stored under refrigerated condition shows a gradual decrease in pH value when comparing to the samples stored under ambient temperature. During the storage period of first 7 days, the pH of SCM_1 & CM_1 reduced from 6.2 to 4 and 6 to 3.7 respectively. The control sample CM has a faster rate of pH reduction over the SCM. The reason can be the addition of various ingredients in the SCM makes it stable over a period of time.

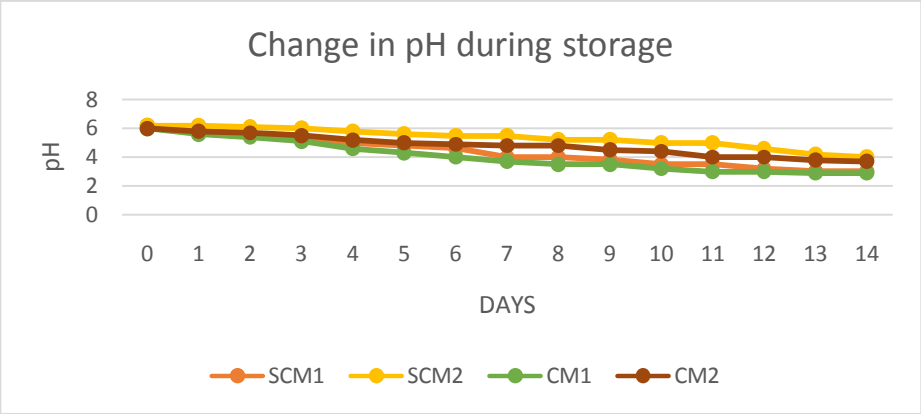

Fig 4: Comparison of TPC in SCM_1, CM_1, SCM_2 & CM_2 during storage at room temperature and refrigerated temperature

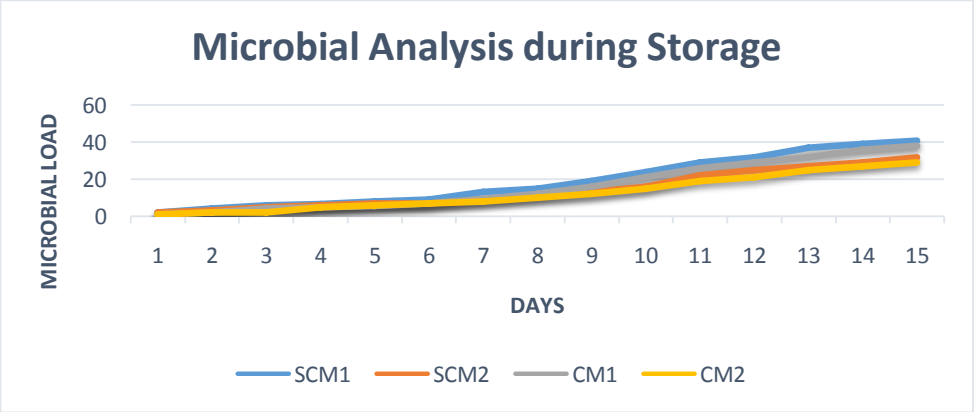

Fig 5: Comparison of TPC in SCM_1, CM_1, SCM_2 & CM_2 during storage at room temperature and refrigerated temperature

The samples stored in refrigerator at 4˚C shows a pH change from 6.2 to 5.5 and 6 to 4.8 for SCM_2 & CM_2 respectively for the first week of storage. The second week of storage shows a reduction in pH value from 4 to 3 and 3.7 to 2.9 for SCM_1 & CM_1. This is an unfavourable condition were the stability of the samples get altered. In the case of the samples stored under refrigerated condition, the pH decreases from 5.5 to 4 and 4.8 to 3.7 for SCM_2 & CM_2 respectively.

The accepted pH value for a coconut based beverage can be 5 and below this level, the stability of the drink get reduced resulting in the unfavourable curdling formation (Balachandran *et al*., 2009). The sample shows curdling formation during the last five days of storage period.

V. CONCLUSION

The spiced coconut milk can be a good alternative to dairy based beverages. The optimized compositions were 7.50g, 1 g and 0.5 g of jaggery, nutmeg, and cardamom respectively. While the process condition optimized were 121.1 ˚C and 1 minute. The developed products that are stored at room temperature and refrigerated temperature give a shelf life period of 7 days and 14 days respectively.

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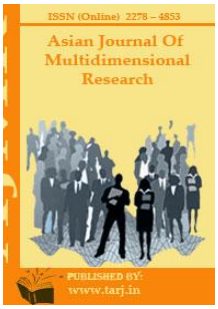

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GLYCAEMIC RESPONSES TO CEREAL- LEGUME BASED INDIAN FOOD PREPARATIONS IN NORMAL SUBJECTS

S.Uma Maheswari Vadivelan*; Prathap Kumar H. Shetty**

*Assistant professor,
Department of Nutrition and Dietetics,
Dr.NGP Arts and Science College (Autonomous),
Coimbatore, Tamil Nadu, INDIA
Email id: mahephd@gmail.com

**Head & Associate professor,
Department of Food Science and Technology,
Pondicherry University, Pondicherry, INDIA

ABSTRACT

Legumes, such as kidney bean (Phaseolus vulgaris L.) and texturised soy protein (Glycine max) have a low glycemic index, and may reduce the glycemic load of meals in which they are included. The aim of the present study was to improve the nutritional and glycaemic index of idli by substitution of texturised soy protein and kidney bean in idli batter. Fasting blood glucose level was taken and post prandial blood glucose level (at 30 min interval till 2 hours) was checked with bread as standard to assess the glycaemic index of control idli and developed idli. Based on the overall results of both textural and sensory parameters, the present data suggest that texturised soy protein and kidney bean could be substituted up to a level of 5% and 40% in idli batter to develop organoleptically acceptable breakfast food.The mean blood glucose levels were increased after the intake of idli at 30 and 60 minutes, after which there was a decrease from 60 minute to 90 minute and 120 minute. The glycaemic index of control idli was 98 and significantly higher ($p \leq 0.05$) than idli incorporated with texturised soy protein powder and Phaseolus vulgaris. The nutritional composition of the optimized idli has revealed that idli is simple breakfast food with beneficial compounds such as proteins, carbohydrates, essential amino acids from the results it is possible to identify food preparations in the traditional Indian diet having attributes of desired glycaemic effect, delayed peak rise, low glucose response curves. However in the present study, value added idli has better hypoglycaemic effect than control idli.

KEYWORDS: *Kidney Bean, Texturised Soy Protein Glycaemic Index, Textural Parameters, Sensorial Parameters,*

1. INTRODUCTION:

Idli a common fermented breakfast food, consumed especially in Southern parts of India and Sri Lanka. Its popularity depends on the textural and sensory attributes. Idli is prepared by steaming the mixture of rice (*Oryza sativa*) and black gram (*Phaseolus mungo*) batter in the ratio of 3:1. Fermentation of rice and black gram dhal is essential for determining the quality of end product idli. Fermentation time is an important step during the preparation, which regulates the sensory characteristics and nutritional quality of idli in terms of flavour as well in the texture. Nutritionally, it is advantageous to consume mixtures of cereals and legumes due to its carbohydrate and protein balance in diet. Though the diversity of the population of India has given rise to a large number of traditional fermented foods with cereals and legumes, being a cereal and legume based fermented product, idli has an improved higher protein efficiency ratio (PER) and increased essential amino acid and vitamin contents.

In recent years, there has been a renewed interest in making available the traditional foods as convenience foods to meet the growing demands of changing societal patterns. The functional foods are designed not only to cover the basic needs in energy, macronutrients and micronutrients but also to bring additional nutritional and physiological benefits to the consumers. Texturized soy protein and kidney bean are easily available, nutritionally rich ingredients which could be incorporated to idli to deliver additional nutritional components lacking or in lower amounts in idli.

The present study intended to incorporate legumes in idli to enhance its organoleptic properties to improve the consumer acceptability and to identify methods for improving the nutrient profile and possible therapeutic effectiveness of idli. With this background, the present study has been undertaken with the following objectives.

OVERALL OBJECTIVE

To improve the functional quality of idli by incorporating legumes.

2. MATERIALS AND METHODS

2.1. Materials

In the present study, the most commonly used variety of rice namely IR 20 and a protein rich black gram variety Aduthurai 3 (ADT3) were used.This method of idli preparation was optimised by using CCRD(Central composite rotatable design),which was used as control idli for the present study (Durga& Shetty, 2012)

2.2 Formulation of idli incorporated with texturized soy protein (TSPI)

Idli batter was prepared using rice, black gram and texturized soy protein. Texturized soy protein which was ground to a fine paste was added to fresh ground idli batter at 5%, 10%, 15% and 20 % level and left for fermentation for 12 hours at 30ºC. The batter was poured in idli mould, and steam cooked in idli steamer for 15min.

2.3 Replacement of black gram dhal with *Phaselous vulgaris* in idli batter (PRI)

The PRI prepared at ratio of 30%, 40% and 50% was carried out keeping the ratio of rice constant and black gram dhal as replaced according to the ratio of *Phaseolus vulgaris* incorporated. The prepared batter is kept for fermentation for 8 hours at 30ºC. The batter was poured in idli mould, and steam cooked in idli steamer for 15min

2.4 Texture profile analysis (TPA)

The texture of each idli was analysed using SMS/75mm compression probein Texture Analyser (Stable Micro Systems, Surrey,UK) .The extra top and bottom layers were sliced off to make the idli fit to the mould. Based on the force deformation curves, several parameters like adhesiveness, springiness, cohesiveness, chewiness and resilience can be calculated by using standard procedures given by (Bourne, 1982) and defined by(Lyon*et al.*, 1999).

2.5 Sensory analysis of idli

The principle of Quantitative Descriptive Analysis (QDA)is based on the ability to train panellists to measure specific attributes of a product in a reproducible manner to yield a comprehensive quantitative product description amendable to statistical analysis (Ghosh and Chattopadhyay, 2012).

2.6 Nutritional Analysis:

Protein is calculated by converting the nitrogen content (% NX 6.25) as determined by Kjeldhal's method and fat content of the freeze dried idli batter samples were extracted by using petroleum ether at 40-60°C and determined using soxhlet apparatus AOAC (1990).

Total dietary fibre was determined in dried, low-fat or fat-free sample which was homogenised and dried overnight in 70°C vacuum oven. The loss of weight due to fat was recorded (Asp *et al*., 1989). The energy value of the freeze dried idli samples were estimated by using bomb calorimeter.

2.7 Glycaemic Index

The samples were screened by using random blood glucose levels. Young healthy adults in the age of 20-30 yrs. were selected based on the blood glucose level. The subjects were non-diabetic, non-smoker, and non-drinker and should not have any medications. Fasting blood glucose level was taken and bread or developed idli was given to check the post prandial blood glucose level (at 30 min interval till 2 hours). Human ethical committee clearance has obtained from Pondicherry University to conduct this study in human volunteers (Approval No. **PU/IEC/2012-13/53**)

2.8 Statistical analysis

The results are expressed as means ±standard deviations of the mean of triplicate observations made of three parallel extractions and determinations. The data were subjected to Duncan's multiple range tests, Dunnets multiple ranges test, using SPSS.Ver.18.0 for texture profile analysis and sensory attributes.

3. RESULTS AND DISCUSSION:

3.1 Table-1&2 shows the texture profile of control and texturized soy protein incorporated idli.

TABLE-1: TEXTURE PROFILE ANALYSIS OF IDLI INCORPORATED WITH TEXTURIZED SOY PROTEIN

Treatments	Hardness (N)	Adhesiveness (N/sec)	Springiness (-)	Cohesiveness (-)	Chewiness (-)
Control idli	45.20^{a}±0.05	0.84^{a}±0.05	0.87^{a}±0.01	0.53^{a}±0.01	21.06^{a}±0.9
TSPI 5%	38.69^{b}±0.36	0.02^{b}±0.02	0.80^{b}±0.01	0.82^{b}±0.01	25.49^{b}±0.25
TSPI 10%	34.68^{c}±1.02	0.07^{c}±0.01	0.91^{c}±0.01	0.83^{c}±0.01	26.19^{c}±0.75
TSPI 15%	30.07^{d}±0.13	0.08^{d}±0.01	0.92^{d}±0.01	0.93^{d}±0.01	25.92^{d}±0.68
TSPI 20%	38.98^{e}±0.07	0.68^{e}±0.06	0.81^{e}±0.01	0.91^{e}±0.01	28.74^{e}±0.35

All values are means of triplicate determinations± standard deviation (SD), Mean values with different superscripts between columns were significantly different where ($p \leq 0.05$, $p \leq 0.01$) by using Dunnets multiple range tests. Parameters with (-) like below indicates unit less. TSPI-idli incorporated with texturized soy protein.

TABLE--2: SENSORY ATTRIBUTES OF IDLI INCORPORATED WITH TEXTURIZED SOY PROTEIN

Treatments	Colour	Fluffiness	Compactness	Sponginess	Firmness	Stickiness	Fermented aroma	Overall quality
Control idli	11.91^{a}± 0.58	13.38^{a}± 0.2	6.01^{a}±0.63	13.67^{a}± 0.14	6.20^{a}±0.16	4.41^{a}±0.29	10.95^{a}± 0.75	13.65^{a}± 0.19
TSPI 5%	10.11^{b}± 0.37	11.48^{b}± 0.52	7.48^{b}±0.26	11.30^{b}± 0.48	9.40^{b}±0.23	5.03^{b}±0.81	10.78^{b}± 0.48	10.46^{b}± 0.33
TSPI 10%	8.80^{c}±0.49	9.56^{c}±0.45	8.48^{c}±0.21	10.13^{c}± 0.70	10.36^{c}± 0.47	6.25^{c}±0.55	9.83^{c}±0.55	9.66^{c}±0.48
TSPI 15%	7.75^{d}±0.60	8.08^{d}±0.54	9.18^{d}±0.27	8.56^{d}±0.39	8.85^{d}±0.76	4.65^{d}±0.57	8.48^{d}±0.36	8.15^{d}±0.56
TSPI 20%	6.93^{e}±0.64	6.20^{e}±0.67	10.26^{e}±0.32	6.85^{e}±0.46	8.05^{e}±0.54	4.18^{e}±0.52	7.36^{e}±0.27	7.51^{e}±0.31

The results with respect to textural parameters like hardness, adhesiveness, springiness, cohesiveness, chewiness for the idli incorporated with texturized soy protein of varying proportions showed that there existed a corresponding correlation between the mentioned parameters. Therefore incorporation of 5% of texturised soy protein in idli proved to be the best as far as the texture profile is concerned.

In the case of texturized soy protein incorporated idli the mean sensory scores of colour, fluffiness, sponginess, fermented aroma and overall quality 5% was found to be the best. However significant difference ($p \leq 0.05$) existed between the variations and the control idli.

The results of texture profile analysis were supported by Rekha *et al.*, (2011) that the values of the control idli offered more resistance to compression than that of soy okara fortified idli The protein quality and foaming capacity of TSP had a positive influence in the textural parameters of idli, thereby increases sponginess to the product after substitution. Therefore, incorporation of 5% of texturized soy protein in idli proved to be the best as per the texture profile.

3.3 Texture profile analysis and sensory attributes of black gram dhal replaced with *Phaseolus vulgaris* (without husk) in idli

The texture profile analysis of idli prepared with black gram dhal replaced with *Phaseolus vulgaris* was compared with control idli were shown in the given table-3&4 by using Dunnets multiple comparison test.

TABLE-3 TEXTURE PROFILE ANALYSIS OF BLACK GRAM DHAL REPLACED WITH PHASEOLUS VULGARIS (WITHOUT HUSK) IN IDLI

Treatments	Hardness(N)	Adhesiveness (N/sec)	Springiness (-)	Chewiness (-)
Control idli	45.20^{a}±0.05	0.84^{a}±0.05	0.87^{a}±0.01	21.06^{a}±0.9
PRI 30%	35.48^{b}±0.16	0.70^{b}±0.04	0.93^{b}±0.01	20.86^{b}±0.26
PRI 40%	24.60^{c}±0.08	0.58^{c}±0.11	0.91^{c}±0.01	16.24^{c}±0.27
PRI 50%	25.94^{d}±0.22	0.20^{d}±0.12	0.81^{d}±0.01	17.37^{d}±0.11

TABLE-4 SENSORY ATTRIBUTES OF BLACK GRAM DHAL REPLACED WITH PHASEOLUS VULGARIS (WITHOUT HUSK) IN IDLI

Treatments	Colour	Fluffiness	Compactness	Sponginess	Firmness	Stickiness	Fermented aroma	Overall quality
Control idli	11.91^{a}±0.58a	13.38^{a}±0.22	6.01^{a}±0.63	13.67^{a}±0.14	6.20^{a}±0.16	4.41^{a}±0.29	10.95^{a}±0.75	13.65^{a}±0.19
PRI 30%	12.41^{a}±0.44a	11.61^{b}±0.30	6.51^{a}±0.31	11.58^{b}±1.03	7.71^{b}±0.62	4.50^{a}±0.28	8.65^{b}±0.39	9.95^{b}±0.55
PRI 40%	12.75^{b}±0.64b	12.76a±0.81	6.96^{b}±0.35	12.78^{a}±0.71	6.08^{a}±0.48	4.01^{a}±0.59	10.71^{a}±0.68	13.86^{a}±0.48
PRI 50%	12.06^{c}±0.63c	9.58^{c}±0.25	8.11^{c}±0.38	9.03^{c}±0.34	7.56^{c}±0.37	6.75^{b}±0.52	11.65^{b}±1.03	9.95^{c}±0.55

All values are means of triplicate determinations± standard deviation (SD), Mean values with different superscripts between columns were significantly different where ($p \leq 0.05$ by using Dunnets multiple range tests. PRI- black gram dhal replaced with *Phaseolus vulgaris* (without husk) in idli.

In the case of black gram dhal replaced with *Phaseolus vulgaris* in idli, the results of the coefficient of correlation between the parameters namely hardness, adhesiveness, springiness, cohesiveness, chewiness for the idli showed that there existed a corresponding correlation between the mentioned parameters. Therefore incorporation of 40% replacement of black gram dhal by *Phaseolus vulgaris* in idli proved to be the best as far as the texture profile is concerned.

In the case of black gram dhal replaced with *Phaseolus vulgaris* in idli the mean sensory scores of colour, fluffiness, sponginess, fermented aroma and overall quality showed that 40% was found to be the best, however significant difference ($p \leq 0.05$) existed between the variations and the control idli. Therefore lesser the hardness and higher the chewiness were the important textural factor for finalisation of the 40% replacement of *Phaseolus vulgaris* (without husk) in idli.

3.3 Effect of value addition on nutritional characteristics of the idli

Table-5 presents the nutritional composition of the comtrol idli and value added idli.

TABLE-5: NUTRITIONAL COMPOSITION OF THE VALUE ADDED IDLI

Nutrients	Control idli	TSP idli	PRI Idli	p-value
Protein(g/100g)	12.07± 0.54[a]	12.99.10±0.11[d]	14.78±0.13[f]	0.000*
Fat(g/100g)	0.11± 0.51[a]	0.15±0.01[c]	0.45±0.01[f]	0.001*
Fibre(g/100g)	0.30±0.01[a]	0.35±0.09[a]	1.90 ±0.19[g]	0.000*
Energy(kcal/100g)	280.66±5.13[a]	262.33±7.37[d]	270.33±3.51[a]	0.084[NS]

All values are means of triplicate determinations± standard deviation (SD), Rows and columns followed by different alphabets are)* significantly different ($p \leq 0.05$) by ANOVA, NS-Not significant by Dunnets multiple range test.

There was a significant difference ($p \leq 0.05$) between the control idli and the value added idli. There was an increase in the fibre of the control idli and other value added idli due to the addition of functional components which possess substantial amounts of dietary fibre. Multiple comparison tests between control idli and value added idli incorporated with texturised soy protein and *Phaseolus vulgaris* explained that there was a significant difference ($p \leq 0.05$). The energy levels of the value added idli namely PRI were almost similar ($p \leq 0.05$). The decrease in the energy could be attributed to the utilization of sugars by fermenting microorganisms are highly active where the exploitation is higher than the rate of production.

3.4 Baseline data of the healthy volunteers used for the study

The healthy volunteers used for the glycaemic index study.Their BMI was normal and the clinical characteristics like fasting blood glucose and post prandial glucose level were in the normal range.

Glycaemic index for control and value added idli in healthy volunteers

Table-6 presents the glycaemic index for control and value added idli in healthy volunteers

TABLE-6: GLYCAEMIC INDEX FOR CONTROL AND VALUE ADDED IDLI IN HEALTHY VOLUNTEERS

Value added idli	Mean blood glucose concentrations (mmol/l)					Peak rise (mmol/l)	Glycaemic index (%)
	0	30	60	90	120		
COI	5.39±0.39	6.38±0.58	5.84±0.90	5.40±0.65	5.25±0.54	1.28[c] ± 0.58	98.48[b] ± 0.68
TSPI	5.24±0.24	5.73±0.41	5.54±0.35	5.19±0.38	4.79±0.38	0.54[a] ± 0.28	99.08 [b] ± 0.67
PRI	5.21±0.27	5.70±0.37	5.54±0.51	5.17±0.43	4.95±0.37	0.64[a] ± 0.36	95.47[b] ± 0.17
F-test (p-value)						5.30 (0.000*)	3.33 (0.008*)

Means with different superscripts were significantly different ($p<0.05$)COI-control idli ; , TSPI- idli incorporated with *Texturised soy protein*, PRI- replacement of black gram dhal with *Phaseolus vulgaris*..

The mean blood glucose levels were increased after the intake of idli at 30 and 60 minutes, after which there was a decrease from 60 minute to 90 minute and 120 minute. The glycaemic index of control idli was 98 and texturised soy protein incorporated idli (99) and significantly higher ($p \leq 0.05$) than *Phaseolus vulgaris* replaced idli.(95)

From the results it is possible to identify food preparations in the traditional Indian diet having attributes of desired glycaemic effect, delayed peak rise, low glucose response curves. From the findings of the glycaemic index, it was found that the slow-release nature of the value added idli is attributed to the presence of legumes added in high ratios contributing the viscous type fibre as reported by (Jenkins *et al*., 1982 and 1983). However in the present study, kidney bean added idli has high hypoglycaemic effect than texturised soy protein and control idli.

4 SUMMARY AND CONCLUSION

The nutritional composition of the optimized idli has revealed that idli is simple breakfast food with beneficial compounds such as proteins, carbohydrates, essential amino acids. The carbohydrates and protein content in value added idli will not only act as a source of energy giving and body building food, but also could serve as a functional breakfast for the children and elderly due to the renowned effects in the glycaemic level.

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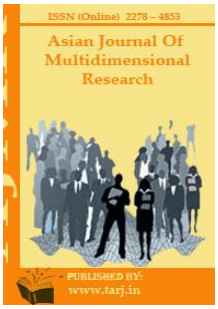

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EFFECT OF ZINC SUPPLEMENTATION ON THE NUTRITIONAL STATUS AND COGNITIVE FUNCTION OF SCHOOL- GOING CHILDREN

Varsha, Gayathri. G*; Hemamalini.A.J**

*Department of Clinical Nutrition,
Sri Ramachandra University,
Tamil Nadu, INDIA
Email id: Varsdrains@Outlook.Com

*Department of Clinical Nutrition,
Sri Ramachandra University,
Tamil Nadu, INDIA

ABSTRACT

BACKGROUND: *The Indian plant based diet is a poor source of zinc and dietary zinc inadequacy is a major cause for under nutrition, stunting wasting, poor cognitive function amongst Indian children. Thus, strategies must be developed to eradicate the hidden hunger of zinc.* ***AIM:*** *To formulate a zinc rich supplement and study its effects on the nutritional status and cognitive function of School going Children.* ***OBJECTIVES:*** *To formulate a zinc rich supplement and evaluate its effect on the nutritional status and cognitive function of School-going children.* ***METHODS:*** *A simple random sampling technique was used to allocate 50 School-going children into 25 children in the experimental and 25 in the control group. The experimental group was provided with zinc supplement for 3 months and the control group was given nutrition counseling alone. Nutritional status (Height, weight, BMI) and cognitive function assessment (working memory and processing speed) was done in both the groups before and after supplementation.* ***RESULTS:*** *Among 50 subjects in the experimental and control group there were 25 girls and 25 boys. The children belonged to age group of 6-15 years. After 3 months of zinc supplementation there was a highly significant improvement (p= 0.0005) in the height, weight, BMI and cognitive function of School-going children.* ***CONCLUSION:*** *Zinc supplementation has shown to improve the nutritional status and cognitive function of School-going children. Thus, zinc must be emphasized to be included as an essential nutrient in the daily diet of children, as its deficiency can tamper the growth and development in children.*

KEYWORDS: *School-Going Children, Zinc, Nutritional Status, Cognitive Function*

INTRODUCTION:

The school age is a period that involves steady growth, and school-going children are inferred to between the ages 6- 15 years. This a period of slow but steady growth and the nutritional requirements reduce per kilogram of body weight as compared to neonates or infants. If children are malnourished in this crucial period then this slows down their growth process. Deficiency of any one of the micronutrients can affect the normal growth and development. (Marcia Nelms, 2013)

Zinc being a key trace element plays a significant role in humans. Zinc deficiency is directly related to retarded growth, hypogonadism, and delayed pubertal development in adolescents. Also, zinc deficiency is highly prevalent amongst stunted and wasted children showing the contribution of zinc towards growth and development. (Dehghani SM, et al. 2011).

India being a developing country has a very high prevalence of malnutrition with about 63% school-going children being malnourished. (Samiran Bisai et al, 2009). The prevalence of zinc deficiency is about 43.8% in India which is quite alarming. This alarming level of zinc deficiency suggests the need for the development of a zinc supplementation program in order to reduce the incidence of zinc deficiency in Indian children. (Kapil et al. 2011)

METHODS:

1. STUDY PROTOCOL:

This study is a randomized control trial. Study was carried out at Sri Sarada Secondry School, Gopalapuram, Chennai. Students were selected from standard I-X. Children with a deficient dietary intake, <50% of their RDA for zinc were selected. An informed consent was obtained from the school authorities, the parents and assent form from children above 12 years of age was collected (English and Tamil). The study was carried out on 50 subjects with 25 subjects each in the control and the experimental group.

TOOLS USED:

NUTRITIONAL ASSESSMENT- The nutritional status was assessed using a Stadiometer for the height, and weight was measured using a digital weighing scale. Thereby, from these measures, the BMI was estimated using the Broka's Index.

COGNITIVE ASSESSMENT- WISC–IV Wechsler Intelligence Scale for Children reflects the current theory and practice of cognitive assessment in children by including increased attention to working memory and processing speed, as well as critical cognitive processes, this tool was used under the supervision of a Clinical Psychologist. (General Ability Index, 2005).

This study was carried out for a period of 6 months.

INCLUSION CRITERIA- Age group between 6-15 years, healthy subjects, those who are willing to participate and those who gave informed consent form.

Ethical clearance- This study was approved by the Institutional ethics committee of Sri Ramachandra University, Porur and was approved by the Committee on 28-4-16, with **REF NO: CSP/16/APR/47/151.**

2. FORMULATION OF ZINC- RICH CHOCOLATE:

In order to meet the daily dietary requirements of zinc for the children, a zinc- rich chocolate was formulated. The ingredients for the formulation of the Zinc rich supplement were selected from zinc rich food sources across various locally available, Indian food groups like cereals, millets, pulses, nuts and oil seeds. All nuts and oil seeds were mixed with melted dark chocolate and thereby the zinc- rich mix became coated with chocolate. This chocolate was labeled and packed according to the various age groups. The formulated zinc rich supplement- **"Chocó Delight"** was then subjected to organoleptic evaluation with a nine point hedonic scale by the trained nutritionists. The chocolate which was formulated was sent for nutrient analysis to identify the zinc content by atomic spectroscopy method. This formulated zinc supplement had a nutritive value of: Energy- 323 kCals, protein- 15.3 g, carbohydrate- 53g, fat- 27 g, zinc- 45 mg, per 100 g of the supplement.

3. SUPPLEMENTATION PERIOD:

BASELINE CHARACTERISTICS:

Prior to supplementation phase children in both the control and experimental groups were assessed for their nutritional status and cognitive assessment. Nutritional status was assessed using anthropometric measurements like height, weight and BMI was calculated.

METHOD OF SUPPLEMENTATION:

This zinc- rich product was then supplemented to 25 children in the experimental group for 3 months. The control group received no supplementation but only nutritional advice. Compliance to the supplementation was checked and it was 100%. There were no dropouts and all participants consumed the supplement throughout the study period.

OUTCOME MEASURES:

After 3 months of supplementation, all the children both in the control and experimental groups were subjected to a post- supplementation nutritional and cognitive assessment in order to document the changes prior to and post supplementation period and also to understand the effect of zinc supplementation.

4. STATISTICAL ANALYSIS

The collected data were analysed with IBM.SPSS statistics software 23.0 Version. To describe about the data descriptive statistics frequency analysis, percentage analysis were used for categorical variables and the mean & S.D were used for continuous variables.

Results:

ANTHROPOMETRIC DATA

TABLE 1 INITIAL ANTHROPOMETRIC DATA BETWEEN GROUPS (N= 50)

ANTHROPOMETRIC PARAMETERS	EXPERIMENTAL (n=25) MEAN ± SD		CONTROL (n=25) MEAN ± SD	
	BOYS(n=16)	GIRLS(n=9)	BOYS(n=9)	GIRLS(n=16)
HEIGHT (cm)	140.62 ±18.89	132.90 ± 16.76	138.33 ± 11.88	137.93 ± 14.99
WEIGHT (kg)	35.04 ± 12.41	30.54 ±10.96	31.33 ± 10.55	32.75 ±11.56
BMI (kg/m^2)	17.14 ± 3.14	16.77 ± 2.58	15.95 ± 3.22	16.65 ±3.06

From the above table it was observed that, the height, weight and BMI of children in both the groups was low as compared to their WHO standard for age suggestive of stunting, underweight and malnutrition in these children.

COGNITIVE FUNCTION

TABLE 2 INITIAL COGNITIVE DATA BETWEEN GROUPS (N= 50)

COGNITIVE PARAMETERS	EXP MEAN ± SD	CON MEAN ± SD	INTERPRETATON		
	BOYS(n=16	GIRLS(n=9)	BOYS(n=9)	GIRLS(n=16)	
WORKING MEMORY INDEX (WMI)	88.93 ±10.68	92.18 ±12.41	93.33 ±10.27	93.25 ± 8.95	Average
PROCESSING SPEED INDEX (PSI)	101.75 ±13.15	103.90±15.94	101.66 ±9.21	96.6875 ±8.22	Average

From the above table it was observed that, a majority of the children had an average working memory and processing speed.

TABLE 3
COMPARISON OF INITIAL & FINAL ANTHROPOMETRIC DATA AMONG CONTROL GROUP (N=25)

ANOP ANTHROPOMETRY	INITIA INITIAL (M±SD)	FIN FINAL (M±SD)	p VAL p VALU p VALUEVALUE UE
HEIGHT (cm)	138.08± 13.70	138.92±13.50	0.0005**
WEIGHT (kg)	32.24±11.01	32.52±11.09	0.258^{NS}
BMI (kg/m^2)	16.40±3.07	16.33±2.99	0.624^{NS}

From the above table it was observed that, there is no significant difference ($p \geq 0.05$) with respect to the initial and final height, weight and BMI of the control group.

Comparison of Initial & Final Anthropometry- Experimental Group

TABLE 4
COMPARISON OF INITIAL & FINAL ANTHROPOMETRIC DATA AMONG EXPERIMENTAL GROUP (N=25)

ANTHROPOMETRY	INITIAL (M±SD)	FINAL (M±SD)	p VALUE
HEIGHT	138.72± 18.28	142.60±18.10	0.0005**
WEIGHT	34.08± 11.8	37.08±11.68	0.0005**
BMI	17.14±2.94	17.75±2.38	0.0005**

**$p \leq 0.01$ (Highly significant)

From the above table it was observed that height of the subjects was found to be 138.72± 18.28 cm initially and after 3 months of zinc supplementation the height was 142.60±18.10 cm. From the above table it was observed that the weight of the subjects was found to be 34.08± 11.8 kg initially and after 3 months of zinc supplementation was 37.08±11.68 kg. From the above table it was

observed that BMI of the subjects was found to be 17.14±2.94 kg/m^2 and after 3 months of zinc supplementation the BMI was 17.75±2.38 kg/m^2. There is a highly significant difference with respect to the initial and final height, weight and BMI of the group.

COMPARISON OF INITIAL AND FINAL COGNITIVE FUNCTION - CONTROL GROUP

TABLE 5 COMPARISON OF INITIAL & FINAL COGNITIVE FUNCTION - CONTROL GROUP (N=25)

COGNITIVE PARAMETERS	INTERPRETATION	INITIAL (M±SD)	FINAL (M±SD)	INTERPRETATION	p VALUE
Working memory Index (WMI)	Average	93.28±9.23	93.04±8.32	Average	0.913^{NS}
Processing speed Index (PSI)	Average	98.48±8.75	102.56±9.04	Average	0.094^{NS}

NS- Not significant

From the above table it was observed that WMI of the subjects was found to be 93.28±9.23 initially and after 3 months the WMI was 98.48±8.75. From the above table it was observed that PSI of the subjects was found to be 98.48±8.75 initially and after 3 months the PSI was 102.56±9.04. There is no significant difference with respect to the initial and final WMI and PSI of the control group.

COMPARISON OF INITIAL & FINAL COGNITIVE FUNCTION - EXPERIMENTAL GROUP

TABLE 6 COMPARISON OF INITIAL & FINAL COGNITIVE FUNCTION – EXPERIMENTAL GROUP (N=25)

COGNITIVE PARAMETERS	INTERPRETATION	INITIAL (M±SD)	FINAL (M±SD)	INTERPRETATION	p VALUE
Working memory Index (WMI)	Average	90.40±11.42	104.92±11.96	High average	0.0005**
Processing speed Index (PSI)	High average	102.84±14.41	124.20±10.57	Superior	0.0005**

**p≤ 0.01 (Highly significant)

From the above table it was observed that WMI of the subjects was found to be 90.40 ± 11.42 initially and after 3 months of zinc supplementation the WMI was 102.84± 14.41. From the above table it was observed that PSI of the subjects was found to be 102.84± 14.41 initially and after 3 months of zinc supplementation the PSI was 124.20± 10.575. There is a highly significant difference with respect to the initial and final WMI and PSI of the control group.

Thus, this study has elucidated that; dietary zinc supplementation enhances the nutritional status and cognitive function of school- going children. This study also reflects the importance of zinc as a micronutrient in the diet of children and must be supplemented with adequate dietary sources to meet their RDA of zinc.

CONCLUSION:

The main aim of this study was to formulate a zinc rich supplement and evaluate its outcomes on the nutritional status and cognitive function of school-going children. Samples were selected using simple randomized sampling technique. Total numbers of samples were 50 in which 25 were controls and 25 were experimental subjects.

Zinc rich food sources were selected and a supplement in the form of a chocolate was formulated from them. The final product was standardized and selected based on the organoleptic evaluation. Nutrient analysis was done by atomic spectroscopy method which resulted in 45.3g of zinc in 100g of the formulated supplement. The shelf life of the product was 30 days. The estimated cost was Rs.18 per 100g of the supplement. The formulated product was supplemented for 3 months and compliance was checked by a school teacher every day. Outcome measures like height, weight, BMI and cognitive parameters were assessed.

MAIN FINDINGS:

- There is no significant difference seen with the initial height, weight, BMI and cognitive function of both the groups.
- There is a highly significant difference ($p \leq 0.001$) seen with respect to the initial and final height, weight, BMI, Working Memory Index (WMI) and Processing Speed Index (PSI) of the experimental group after zinc supplementation for 3 months.
- There is no significant difference seen with respect to the initial and final height, weight, BMI, Working Memory Index (WMI) and Processing Speed Index (PSI) of the control group.

Hence, zinc plays a very important role in improving the height, weight and BMI of children. It not only supports physical growth but it also enhances the cognitive development of children. The findings of this study also suggest a statistically significant improvement in the height, weight, BMI, Working Memory Index (WMI) and Processing Speed Index (PSI) of the experimental group. To conclude, zinc supplement in School-going children improves their nutritional status and cognitive function. Thus, the diet of children must comprise of foods rich in zinc and zinc supplementation can become a preventive as well as curative strategy to treat the zinc- related hidden hunger and the related malnutrition.

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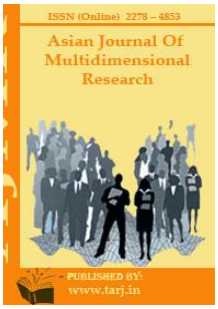

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AN ENZYMATIC EVALUATION OF ANTIDIABETIC ACTIVITY OF MOMORDICA CHARANTIA

Akhila.C*; S.Usha*; P. Lalitha;**

*Research Scholar,
Department of Chemistry,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

*Research Scholar,
Department of Chemistry,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

**Associate Professor of Chemistry,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: goldenlalitha@gmail.com

ABSTRACT

Diabetic mellitus (DM) has been termed as the 'Mother of all Diseases'. It is a serious chronic disease without a cure and associates with significant morbidity and mortality. Almost each family in India has at least one diabetic patient. There are several commercially available drugs to control diabetics. Over usage of drugs may cause side effects. Due to this reason almost all diabetic people look upon natural treatments and by way of food control to help manage their symptoms. Bitter gourd is taken in our regular diet from ancient time. It is well known that bitter gourd has antidiabetic property. In the present study different varieties of Momordica charantia were experimentally evaluated for its antidiabetic activity using amylase inhibition assay. It was intended to evaluate its seed, pulp, flesh of green bitter gourd, ripe ones and small variety of bitter gourd part for its antidiabetic property. Extract for the studies were prepared using Sonication method, Homogenizer method and Microwave oven method. Small bitter gourd Pulp dried under room temperature and extracted using microwave oven gave good results. Commercially available antidiabetic drugs and few non-diabetic plants were also tested for evaluating the assay and its

validity. The results clearly portray the validity of this method and aids in screening plant samples in a short duration of time. Also it is suggested that small bitter gourd variety is more anti-diabetic than mature ones.

KEYWORDS: *Antidiabetic, Momordica Charantia, Amylase Inhibition*

INTRODUCTION

Diabetes is a complex disorder characterized by hyperglycemia. The disease is primarily classified into insulin-dependent Diabetes mellitus (type 1 diabetes) and non-insulin-dependent *Diabetes mellitus* (DM) (type 2 diabetes) caused by immunological destruction of pancreatic cells resulting in insulin deficiency. Type 2 diabetic patients are increasing globally day by day. Therefore, the control of increase in blood sugar has been shown to be important in the treatment of diabetes and the prevention of cardiovascular complications. The commercially available anti-diabetic drugs *viz.* Biguanides, thiazolidinediones, metformin, sulfonylurea, meglitinides, miglitol, acarbose etc. may have side-effects like digestive discomfort, lactic acidosis, headache, dizziness, hypoglycemia, liver cell injury, neurological defects etc. It has created a thrust for the development of new medicines. An oral anti-diabetic drug pioglitazone is banned by Drugs Technical Advisory Board (DTAB) on account of its side effects, portrays the need for developing new drugs with less or no side effects **(Firdhouse et al., 2015).**

Almost all diabetic people look upon natural treatments, such as bitter melon, to help manage their symptoms. Many have found that 2000 mg daily of bitter melon lowers blood glucose levels considerably in people with type II diabetes when compared with a 1,000 mg dose of metformin. The isolation of bitter gourd like seeds leaves of the plant to possess antidiabetic activity and many cucurbitane-type triterpenoids **(Keseru *et al.*, 2016).**

The complementary agent of *Momordica charantia* (bitter melon) is treated in DM in the populations of Asia, South America, India and East Africa. The active components charatin, vicine and polypeptide are thought to be structurally similar to human insulin. Meta-analysis of bitter melon on glycemic control and glycemic outcomes in patients with DM is reported **(Yin *et al.*, 2014).**

The antidiabetic study particularly with animal testing model is a tedious procedure that requires sacrifice of animal groups. Hence the present research work is aimed at employing a simple tool to screen plant samples viz. varieties of bitter gourd, for antidiabetic activity. A simple spectrophotometric method using *Porcine Pancreatic amylase* and *Aspergillus Oryzae amylase* has been used. The study aims at fractionating the extracts of different types of bitter gourd viz. small, big, green ripened bitter gourd and also different parts of bitter gourd viz. Seed, Pulp, flesh and identify the fractionates / plant part with more antidiabetic activity.

MATERIALS AND METHODS

Chemicals

Aspergillus oryzae alpha amylase was purchased from Hi-Media Pvt. Ltd., Mumbai, *Porcine pancreas* alpha amylase was purchased from SIGMA Pvt. Ltd., Mumbai.

Collection of plant material and preparation

Momordica charantia was collected from a local vegetable market in Coimbatore district, Tamilnadu. The plant parts were separated depending on their size and shape. The different parts of

the plant such as flesh, pulp and seed were taken for the study. The collected plant samples cut into small pieces and dried under room temperature and sunlight. Then it was partially ground and kept using closed bottles for further study.

Preparation of plant extracts

Three different methods such as sonication method, homogenizer method, and microwave oven method were carried to preparing the plant extract. One gram of flesh, pulp and seed were immersed separately in 50 ml doubly distilled water. The mixture was sonicated/ microwaved for 1 hour. The crude extract was filtered, filtrate dried using water bath at 80^0C.The samples were assigned different sample codes as in Table 1.

TABLE 1: SAMPLE CODE ASSIGNED TO PLANT EXTRACTS

S.No	Plant Code	Sample	Plant Code	Sample
1	BFSM	Big bitter gourd Flesh Sonication Method under the sun light	BSMRT	Big bitter gourd Seed Microwave oven method under at room temperature
2	BFSRT	Big bitter gourd Flesh Sonication method under the Room Temperature	SFSSL	Small bitter gourd Flesh Sonication method under light
3	BFHM	Big bitter gourd Flesh Homogenizer Method under the sun light	SFSRT	Small bitter gourd Flesh Sonication method under at room temperature
4	BFHRT	Big bitter gourd Flesh Homogenizer method under the Room Temperature	SHSLF	Small bitter gourd Flesh Homogenizer method under sun light
5	BFSLM	Big bitter gourd Flesh Microwave oven method under the Sun Light	SRTFH	Small bitter gourd Flesh Homogenizer method under at room temperature
6	BFRTM	Big bitter gourd Flesh Microwave oven method under the Room Temperature	SFSLM	Small bitter gourd Flesh Microwave oven method under sun light
7	BPSM	Big bitter gourd Pulp	SFRTM	Small bitter gourd Flesh Microwave oven method at room temperature
8	BPRTS	Big bitter gourd Pulp	SPSSL	Small bitter gourd pulp Sonication method under sun light
9	BHPSL	Big bitter gourd Pulp Homogenizer method under the Sun Light	SPSRT	Small bitter gourd pulp Sonication method at room temperature
10	BPRTH	Big bitter gourd Pulp Homogenizer method under the Room Temperature	SPSLH	Small bitter gourd pulp Homogenizer method under sun light
11	BPSLM	Big bitter gourd Pulp	SPRTH	Small bitter gourd pulp

				Homogenizer method under sun light
12	BPRTM	Big bitter gourd Pulp Microwave oven method under the Room Temperature	SPSLM	Small bitter gourd pulp Microwave oven method under sun light
13	BSSLS	Big bitter gourd Seed Sonication method under the Sun Light	SPRTM	Small bitter gourd pulp Microwave oven method at room temperature
14	BSRTS	Big bitter gourd Seed Sonication method under the Room Temperature	SSLSS	Small bitter gourd seed Sonication method under sun light
15	BSHSL	Big bitter gourd Seed Homogenizer method under the Sun Light	SSSRT	Small bitter gourd seed Sonication method at room temperature
16	BSHRT	Big bitter gourd Seed Homogenizer method under the Room Temperature	HSSLS	Small bitter gourd seed Homogenizer –under sunlight
17	BSSLM	Big bitter gourd Seed	RTSSH	Small bitter gourd seed Homogenizer method at room temperature
18			SSOSL	Small bitter gourd seed Microwave oven method under the sun light

Preparation of alpha amylase enzyme solution

Aspergillus Oryzae amylase and *Porcine Pancreas* amylase were prepared by dissolving 0.0125g each in 50ml doubly distilled water.

Antidiabetic potential of plant extracts- *In vitro* assay with alpha amylase from plant and animal source

Taken (20µl) plant extract with 1ml dimethyl sulfoxide and shaken for 2minutes. 1ml starch solution is added to it and again it shaken for 2 minutes. Then added 1ml plant amylase enzyme solution and 1ml Dinitro salicylic acid (coloring reagent) with constant shaking. This mixture was heated for 15 minutes. The color of the solution turned to reddish orange absorbance was noted at 540nm using spectrophotometere. The experiment was repeated using blank. The same procedure is carried out for all prepared samples and also with animal amylase. Acarbose was used as standard.

Calculation of percentage inhibition of alpha amylase inhibition

The inhibition efficiency of the plant extracts against the enzyme alpha amylase was calculated using the formula:

Inhibition efficiency % = (As- Ab/As)*100; where Ab – Absorbance of blank and As – Absorbance of sample

RESULTS AND DISCUSSION

Extraction of plant materials

The three different parts of bitter gourd like flesh, pulp and seed of bitter gourd (big and small) were extracted by different methods such as Sonication, Homogenizer and Microwave oven. Among the 36 extract BFSM gave maximum yield 2.9350g.The maximum yield was obtained using sonication extracts compared to homogenizer and microwave oven method. Previous literature studies reveal that *Momordica charantia* is rich in phyto constituents. The evaluation of phytochemical constituents of bitter gourd revealed bioactive compounds present in alkaloids, steroids, flavonoids, carbohydrate, phenol and anthraquinones.

Alpha amylase inhibition assay

Inhibition efficiency of alpha amylase was carried out for 36 plant extracts in order to evaluate the antidiabetic potential of the *Momordica charantia* extracts and also to establish alpha amylase assay as a facile screening tool.

The percentage of plant and animal amylase inhibition efficiency of acarbose are 64.12% and 62.25% respectively. The alpha amylase inhibition efficiency of bitter gourd extracts under different conditions of extract preparation and for different varieties and different parts of bitter gourd are given in tables 2-4. The inhibition efficiency of SPRTM (Small bitter gourd Pulp dried under Room Temperature extracted using Microwave oven) extract was 80.65% for plant amylase and 80.6% for animal amylase inhibition efficiency respectively. All other extracts also showed amylase inhibition comparable to that of standard.

CONCLUSION

There are mushrooming research work related to phtyoscreening of plant extracts. Several methods of assessment are tedious and there are several extracts traditionally used without scientific validation of the bioactivity for which it is used. One such edible and commonly used vegetable is bittergourd widely known for its antidiabetic property. In the present study different varieties of *Momordica charantia* were experimentally evaluated for its antidiabetic activity using amylase inhibition assay. The seed, pulp, flesh of green bitter gourd, ripe ones and small variety of bitter gourd parts screened for its antidiabetic property revealed small bitter gourd Pulp dried under room temperature and extracted using microwave to give good results. The validity of this method and its facileness was ascertained by screening non – antidiabetic plants.

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TABLE 2 AMYLASE INHIBITION EFFICIENCY OF BITTER GOURD EXTRACTS PREPARED UNDER SONICATION METHOD

Inhibition Efficiency in %					
Extracts prepared under Sonication method	**Plant amylase**	**Animal amylase**	**Extracts prepared under Sonication method**	**Plant amylase**	**Animal amylase**
BFSM	73	70.24	SFSSL	77.78	77.48
BPSM	75.8	74.5	SPSSL	70.7	69.9
BSSLS	72.7	69.5	SSLSS	78.1	78.8
BFSRT	75.3	75.5	SFSRT	73.9	72.2
BPRTS	77.4	74.8	SPSRT	69.2	70.9
BSRTS	74.7	73.7	SSSRT	73.6	73.7

TABLE 3 ASPERGILLUS ORYZAE AMYLASE AND PORCINE PANCREATIC AMYLASE INHIBITION EFFICIENCY OF BITTER GOURD EXTRACTS PREPARED UNDER HOMOGENIZER METHOD

S.No	**Extracts prepared under Homogenizer method**	**Inhibition Efficiency in %**	
		Plant amylase	**Animal amylase**
1.	BFHM	71.8	71.9
2.	BHPSL	70.4	68.8
3.	BSHSL	66.1	64.3
4.	BFHRT	70.4	73.7
5.	BPRTH	77.1	75.2
6.	BSHRT	63.1	64.3
7.	SHSLF	70.4	75.0
8.	SPSLH	74.7	75.55
9.	HSSLS	76.7	75.5
10.	SRTFH	76.5	74.2
11.	PSRTH	76.5	76.2
12.	RTSSH	72.7	73.4

TABLE 4 AMYLASE INHIBITION EFFICIENCY OF BITTER GOURD EXTRACTS PREPARED UNDER MICROWAVE OVEN METHOD

Extracts prepared under Microwave oven method	**Inhibition Efficiency in %**	
	Plant amylase	**Animal amylase**
SFSLM	70.4	68.8
SPSLM	**82.4**	**82.0**
SSOSL	72.1	72.5
SFRTM	78.2	78.5
SPRTM	**80.65**	**80.6**
SSRTM	72.4	70.9

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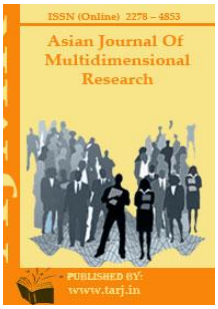

Asian Journal of Multidimensional Research (AJMR)

(Double Blind Refereed & Reviewed International Journal)

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POTENCY OF NIGELLA SATIVA ON ANEMIA PERVASIVE AMONGST ALCOHOLICS

Fathima Shahzatha*

*Assistant Professor,
Department of Food Service Management & Dietetics,
Cauvery College for Women,
Trichy, Tamil Nadu, INDIA
Email id: fathimashah77@gmail.com

ABSTRACT

Alcohol has numerous adverse effects on human blood cells and their functions. Alcoholics are generally anemic due to several factors like gastritis, poor intake etc. The objective of this study is to ascertain how Nigella Sativa could alleviate anemia among alcoholics. In the current study, Nigella Sativa herb was administered to eighteen either sex albino Wister rats each weighing about 150-200 gms. These where divided into three experimental groups; namely, Group I (No special treatment meted to this group), Group II (Upto 70% Ethanol administered to this group), Group III (Nigella Sativa administered upto 250 mg/Kg for this group) with six rats in each group. During a period of 21 days the three types of Groups where monitored. The hematological changes and hemoglobin level were observed and recorded before the 21 days period and during the same period. The study revealed that Group III specimens displayed significant increase in hemoglobin, Red Blood Cells and Other hematological conditions due to the oral administration of the herb Nigella Sativa.

KEYWORDS: *Haemolytic Anaemia, Megaloblastic Anaemia, Red Blood Cell, Haemoglobin*

INTRODUCTION

Prolonged excessive consumption of Alcohol leads to several ill effects on the human physiology. The direct consequence of such an addiction leads to toxic effects on the bone marrow, the blood cell precursors, the mature red may ultimately lead to decreased RBC in the blood[1]. Such a situation could initiate patients to blood cells (RBCs), White Blood Cells and Platelets. Alcohol can suppress production of blood cell which develop anemia.

Alcoholics may have megaloblastic Anaemia due to folate deficiency which may be due to deficiency of nutritional diet. Such a condition may be due to a weak antifolate action of ethanol. Deficiency of folate in heavy drinking alcoholic populace can occur partly due to excess excretion of folate through urine[2]. In addition, chronic alcoholics have peptic ulcer, gastric lesions[3], improper absorption of folate.

A study accomplished by Chandini detected that anemia is persistently prevalent in individuals who are chronic alcoholics. Further, the study also threw light that 36% of such individuals had low hemoglobin level[4]. Chronic alcoholics are saddled with rigorous effect on hematological system such as increase in mean corpuscle volume, macrocytic megablastic anemia as a result of folate and B12 deficiency, sideroblastic anemia, dwindle in the number of T-Cells, thrombocytopenia, perturb in coagulation. Alcoholics have profound gastric acid which may aggravate gastritis and lead to peptic ulcer and potential bleeding[5]. In this study, a modest attempt has been made to attenuate such types of Anemia in alcoholics through the use of Nigella Sativa herb.

MATERIALS AND METHOD

EXPERIMENT DESIGN

Albino Wister rats of either sex weighing between 150 to 200gms were divided in to three groups with 6 animals in each group.

Group I: Control (saline 5 ml/kg)

Group II: **Oral administration of ETHANOL in 70% v/v**

Group III: **ETHANOL** + EXTRACT 250mg/kg.

ASSESSMENT OF SELECTED HAEMATOLOGICAL PARAMETERS

Collection of blood for haematological studies

In this study, experiment group of animals was treated with respective extracts . The animal body weight was taken for every week. After the treatment period, the animals were anaesthetized by ketamine hydrochloride and the blood was collected from Retro-orbital sinus by using capillary tube into a centrifugation tube which contains EDTA for haematological parameters

Estimation of Haemoglobin

Haemoglobin was estimated using Sahli's acid haematin method. The lower meniscus of the fluid was noted and reading was noted in g/100ml[12]

DATA ANALYSIS

Results are expressed as the mean ± SEM Statistical significance (p) calculated by one way ANOVA followed by dunnett's (n=6); NS- non significant, *p<0.05, **p<0.01, ***p<0.001, calculated by comparing treated groups with control group.

RESULT

The oral administration of nigella sativa does not produce any profound toxicity and mortality in the mice. The body weight increased considerably due to intake of the herb. On administration of 250mg/kg of the herb an appreciable increase in the level of Red blood cells, Hemoglobin, Packed cell Volume and Mean Corpuscular Hemoglobin was observed as per the values detailed in table I.

TABLE– I EFFECT OF EXPERIMENT SUBSTANCE ON SELECTED HAEMATOLOGICAL PARAMETERS

GROUP	CONTROL	ONLY ALCOHOL	ALCOHOL + EXT250mg/kg
RBC	2.73±1.2233	2.283±1.023	2.93±1.314
HB	6.58±2.957	5.35±2.401	7.3±3.2696
PCV	20.55±9.211	16.55±7.428	22.4±10.03
MCH	12.1±5.41	11.17±5.0016	12.55±5.62

Values arae expressed as mean ± SEM Statisticalsignificance (p) calculated by one way ANOVA followed by dunnett's (n=6); NS- non significant, *p<0.05, **p<0.01, ***p<0.001, calculated by comparing treated groups with control group.

DISCUSSION

In this study, rats subjected to alcohol addiction where found to be anemic. The experimental plant herb had profound impact on the vascular components. Supplementation with 250mg/kg for the Wister rats, considerably increased RBC compared to standard group. Also there was a significant increase in Haemoglobin, in the herb administered group.

In the nutrient analysis of the herb Nigella, the presence of phytochemicals such as flavanoids, phenols, alkaloids in adequate quantity was observed. Further, previous studies by other research scholars illustrated the presence of thymoquinone and nigellone[6.] For many disease conditions, these alkaloids and phenols had proved to be a curing agent.

Hemolytic anemia is common among alcoholics due to spur cell formation, enlarged spleen and folic acid deficiency. Red Blood Cells membrane contains lipids rich in unsaturated fatty acids. RBCs are frequently exposed to oxygen in comparison to other body tissues and hence are more prone to oxidative damage. Invasion of RBC membrane by peroxidants may lead to cell hemolysis[7]. In addition, the hemoglobin in RBCs is robust catalyst which may commence lipid preoxidation.

The previous studies had demonstrated that Nigella sativa causes reduction in the quantum of anemia via lipid peroxidation reduction in RBC haemolysis[8]. In the current study, the reason behind the amelioration in anemia could be perceived due to the presence of alkaloids, thymoquinone and nigellon present in the herb. The oxidative stress of alcohol metabolite acetaldehyde on cells of anemia inducted rats had curtailed the lipid peroxidation subsequently leading to reduction in Red blood Cell hemolysis..

In addition to lipid preoxidation, oxidation affects vital –SH groups of proteins which are substantially active and may be focused during oxidative stress. Reduced glutathione levels lead to decrease in –SH groups[9]. Glutathione precisely protects membrane proteins and safeguard their stability. Diminished levels of glutathione results in oxidation of membrane –SH group and loss of membrane stability[10].

The outcome of the study of other research scholars demonstrates a direct relationship between the concentration of the tested flavonoid and its antioxidant effect. A careful perusal establishes that these levels were also observed at acceptable levels at much lower flavonoid concentrations. Protein –SH groups play an imperative role in preserving cell membrane stability. Under oxidative stress, -SH groups protect cellular structures against free radicals by undergoing oxidation and forming disulfide bonds[11]. If antioxidant compounds prove efficient in protecting –SH groups against oxidation, they are likely to increase cellular resistance to oxidative stress. Alcohol causes oxidative stress among the body cells. The antioxidant effect of phytochemical flavonid adequately present in Nigella Sativa protect the body cells from such stress. As per the research of other scholar it had been cited that at even a lower level presence of flavonoid could help protect the body cell from stress. The quantity of 5.9 (mg QE / gm) of flavonoid present in Nigella Sativa does the same function, thereby protecting the body cell from the corrosive effect of alcohol.

Prospective studies unambiguously had shown an increase in the risk of obesity as the level of omega-6 fatty acids and omega-6/omega-3 ratio increase in Red Blood Cell (RBC) membrane phospholipids[12]. Nigella Sativa has adequate fatty acids. So using the same rationale, the fatty acids present in Nigella Sativa may have a decisive role in the increase in the Red Blood Cell membrane phospholipids.

In another study the Nigella Sativa herb had proved to be beneficial in the reduction of alcoholic gastritis[13]. The plausible increase in RBC and Heamoglobin in this study could be due to diminishing of gastritis.

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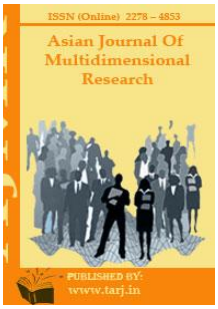

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FORMULATION, STANDARDIZATION AND SHELF LIFE STUDY OF BUTTERNUT INCORPORATED PAPAYA JAM

Dr.K. Mahalakshmi Sangeetha*; Mr. Aravindh A**

*Associate Professor,
Department of Foods and Nutrition,
Rathnavel Subramaniam College of Arts and Science,
Sulur, Coimbatore, Tamil Nadu, INDIA

**PG Student,
Department of Foods and Nutrition,
Rathnavel Subramaniam College of Arts and Science,
Sulur, Coimbatore, Tamil Nadu, INDIA
Email:aravindhamlu@gmail.com

ABSTRACT

Jams are delicious and nutritious spreads typically made from fruit, sugar and pectin that ensure availability of fruits in off-season.From the study, it is concluded that 75% of Butternut was acceptable in Papaya jam. The prepared product had high Vitamin A and Iron when compared to the standard product. The prepared product is acceptable till 7th day without any microbial deterioration if it is stored in Glass bottle properly. Many food products are made by combining raw materials in specific proportions in a formulation, and research on the effects of various formulations on product qualities is common in product design ***(Earle & Earle, 2009).*** *Sensory analysis is used to compare similarities or differences in a range of dishes or products, evaluate a range of dishes or products, analyze food samples for improvements, and explore specific characteristics of a product and whether a final food product meets its original specification. Its contribution to the growth of the companies, its influence on profit performance, and its role as a key factor in business planning has been well documented.*

KEYWORDS: *Nutritious, Deterioration, Products, Jams*

INTRODUCTION

The new product development (NPD) literature emphasizes the importantance of introducing Its contribution to the growth of the companies, its influence on profit performance, and its role as a key factor in business planning has been well documented.new products on the market for continuing business success. New products are responsible for employment, economic growth, technological process, and high standard of living **(Bhuiyan, 2011)**

Many food products are made by combining raw materials in specific proportions in a formulation, and research on the effects of various formulations on product qualities is common in product design **(Earle & Earle, 2009)**

Jams are delicious and nutritious spreads typically made from fruit, sugar and pectin that ensure availability of fruits in off-season. Jam differs from each other in the raw materials used, processing methods and additives **(Fasogbon, 2013).** The fruit is heated with sugar and water to activate the pectin in the fruit. Many tropical fruits have been used in the production of jam. Final test for setting up the jam, push the surface of the jam gently with your fingertip and if the surface wrinkles setting point is reached **(Harrison and Harrison, 2009)**

OBJECTIVES

The present study was carried out with the following objectives.

- To identify suitable ingredients and formulate the jam.
- To analyze the nutrient content of the formulated jam.
- To study the storage stability
- To calculate the cost of the formulated jam
- To popularize the formulated jam to target group.

METHODOLOGY

The Methodology adopted for the present studyis given in Figure 1

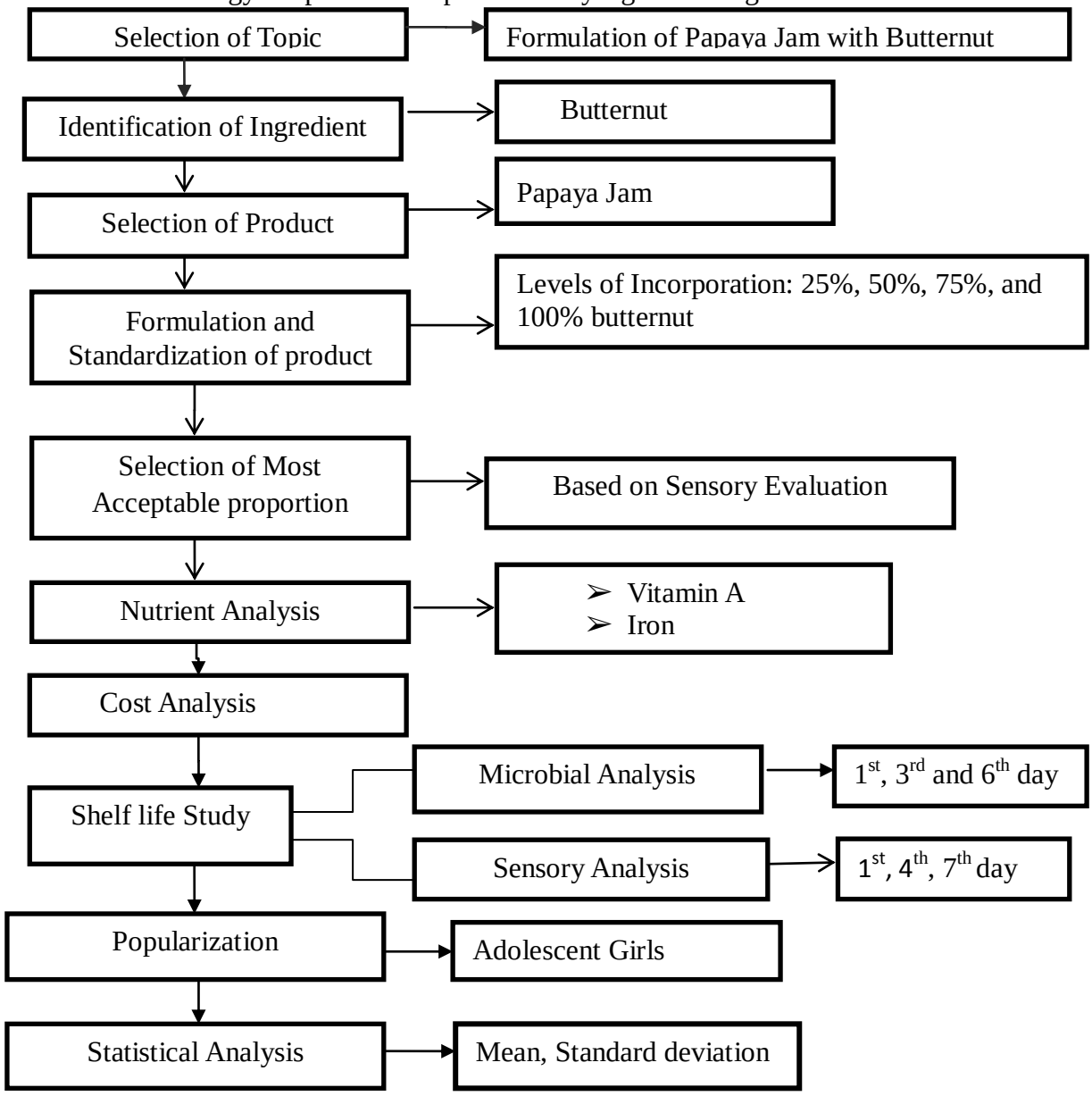

Figure- 1 Methodology

RESULTS AND DISCUSSION

The details regarding sensory analysis of standard and varying proportions of butternut incorporated jam is given in **Table I**.

TABLE-I MEAN SENSORY SCORES OF STANDARD AND VARYING PROPORTION OF BUTTERNUT INCORPORATED PAPAYA JAM

S.NO	Criteria	Max Score	Standard Mean± SD	Sample A (25%) Mean± SD	Sample B (50%) B Mean± SD	Sample C (75) C Mean± SD	Sample D(100) D Mean± SD
1	Appearance	5	4.9±0.30	4.73±0.44	4.5±0.82	4.73±0.58	4.56±0.56
2	Colour	5	4.36±1.03	4.1±0.84	3.93±0.73	4.03±1.06	4.36±0.74
3	Texture	5	4.66±0.60	4.26±0.73	4.03±0.96	4.36±0.80	4.33±0.92
4	Flavour	5	4.83±0.46	4.56±0.62	4.46±0.77	4.66±0.58	4.53±0.73
5	Taste	5	4.86±0.34	4.53±0.57	4.5±0.62	4.73±0.58	4.33±0.80
	Overall Acceptability		4.7±0.5	4.4±0.64	4.2±0.7	4.5±0.7	4.4±0.7

From the above **Table I** it is observed that the mean overall acceptability of standard was4.7±0.5, sample A was4.4±0.64, sample B was4.2±0.7, Sample C was 4.5±0.7 and sample D was 4.4±0.7. Since sample C had the highest mean score in all the criteria when compared other samples like sample A, B and D. So sample c was chosen as the best product and subjected to further analysis.

Nutrient Analysis of the selected product and Standard product

The details regarding Vitamin A and Iron content of standard and selected proportion of butternut incorporated papaya jam is given in **Table II**.

TABLE II NUTRIENT CONTENT OF STANDARD AND VARYING PROPORTION OF BUTTERNUT INCORPORATED PAPAYA JAM

S.NO	NUTRIENT	STANDARD (per 100g)	SAMPLE (100 g)
1	Vitamin A(IU)	448	540
2	Iron (mg)	1	2.1

From the above Table it is observed that the Vitamin A content increased by 92IU/100g and iron content increased by 1.1mg/100g on incorporation of Butternut. One hundred grams of butternut fruit contain 532ug of Vitamin A and 0.60mg of Iron.

Microbial Analysis of the Standard and Selected Butternut Incorporated papaya Jam on storage

The details regarding the microbial load of standard and selected proportion of butternut incorporated jam is given in **Table III**.

TABLE III MICROBIAL LOAD OF THE STANDARD PRODUCT AND SELECTED PRODUCT ON STORAGE

Days	Name of the Product	Indicator Test Result (CFU / gram) and Interpretation/Standard Plate Count. Glass Bottle			
		G	M/S	US	P H
1ST day	Standard	✓	-	-	-
	Sample	✓	-	-	-
3rd day	Standard	✓	-	-	-
	Sample	✓	-	-	-
6th day	Standard	✓	-	-	-

	Sample	✓	-	-	-
Remark	On the 8th day after sampling NO contamination was found.				
Organism identified	No Bacterial growth was observed.				

(Good= **G**; Satisfactory = **S**; Marginal = **M**; Unsatisfactory = **US**; Potentially Hazardous = **PH)**

From the above Table it is clear that there was no microbial growth in both standard and sample immediately after preparation on1st, 3rdand 6th day of storage. So, from the result we can conclude that the product is microbial safe for consumption on storage in Glass Bottle for one week.

Sensory Analysis of the Standard and Selected Butternut incorporated Papaya Jam on storage.

Sensory analysis implies sense of taste, smell, and other senses. Sensory analysis is used to compare similarities or differences in a range of dishes or products, evaluate a range of dishes or products, analyze food samples for improvements, and explore specific characteristics of a product and whether a final food product meets its original specification.

The details regarding the mean sensory scores of standard and Butternut incorporated Papaya Jam on storage in Glass bottle given in **Figure 2**.

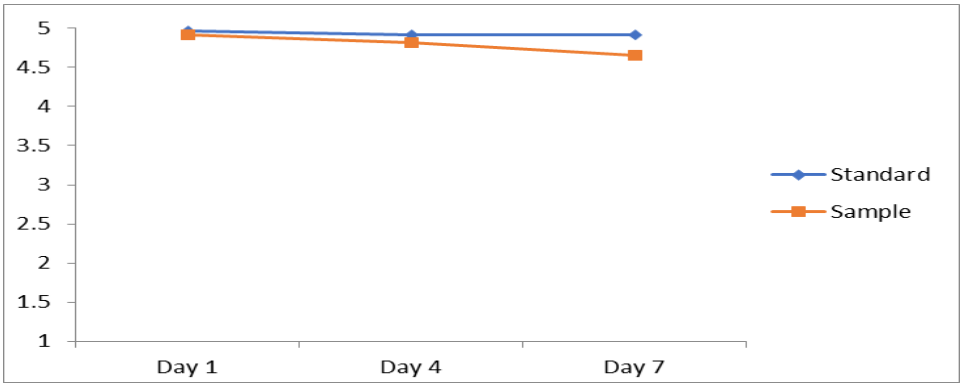

Figure-2

Mean Sensory Score of Standard and Selected Butternut incorporated Papaya Jam during Storage in Glass Bottle

From the Figure 2, it is observed that the overall acceptability of standard papaya jam on 1st day was4.96±0.154th day was 4.91±0.24, 7th day was4.91±0.28. The overall acceptability of sample on 1st day was4.91±0.24, 4th day was4.81±0.43, and 7th day was 4.65±0.48 respectively. From the result it can be concluded that there was a negligible decrease in sensory attribute on storage in Glass Bottle.

Cost Calculation of the Standard and Butternut Incorporated Papaya Jam

The details regarding the cost of standard and Butternut incorporated papaya jam is given in **Table V**

TABLE V COST ANALYSIS OF STANDARD AND SELECTED PRODUCT

S. No	Product(100g)	Cost(Rs.)
1	Standard	31/-
2	Sample	23/-

The results revealed that the cost of 100g Butternut incorporated Papaya jam was Rs.23 whereas the cost of standard was Rs.31. Incorporation jam increased the cost of papaya jam by Rs.8.

Popularization of the Selected Product

Popularization among public helps to determine their food habits, preference. The Butternut incorporated Papaya jam was popularized among the Adolescent girls in RVS College of Arts and Science, Sulur, Tamil Nadu.

The results of the study clearly show that all the selected adolescent girls like jam. About 20 adolescent girls already knew about butternut fruit. About 26 adolescent girls only knew that butternut is rich source of Vitamin A. All liked the formulated jam and were interested to buy this product available in market.

The details regarding the acceptability of Butternut Incorporated Papaya jam among adolescent girl is given in**Figure 3.**

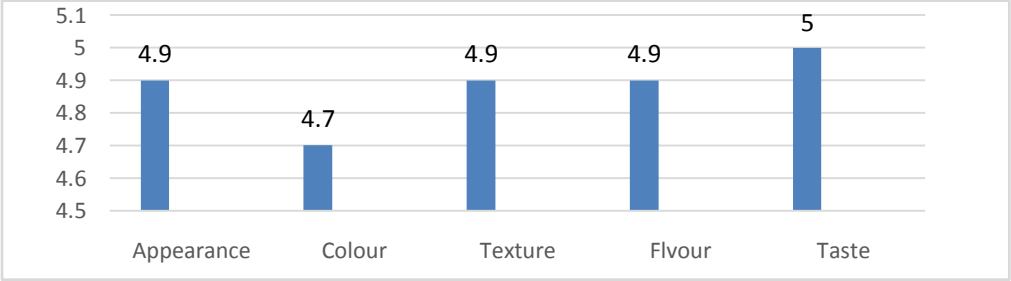

Figure 3

Mean Score for Sensory Analysis on Popularization

From the above Figure it is observed that Butternut incorporated Papaya jam had a mean score of 5±0 for appearance. Color, texture, flavor and taste of selected product had a mean score of 4.97±0.18, 4.97±0.18, 4.93±0.25, 4.97±0.18 respectively. The mean sensory score of popularization showed all the selected subjects showed preference towards the product.

CONCLUSION:

From the study, it is concluded that 75% of Butternut was acceptable in Papaya jam. The prepared product had high Vitamin A and Iron when compared to the standard product. The prepared product is acceptable till 7th day without any microbial deterioration if it is stored in Glass bottle properly. The cost of the prepared best product was slightly lower than the standard. In the popularization study the entre participants accepted the product.

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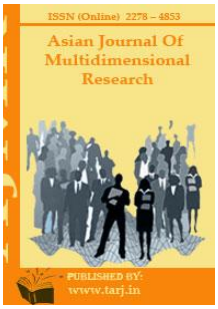

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PLANT BASED COMPOSITE MILK YOGURT - ROLE IN PROMOTION OF GASTRO ENTERIC HEALTH

P.Hema Prabha*; R.Sinthiya**

*Department of Food Processing and Preservation Technology,
School of Engineering,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, TamilNadu, INDIA
Email id: hemanano@gmail.com;

*Department of Food Processing and Preservation Technology,
School of Engineering,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, TamilNadu, INDIA
Email id: sinthiya1602@gmail.com

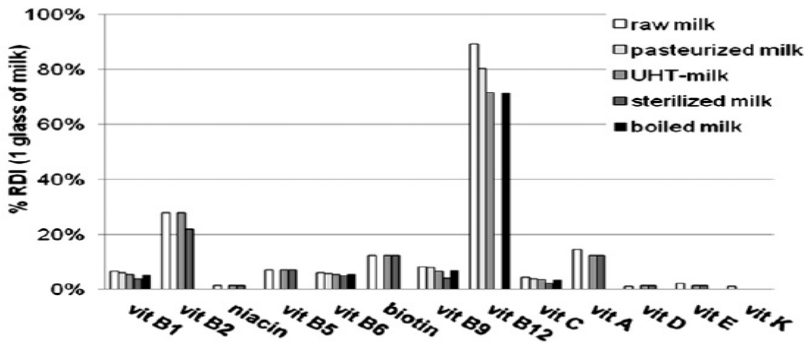
ABSTRACT

Milk is a source of major nutrients that provides complete nourishment and offer wide range of health benefits. Milk is a product widely consumed by the public, especially by infants and children. Plant based milk are extracted by grinding a bean or nut, then adding water and flavours. The plant based milk such as soy milk, almond milk, coconut milk, cashew milk, cotton seed milk, rice milk, hemp milk, peanut milk etc. The qualities of plant protein sources stimulate their inclusion in the preparation of yoghurt so as to provide protein rich product at affordable price in place of animal protein which is scarce and expensive. The increase in yogurt consumption is probably due to its high organoleptic quality and potential health-enhancing effects. This article throws light on the nutritional benefits of composite milk based yogurt and its significance in protecting gastro enteric health among humans.

KEYWORDS: *Milk, Plant Based Milk, Composite, Gastro Enteric, Health Benefits*

INTRODUCTION

Milk is an emulsion or colloid of butterfat globules within a water based fluid that contains dissolved carbohydrates and protein aggregates with minerals. FAO estimates 85% of all milk worldwide was produced from cows. Milk is extremely perishable and various methods are employed to preserve it, the most prominent being fermentation. Coconut (*Cocos nucifera*) milk is being used by confectionaries, bakeries, biscuits and ice cream industries worldwide to enhance flavor and taste of various products. Coconut milk is a rich source of calcium. The milk is reported to be high in minerals and vitamin content while total saturated fat contributes to 10% of the total energy. Cotton milk is an extract of Gossypium sp., seeds, which contains cotton lipids, proteins and sugars as an emulsion.Yogurt, as a fermented dairy product is regarded as probiotic carrier, is nutritionally rich in available protein, calcium, milk fat, potassium, magnesium, vitamin B_2, B_6 and vitamin B_{12}. It has nutritional benefits beyond those of milk, because people who are moderately lactose intolerant can enjoy yogurt without ill effects, as most of the lactose in the milk precursor has been converted to lactic acid by the bacterial culture (Joel Ndife et al., 2014).



(www.organicfacts.net).

MILK COMBINATIONS

Olusola Ladokun and Sarah Oni, 2014 prepared yogurt from cow milk, goat milk, soy milk and coconut milk using starter culture *L.bulgaricus* and *L.acidophilus.* The result obtained showed that the initial pH of fresh milk sample were slightly acidic cow milk (6.3), goat milk (6.2), soy milk (6.4), coconut milk (6.0). All fresh milk has high moisture content range from (63.34% to 76.90%), fat content range from (9.76% to 15.02%). So for other milk raw materials are collected and they are processed. The pH value was determined immediately after production 24-72 hours and the incubation temperature 45□ C for 3 hours. So the result revealed that milk prepared from coconut and soy bean could be used as a beverage for both the young and old due to high fat and protein content.

Table 1 pH value of different milk from 0-72 hours at incubation temperature 45□ C

Sample / hours	0 hours	48 hours	72 hours
Skimmed milk	5.37	5.10	4.09
Cow milk	5.85	5.31	5.11
Coconut milk	5.98	5.62	5.33

(Source: Olusola Ladokun and Sarah Oni, 2014).

The commercially prepared yogurt contains the following minimal proximate compositions:

TABLE 2 MINIMAL PROXIMATE COMPOSITIONS OF YOGURT

Protein	3.5g
Fat	3.25g
Moisture content	87.7%

(Source: Akoma et al., 2000)

NUTRITIVE COMPOSITION COMPOSITE MILK

NUTRIENTS	COCONUT MILK	COTTON SEED MILK	COW MILK	CORN MILK	SOY MILK
Energy	230cal	367cal	42cal	86Kcal	54cal
Carbohydrates	5.5g	22g	5g	18.70g	6g
Dietary fibres	2.2g	6g	-	2g	0.6g
Fat	23.8g	39g	1g	1.35g	1.8g
Protein	2.3g	33g	3.4g	3.27g	3.3g
Water	68%	40%	87%		

Table 3 Proximate analysis of milk per 100g (Source: www.wikipedia.org)

COMPOSITE MILK YOGURT AND ITS NUTRITITVE VALUE

Yogurt is an ancient food that has been a part of the human diet as a healthy food. Yogurt is symbiosis of two strains *S.thermophilus* and *L.bulgaricus* of bacteria in a sterile environment at very low temperature 36□ C to 42□ C for 38 hours. Yogurt is an excellent sources of calcium and protein and can be consumed with any meal. In United States (90% - 95%) of adult females and (75% - 90%) of adult male falls short of the recommended 3 servings of dairy per day. Yogurt is important in Asia, Africa, America because they are rich in calcium and potassium. (Maurofisberg and Rachel Machodo, 2015)

Composite milk Yogurts are now being manufactured in a numerous types and varieties with different fat content, favour and textures.Yogurt can be categorised into two different groups: standard culture yogurt and bio or probiotic yogurt. It should contain at least 3.25% of composite milk fat and 8.25% of milk solid non-fat (MSNF) with a titrable acidity of not less than 0.9%, expressed as lactic acid. The consumption should be more than 100 g of bio-yogurt containing more than 10^6 $CFUmL^{-1}$ viable cells. Composite milk yogurt consumption is also reported to be effective in cytokine production, T-cell function and natural killer-cell activity, and thereby result and overall immunological enhancement ((Adelodun and Abiodun, 2012). Weerathilake et al., 2014)

Composite milk yogurt is normally retailed in one of the three physical states, namely set (undisturbed gel in the retail pot), stirred (the acid gel formed during incubation in large fermentation tanks is disrupted by stirring) or fluid (drinking yoghurt). Most of the basic composite milk yogurts are set yogurts, which are fermented in the container that they are eventually sold in, while most fruit-flavoured yogurts are stirred yogurts, because flavours and fruit added after fermentation need to be properly dispersed in the yogurt matrix (Tulay Ozcan, 2013). They are sold commercially as low fat or fat free.

HEALTH BENEFITS OF YOGURT

Plant based composite milk yogurt is healthy, thick, creamy, good in taste, versatile and delivers similar nutritional benefits like milk. Milk proteins in yogurt can be divided into whey and casein. Casein can increase the absorption of minerals and lower the blood pressure. Whey proteins have been used among body builders and athletes. Inclusion of milk proteins in plant based composite milk yogurt could result in improved textural characteristics.

A large scale in vitro screening of *streptococcus thermophillus* strains with high anti-inflammatory potential was analysed by Maira Junjua et al., 2016. They evaluated the capacities of 30 strains of different origins, to resist the stresses prevailing in digestive tracts. It appeared that a resistant to low pH, bile salts and H_2O_2 and their capacities adhesion lightly varied from one strain to another. Most of the *streptococcusthermophillus* tested seemed capable to survive inside the gastro intestinal tract and certain displayed very promising anti-inflammatory properties in vitro (Maira Junjua et al., 2016).

CONCLUSION:

In developing countries, it appears that the productivity with regard to cow milk is low. Growing consumption of dairy products is bringing important nutritional benefits to large segments of the population of developing countries, although many millions of people in developing countries are still not able to afford better-quality diets owing to higher cost. This results in less consumption of dairy products leading to inadequate protein intake. The plant milk sources are easily available, low in cost and rich in nutrients, these milks can be used in combinations for yogurt production. Due to decreasing cow milk production, the supply may not meet the demand which might lead to increased costs.Milk from plant sources offer a good alternative for yogurt production.

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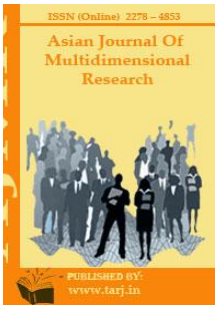

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FORMULATION AND PHYSICOCHEMICAL CHANGES IN PAPAYA LASSI AND WHEY UTILIZED FRUITS ADDED PAPAYA LASSI

Dr.K.Kavitha*; A.SaburaFathima Refana**

*Assistant Professor,
Department of Foods& Nutrition,
Vellalar College for Women,
Erode, Tamilnadu, INDIA
Email id: kavitha.nutrition@gmail.com

**M.Sc. Foods and Nutirition,
Department of Foods& Nutrition,
Vellalar College for Women,
Erode, Tamilnadu, INDIA

ABSTRACT

Papaya lassi and whey utilized fruits added papaya lassi was formulated and prepared with different proportions. From the formulated lassi, papaya dates lassi and whey papaya banana lassi were highly acceptable than the combination of other fruits added lassi. The physico chemical characteristics like titrable acidity, pH and syneresis were analysed in triplicates, it was found that the titrable acidity increases, pH decreases and syneresis level increases as time increases. The percentage of total sugar and reducing sugar content of papaya dates lassi and whey papaya dates lassi received higher value and the percentage of non-reducing sugar content was higher in papaya avocado lassi and whey papaya banana lassi. The highly accepted papaya lassi and whey utilised papaya with combination of other fruits lassi were analysed it microbial safety, at the end of storage the microbial count is slightly increased and it was found to be safe level. The formulated products offer a good option for the production of functional fruit blend lassi and beverages.

KEYWORDS: *Whey Utilised Lassi, Papaya Lassi, Titrable Acidity, Syneresis And Reducing Sugar*.

1. INTRODUCTION

Utilization of whey appears to be the most obvious and logical avenue for returning the nutrients into the human food chain. Whey and whey derived products are being an excellent nutritional ingredient and functional characteristics in different foods (Marshall, 1995). Whey proteins referred to as "fast protein" for its ability to quick provide nourishment to muscles. Additionally, whey contains variable amount of lactic acid and non-soluble nitrogen (Kosikowski, 1979). Whey protein has potential as a functional food component to contribute to the regulation of body weight by providing satiety signals that affect both short-term and long-term food intake (Khamrui and Rajorhia, 1998). Lassi being a traditional drink and favourable one among people and whey water which is highly nutritious. So, a study has been initiated to formulate fruits like papaya, avocado, banana and dates added lassi and lassi utilizing with whey water and fruits with different proportions.

2. METHODOLOGY

A. Selection of raw materials

For the preparation of papaya lassi and whey utilized papaya lassi the raw materials such as cow's milk, papaya, avocado, banana and dates were purchased from PazhamudhirNilayam and departmental store in Erode District, Tamilnadu.

B. Formulation and standardisation of papaya lassi and whey utilised papaya lassi

a. Preparation of whey

Cow's milk (100 ml)
↓
Boil the milk for 10 minutes
↓
Add 2ml of lemon juice
↓
Stir slowly until it curdles completely
↓
Strain the curdle mixture
↓
The resultant whey is collected

Figure 1 Preparation of whey

b. Standardization of papaya lassi and whey utilized papaya lassi

50ml Whey
↓
50ml Sliced ripe papaya fruit pulp (seeds and peel removed)
↓
Add sugar (15 to 20gm) and stir well
↓
Blend well and fill in containers
↓
Refrigerate at 20^0C and Serve chill

Figure 2 Standardization of whey utilized papaya lassi

c. Standardization of papaya lassi

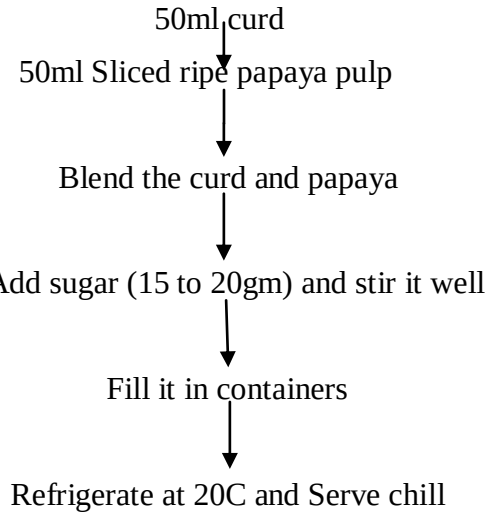

Figure 3Standardization of papayalassi

C. Formulation of fruits added in papaya lassi and whey utilised papaya lassi

The fruits like avocado, banana and dates were added in the formulated standard papaya lassi and whey utilized papaya lassiand its ratio is given in blend ratio table I and II.

TABLEI BLEND RATIO OF FRUITS ADDED IN PAPAYA LASSI

S.No.	**Ingredients**(gm)	**Standard PL**	**PAL**	**PBL**	**PDL**
1	Curd	50	30	30	30
2	Papaya	50	35	35	35
3	Sugar	20	20	20	20
4	Avocado	--	35	--	--
5	Banana	--	--	35	--
6	Dates	--	--	--	35

PL –Papaya Lassi **PAL** –Papaya Avocado Lassi

PBL –Papaya Banana Lassi **PDL** –Papaya Dates Lassi

TABLEII BLEND RATIO OF FRUITS ADDED IN WHEY UTILISED PAPAYA LASSI

S.NO.	**Ingredients**(gm)	**Standard WPL**	**WPAL**	**WPBL**	**WPDL**
1	Whey	50	30	30	30
2	Papaya	50	35	35	35
3	Sugar	20	20	20	20
4	Avocado	--	35	--	--
5	Banana	--	--	35	--
6	Dates	--	--	--	35

WPL – Whey Papaya Lassi **WPAL** – Whey Papaya Avocado Lassi

WPBL – Whey Papaya Banana Lassi **WPDL** – Whey Papaya Dates Lassi

Procedure

From the prepared lassi, the proportion of curd ,whey and papaya was reduced, and the fruits like avocado, banana and dates pulp were added equally to that of papaya pulp and it was organoleptically evaluated.

D. Organoleptic evaluation of the formulated lassi

The formulated lassi were evaluated for appearance, colour, flavour, taste, texture and overall acceptability by semi-trained panel of 24 judges from the department using a nine point hedonic scale with scores ranging from liked extremely (9) to disliked extremely (1). The overall acceptability scores were calculated by taking mean of all the five attributes for each sample.

E. Assessment of Physico – chemical changes of the formulated lassi

The formulated papaya lassi and whey utilised papaya lassi were analysed for different physico - chemicalcharacteristics such as pH, titrable acidity, syneresis, total, reducing and non- reducing sugars. The formulated lassi were stored under glass containers for 6 hours and its storage stability was measured every 2 hours.

i) PH

The pH of the sample was determined using the calibrated digital pH meter at 20^0C (Patel, 2013).

ii) Titrable acidity

The titrable acidity of lassi was determined according to the procedure given in Bureau of Indian Standards (Patel, 2013).

Iii) Syneresis

The syneresis was estimated by centrifugation method (Ramana,1994).

iv) Total, Reducing and Non-reducing sugars

For determination of total, reducing and non-reducing sugaranthrone reagent test was used.

F. Analysis of data

The results obtained were consolidated, tabulated, statiscally analyzed and results were discussed and concluded.

3. RESULTS AND DISCUSSION

A. Organoleptic evaluation of the standard lassi and fruits added lassi

a.Mean scores for acceptability of standard and fruits added papaya lassi

The formulated standard and fruits added papaya lassiwereorganoleptically evaluated. The mean scores for over all acceptability of standard papaya lassi, papaya avocado lassi, papaya banana lassiandpapaya dates lassi was found to be 8.37±0.56, 8.0±0.64, 8.29±0.61 and 8.33±0.55respectively. Next to standard, papaya dates lassiwas ranked superior for the mean scores for all the parameters like appearance, colour, flavour, consistency and taste. On statistical analysis revealed that there was no significant difference between standard and all the other formulated lassi. However, papaya avocado lassi received low scores in parameters like flavour and taste; it may be due to the bitterness of avocado.

B.Mean scores for acceptability of whey utilized standard and fruits added papaya lassi

The mean scores for acceptability of formulated is given in Table IV. The formulated whey utilized standard and fruits added papaya lassi were organoleptically evaluated and the mean scores for over all acceptability of whey papaya lassi, whey papaya avocado lassi, whey papaya banana lassi andwhey papaya dates lassiwas found to be8.66±0.47, 8.20±0.64, 8.62±0.48 and 8.41±0.49 respectively. From the results, it was noted that next to standard, Whey Papaya Banana Lassi received the highest scores for the mean acceptability for all the parameters like appearance, colours, flavours, consistency and taste. Onstatistical analysis revealed that there was no significant difference between standard and Whey Papaya Banana Lassi and Whey Papaya Dates Lassi, 1 percent significant difference was found between standard and Whey Papaya Avocado Lassi, it might be due to bitterness of avocado.

B. Phsico - chemical changes of formulated lassi

a. Titrable acidity

TheTitrable acidity of the formulated lassiis presented in table III and IV.

TABLE III TITRABLE ACIDITY IN PAPAYA LASSI AND FRUITS ADDED PAPAYA LASSI

STORAGEPERIOD(HRS)	STD PL	PAL	PBL	PDL
0	0.042±0.001	0.010±0.00	0.059±0.001	0.078±0.00
2	0.063±0.002	0.018±0.001	0.069±0.004	0.108±0.001
4	0.066±0.00	0.028±0.004	0.072±0.004	0.144±0.004
6	0.078±0.004	0.034±0.00	0.075±0.00	0.162±0.004

From the table, it was cleared that the titrable acidity increased acidity increased with increasing fermentation time. The acidity of standard papaya lassi increased from 0.042 to 0.078 and papaya avocado lassi 0.010 to 0.034, it shows when the storage period increased, then the acidity also get increased. Meanwhile, the acidity of papaya banana lassi and papaya dates lassi increased from 0.059 to 0.075 and 0.078 to 0.0162 respectively.

TABLE IV TITRABLE ACIDITY IN WHEY PAPAYA LASSI AND FRUITS ADDED WHEY PAPAYA LASSI

STORAGE PERIOD(HRS)	STD WPL	WPAL	WPBL	WPDL
0	0.008±0.001	0.015±0.004	0.009±0.004	0.027±0.00
2	0.024±0.00	0.024±0.002	0.018±0.00	0.033±0.004
4	0.033±0.00	0.033±0.001	0.027±0.00	0.047±0.001
6	0.046±0.004	0.039±0.00	0.036±0.001	0.056±0.00

From the table, it was noted that the titrable acidity increased significantly with increasing fermentation time. The acidity of standard Whey Papaya Lassi increased from 0.008 to 0.046 and for Whey Papaya Avocado Lassi 0.015 to 0.039, it was evident that when storage period increased then the acidity also get increased. At the same time, the acidity of Whey Papaya Banana Lassi and Whey Papaya Dates Lassi increased from 0.09 to 0.036 and 0.027 to 0.056 respectively.

b. Syneresis

The percentage of syneresis of the formulated lassi stored for the period of 6 hours are presented in Table V and VI and the changes in syneresis was checked at every 2 hours interval.

TABLE V SYNERESIS IN PAPAYA LASSI AND FRUITS ADDED PAPAYA LASSI

STORAGE PERIOD (HOURS)	STD PL (%)	PAL (%)	PBL (%)	PDL (%)
0	0.15±0.000	0.07±0.001	0.15±0.000	0.18±0.000
2	0.26±0.004	0.17±0.000	0.18±0.004	0.22±0.000
4	0.31±0.003	0.26±0.001	0.20±0.003	0.24±0.004
6	0.37±0.001	0.38±0.000	0.25±0.001	0.26±0.001

The syneresis in papaya lassi and fruits like avocado, banana and dates lassi was noted and revealed that there was an increase insyneresis over period of 6 hours, the change in syneresis was checked for every 2 hours. In standard dates papaya lassi, the syneresis is increased from 0.15percent at initial hour to 0.37 per cent at the end of the storage period and for papaya avocado lassi0.07 percent at initial hour to 0.38 percent at the end of the storage period, It shows that syneresis increases with increasing storage period. At the same time the syneresis for papaya banana lassi and papaya dates lassiincreased from 0.15 to0.25 percent and 0.18 to 0.26 percent respectively.

TABLE VI SYNERESIS IN WHEY PAPAYA LASSI AND FRUITS ADDED PAPAYA LASSI

STORAGE PERIOD (HOURS)	STD WPL (%)	WPAL (%)	WPBL (%)	WPDL (%)
0	0.13±0.001	0.13±0.000	0.17±0.000	0.22±0.001
2	0.17±0.000	0.23±0.004	0.20±0.000	0.24±0.004
4	0.37±0.003	0.38±0.001	0.25±0.001	0.26±0.004
6	0.42±0.004	0.40±0.000	0.27±0.004	0.28±0.000

The syneresis in whey papaya lassi and fruits like avocado, banana and dates was noted and it was revealed that there was an increase in syneresis over period of 6 hours, the change in syneresis was checked for every 2 hours. In standard dates papaya lassi, the syneresis is increased from 0.13 percent at initial hour to 0.42 per cent at the end of the storage hour and for papaya avocado lassi0.13 percent to 0.40 percent. It shows that syneresis increases with increasing storage period. At the same time the syneresis for papaya banana lassi and papaya dates lassiincreased from 0.17 to 0.27 percent and 0.22 to 0.28 percent respectively.

c.pH

The pH of the formulated lassi is checked for 6 hours at every 2hours interval and the data's are given in table VII.

TABLE VII PHOF THE PAPAYA LASSI AND FRUITS ADDED PAPAYA LASSI

STORAGE PERIOD (HOURS)	STD PL	PAL	PBL	PDL
0	5.3±0.09	5.8±0.09	4.9±0.04	6.5±0.04
2	5.0±0.08	5.4±0.04	4.5±0.04	6.1±0.04
4	4.9±0.00	5.1±0.08	4.2±0.04	5.90±0.09
6	4.7±0.04	4.8±0.04	4.0±0.04	5.3±0.08

Regarding the pH of the papaya lassi and fruits added papaya lassi, it shows that the pH value decreased with increase in storage period. At initial hour the pH of Standard Dates Whey Papaya Lassi was 5.3 and it decreased to 4.7 at the end of the storage hour and for Whey Papaya Avocado Lassi decreased from 4.9 at initial hour to 4.0 at the end of the storage hour. At the same time, the pH value of Whey Papaya Banana Lassi and Whey Papaya Dates Lassi decreased from 5.8 to 4.8 and 6.5 to 5.3 respectively. Hence, it is evident that the decreased in pH denotes that the increasing time which increase the acid content of the product.

TABLE VIII PHOF WHEY PAPAYA LASSI AND FRUITS ADDED WHEY PAPAYA LASSI

STORAGE PERIOD (HOURS)	STD WPL	WPAL	WPBL	WPDL
0	5.7±0.04	5.7±0.05	6.3±0.04	6.1±0.04
2	5.5±0.04	5.3±0.04	5.9±0.04	5.7±0.03
4	5.2±0.03	5.0±0.04	5.3±0.04	5.2±0.04
6	4.9±0.04	4.8±0.03	4.9±0.04	4.8±0.04

Regarding the pH of the whey papaya lassi and fruits added whey papaya lassi, it was revealed that at initial hour the pH of Standard Whey Papaya Lassi was 5.7 and at the end of the storage hour it decreased to 4.9 and for Whey Papaya Avocado Lassi it decreased from 5.7 at initial hour to 4.8 at the end of the hour. At the same time, the pH value of Whey Papaya Banana Lassi and Whey Papaya Dates Lassi decreased from 5.8 to 4.8 and 6.5 to 5.3 respectively. From the results, it is evident that pH value decreased with increase in time due to the increase of acid content in the products.

d.Total, reducing and non-reducing sugar of papaya lassi and fruits added papaya lassi

Total, reducing and non-reducing sugar of papaya lassi and fruits added papayalassi are given in table IX and X.

TABLE IX TOTAL, REDUCING AND NON- REDUCING SUGAR OF PAPAYA LASSI AND FRUITS ADDED PAPAYA LASSI

SAMPLE	TOTAL SUGARS (%)	REDUCING SUGARS (%)	NON REDUCING SUGAR (%)
STD PL	17.28	10.12	6.80
PAL	18.14	8.21	9.43
PBL	18.25	10.23	7.61
PDL	19.24	11.12	7.71

The total sugar content of standard papaya lassi was found to be 17.28 percent and reducing sugar was found to be 10.12 percent. The total sugar and reducing sugar content of Papaya Dates Lassi was 19.24 percent and 11.12 percent which is higher than standard, may be due to the high sugar content of dates. Next to Papaya Dates Lassi, Papaya Banana Lassi has received a higher total and reducing sugar. Papaya Avocado Lassi has received low reducing sugar when compared to other formulated lassi. Standard Papaya Lassi found to have 6.80 percent non reducing sugar when compared to Papaya Avocado Lassi, Papaya Banana Lassi and Papaya Dates Lassi which has received 9.43, 7.61, 7.71percent respectively.

TABLE X TOTAL, REDUCING AND NON- REDUCING SUGAR OF WHEY PAPAYA LASSI AND FRUITS ADDED WHEY PAPAYA LASSI

SAMPLE	TOTAL SUGARS (%)	REDUCING SUGARS (%)	NON REDUCING SUGAR (%)
STD WPL	15.28	12.51	2.63
WPAL	15.56	12.73	2.68
WPBL	16.24	11.08	4.90
WPDL	18.22	14.18	3.83

The total and reducing sugar of Standard Whey Papaya Lassi is found to be 15.28 and 11.51 percent respectively. The total and reducing sugar of Whey Papaya Dates Lassi was found to be higher than

the other formulated lassi; It may be due to the high sugar content of Dates. Whey Papaya Avocado Lassi has received slightly equal percent of total and reducing sugar as Standard Whey Papaya Lassi. Whey Papaya Banana Lassi has received highertotal and reducing sugar next to Whey Papaya Dates Lassi. Whey papaya banana lassi was found to have high non reducing sugar than Standard Whey Papaya Lassi, Whey Papaya Avocado Lassi and Whey Papaya Dates Lassi which were found to have 2.63, 2.68 and 3.83 percent respectively.

4. CONCLUSION

Hence it may be concluded from the above study, the formulation of fruits added papaya lassi and whey utilized fruits added papaya lassi improved the nutrient content and overall acceptability gave effective scores and results. Papaya dates lassi and whey papaya banana lassi were highly acceptedwhen compare with other lassi. All the formulated lassi increased in acidity and syneresis but decreased in pH when time increased. The formulated products offer a good option for the production of functional fruit blend lassi and beverages. The formulated whey lassi showed better protein energy malnutrition and mineral deficiency among children in developing countries. The use of fruit blend lassi maintains gut flora because of the presence of probiotics and prebiotics, it also lowers LDL and raises HDL cholesterol.

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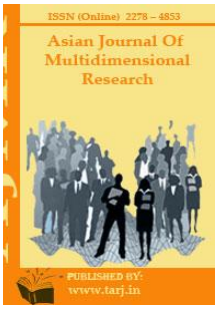

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FORMULATION, STANDARDIZATION AND SHELF LIFE STUDY OF DRUMSTICK LEAVES POWDER INCORPORATED CHOCO CHIP COOKIES

Dr. K Mahalakshmi Sangeetha*; Ms. Pragathi P**

*Associate Professor,
Department of Foods and Nutrition,
Rathnavel Subramaniam College of Arts and Science,
Sulur, Coimbatore, Tamil Nadu, INDIA

**PG Student
Department of Foods and Nutrition,
Rathnavel Subramaniam College of Arts and Science,
Sulur, Coimbatore, Tamil Nadu, INDIA
Email id: pragathipragu4@gmail.com

ABSTRACT

A product that has passed it shelf life might still be safe, but quality is no longer guaranteed. The prepared product is acceptable till 12th day without any microbial deterioration if it is stored in Air tight container. In the popularization study, the entire participants accepted the product. Due to the high concentrations of antioxidants present in Moringa leaves, they can be used in patients with inflammatory conditions, including cancer, hypertension, and cardiovascular diseases. Use prior to the expiration date does not guarantee the safety of a food or drug and a product is not necessarily dangerous or ineffective after the expiration date. For food, shelf life from expiration date; the former refers to food quality the later to food safety. Thirty girls know that Drumstick leaves are rich in Iron. Only 19 girls are used drumstick leaves in powder form. Thirty girls were aware that Drumstick leaves are rich in Iron. The substance is ingested by an organism and assimilated by the organism's cells in an effort to produce energy, maintain life or stimulate growth **(Stanley, 2008).**

KEYWORDS: *Inflammatory Conditions, Antioxidants, Hypertension, Concentrations, Deterioration*

INTRODUCTION

Food is any substance consumed to provide nutritional support for an organism. It is usually of plant or animal origin, and contains essential nutrients, such as carbohydrates, fats, proteins, vitamins or minerals. The substance is ingested by an organism and assimilated by the organism's cells in an effort to produce energy, maintain life or stimulate growth **(Stanley, 2008).**

The design of various food products focuses on identification of the structure and composition of food ingredients that have the desired characteristics. A thorough understanding of the functions and properties of the various ingredients is the basic key to formulating for the desired attributes. The revealing of structural properties of a food product is the main task of food formulation problem **(Avramenko and Kraslawski, 2008)**

Drumstick *(Moringa Oliefera)* leaves powders are packed with nutritional properties and are 100% edible. Moringa trees have been used to combat malnutrition, especially among infants and nursing mothers. It is cultivated all over the world due to its multiple utilities. Through research, the Moringa leaves contain more iron than spinach, more calcium than milk**(Fahey,2018).**Due to the high concentrations of antioxidants present in Moringa leaves, they can be used in patients with inflammatory conditions, including cancer, hypertension, and cardiovascular diseases. The β carotene found in Moringa leaves has been shown to act as an antioxidant and the concentrations of saponins in *Moringa Oliefera*freeze-dried leaves range between 64 and 81 g/kg of dry weight which have anti-cancer properties. A study shows that the compounds in *MO* may also protect against Alzheimer's disease and Parkinson's disease. The effects of the bioactive component of *MO*leaves in protecting against cardiovascular, diabetes and cancer **(Marcela,2017)**.A study in 30 women showed that taking 1.5 teaspoons (7 grams) of moringa leaf powder every day for three months significantly increased blood antioxidant levels and reduced fasting blood sugar levels by 13.5%, on average and another study showed that *Moringa Oliefera* may have similar cholesterol lowering effects **(Arnarson, 2018).**

OBJECTIVES

Based on the above discussions, the present study was carried out with the following objectives

- To formulate and standardize the Drumstick leaves powder incorporated choco chip cookies
- To select the most acceptable proportion after sensory evaluation.
- To ascertain shelf-life of selected food products.
- To analyze the Iron and Calcium content of Drumstick leaves powder incorporated choco chip cookies.
- To popularize Drumstick leaves powder incorporated choco chip cookiesamong Adolescent girls.

METHODOLOGY

The experimental procedure adopted for the present study is given in the form of flow chart in **Figure 1.**

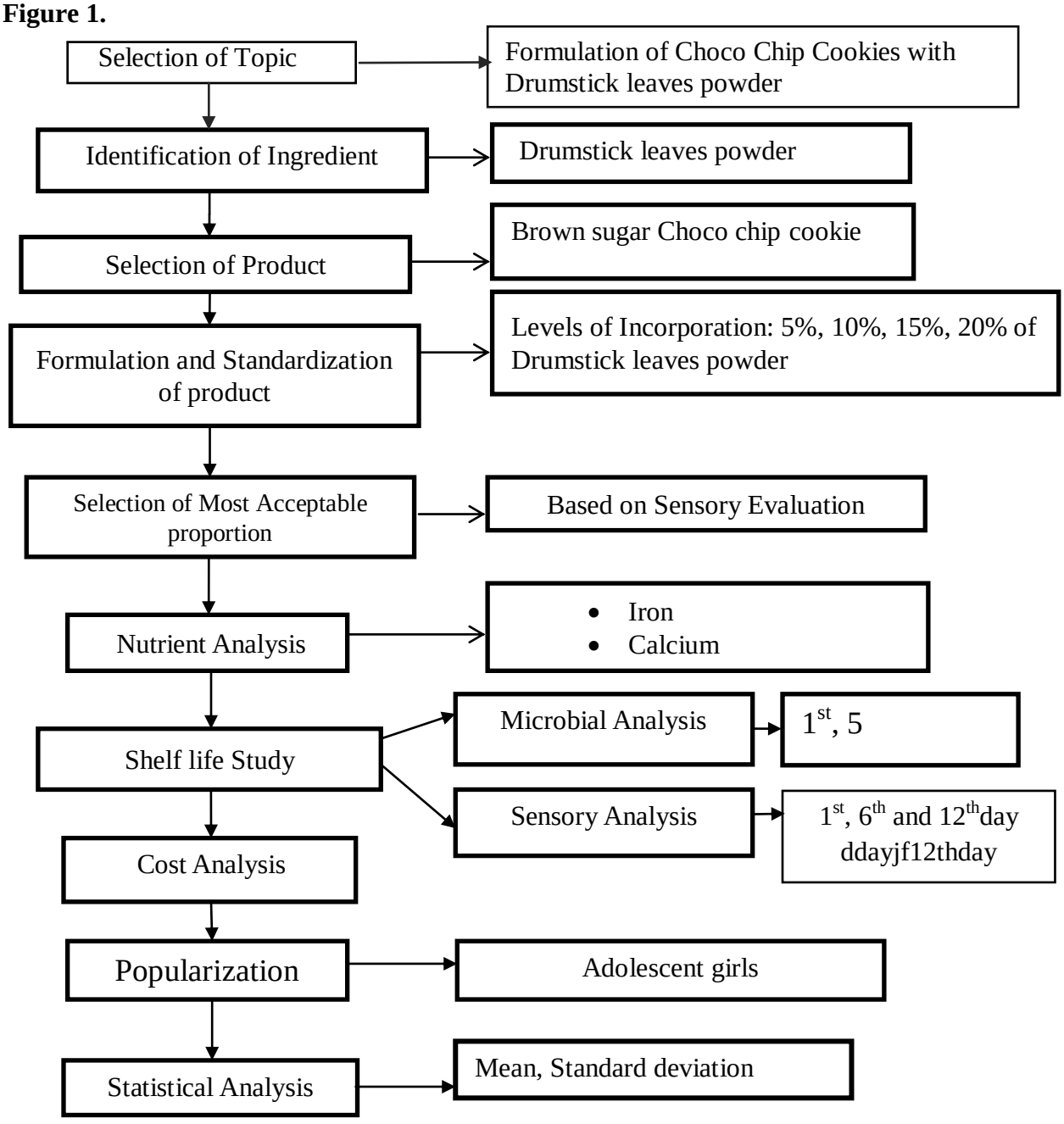

Figure 1

METHODOLOGY
RESULTS

Mean Sensory Analysis of Standard and Drumstick leaves powder incorporated choco chip cookies

The mean sensory scores obtained by standard and varying proportions of Drumstick leaves powder incorporated choco chip cookies is given in Table I

TABLE I
MEAN ORGANOLEPTIC SCORE OBTAINED BY VARYING PROPORTION CHOCO CHIP COOKIES

S.No.	Criteria	Max Score	Standard Mean±SD	Sample A(5%) Mean±SD	Sample B(10%) Mean±SD	Sample C(15%) Mean±SD	Sample D(20%) Mean±SD
1	Appearance	5	5±0	5±0	4.93±0.25	4.9±0.30	4.93±0.25
2	Colour	5	4.86±0.34	4.76±0.43	4.6±0.49	4.73±0.44	4.73±0.44
3	Texture	5	5±0	4.86±0.34	4.83±0.37	4.83±0.37	4.73±0.52
4	Flavour	5	4.9 ±0.30	4.93±0.25	4.86±0.34	4.9 ±0.30	4.76±0.62
5	Taste	5	4.96±0.18	4.96±0.18	4.83±0.46	4.73±0.52	4.4±0.85
	Overall acceptability			4.90±0.24	4.81±0.38	4.81±0.38	4.71±0.53

From the above **Table I** it is observed that Sample A had the highest mean score in all the criteria when compared to other samples like sample B, C and D. So Sample A was chosen as the best product and subjected `to further analysis.

Nutrient Analysis of Drumstick leaves powder Incorporated Chocó Chip Cookie

Nutrient analysis refers to the process of determining the nutritional content of foods and food products. The details regarding Iron and Calcium content of Drumstick leaves powder is given in **Table II**

TABLE II NUTRIENT ANALYSIS OF THE SELECTED PRODUCT AND STANDARD PRODUCT

SI.No	NUTRIENT	STANDARD (per 100g)	SAMPLE (per 100g)
1	**Iron (mg)**	**1.2**	**5.56**
2	**Calcium (mg)**	**20**	**80.2**

From the above **Table II**it was observed that the Iron content was 5.56mg/100g in selected product and 1.2mg/100g in standard product. Calcium content was 80.2mg/100g in selected product and 20mg/100g in standard product. From the results, it can be concluded that there is a slight increase in iron and calcium content on incorporation of Drumstick leaves powder. One hundred grams of Drumstick leaves powder contains 185mg and 4mg of Calcium and iron respectively **(USDA,2018).**

Shelf life study

Shelf life is the recommended maximum time for which products can be stored during which the defined quality of a specified proportion of the goods remain acceptable under expected conditions of distribution, storage and display. Use prior to the expiration date does not guarantee the safety of a food or drug and a product is not necessarily dangerous or ineffective after the expiration date. For food, shelf life from expiration date; the former refers to food quality the later to food safety. A product that has passed it shelf life might still be safe, but quality is no longer guaranteed.

The standard and selected products were analyzed for its shelf life by evaluating their sensory attributes and total microbial load after packing in air tight container for a period of 12 days.

Microbial Analysis of the Standard and Selected Drumstick leaves powder Incorporated Choco Chip Cookie on storage

Microbial analysis is the primary indicator in shelf-life studies. Microbiological testing on food products includes presence/ absence of pathogens, total coli form and aerobic plate counts.

The details regarding the microbial content in standard and selected proportion of Drumstick leaves powder incorporated choco chip cookies on storage is given in **Table III**

TABLE III MICROBIAL LOAD OF THE STANDARD PRODUCT AND SELECTED PRODUCT ON STORAGE

Days	**Name of the Product**	**Indicator Test Result (CFU / gram) and Interpretation/Standard Plate Count. Air tight container**			
		G	**M/S**	**US**	**P H**
1ST day	Standard	✓	-	-	-
	Sample	✓	-	-	-
5th day	Standard	✓	-	-	-
	Sample	✓	-	-	-
11th day	Standard	✓	-	-	-
	Sample	✓	-	-	-
Remark	On the 13th day after sampling NO contamination was found.				
Organism identified	No Bacterial growth was observed.				

(Good= **G**; Satisfactory = **S**; Marginal = **M**; Unsatisfactory = **US**; Potentially Hazardous = **PH)**

From the above **Table III** it was clear that there was no microbial growth in both standard and sample immediately after preparation and on 1st, 5th, 11th day. So, from the result we can conclude that the product is safe for consumption microbially on storage in Air tight container for a period of 12 days.

Sensory Analysis of the Standard and Selected Drumstick leaves powder Incorporated Choco Chip Cookie on storage.

Sensory analysis implies sensory of taste, smell, and other senses. Sensory analysis is used to compare similarities or differences in a range of dishes or products, evaluate a range of dishes or products, analyze food samples for improvements, example is acceptable vs. unacceptable, explore specific characteristics of a product, whether a final food product meets its original specification, provide feedback data to enable informed decisions to be made.

The details regarding the mean sensory scores of standard and Drumstick leaves powder Incorporated Choco Chip Cookie on storage in Air tight container given in **Table IV**and **Figure 2**

TABLE-IV
MEAN SENSORY SCORE OF STANDARD AND SELECTED DRUMSTICK LEAVES POWDER INCORPORATED CHOCO CHIP COOKIE ON STORAGE IN AIR TIGHT CONTAINER

S. No	Criteria	Max Score	1st day		6th day		12th day	
			Std	Sample	Std	Sample	Std	Sample
1	Appearance	5	5±0	4.93±0.25	4.96±0.18	5.0±0	5±0	4.93±0.25
2	Colour	5	4.96±0.18	4.73±0.58	4.96±0.18	5.0±0	5.0±0	4.93±0.25
3	Texture	5	4.93±0.36	4.9±0.40	4.96±0.18	4.96±0.18	5±0	4.96±0.18
4	Flavour	5	4.96±0.18	4.93±0.25	4.96±0.18	5±0	5±0	5±0
5	Taste	5	4.96±0.18	4.96±0.18	5.0±0	5.0±0	4.96±0.18	4.96±0.18
	Overall acceptability		4.96±0.18	4.89±0.33	4.96±0.18	4.99±0.03	4.99±0.03	4.95±0.17

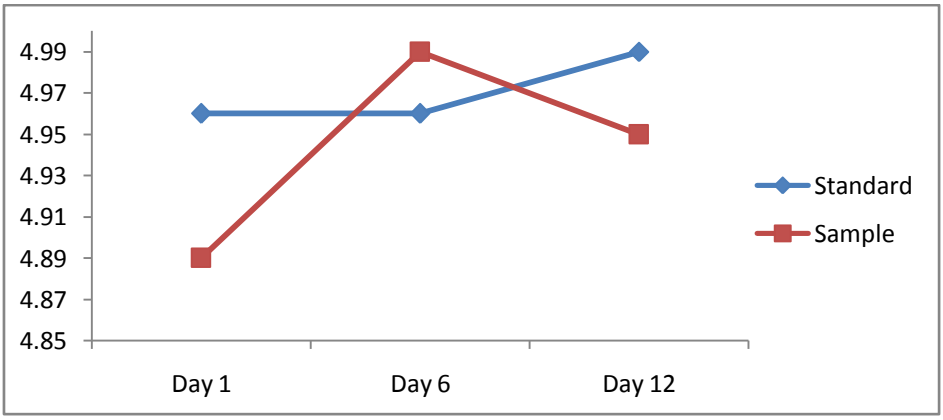

Figure 2

Mean Sensory Score of Standard and Selected Drumstick leaves powder Incorporated Choco Chip Cookie on storage in Air tight container

Above **Table IV**and **Figure 2**clearly shows that there was a negligible decrease in standard and sample on storage in Air tight container. So it can be concluded that packaging material is good in retaining the sensory attributes of Choco Chip Cookie**.**

Popularization of the Selected Product

Popularization among public helps to determine their food habits, preference. The Drumstick leaves powder Incorporated Choco Chip Cookie was popularized among the adolescent girls in RVS College of Arts and Science, Sulur, Tamil Nadu.

The result in popularization study shows that 30 adolescent girls like bakery foods. About 28 including Drumstick leaves in their daily diet. Thirty girls know that Drumstick leaves are rich in Iron. Only 19 girls are used drumstick leaves in powder form. Thirty girls were aware that Drumstick leaves is rich in Iron. Twenty two girls were tasted Choco Chip cookies before. Thirty girls were aware about Calcium is good for bones. Thirty girls like the drumstick leaves powder incorporated Choco Chip Cookie. Thirty girls are willing to recommend this product to their friends. Thirty girls are interested to buy this product in the market if available.

CONCLUSION

From the study, it is concluded that Choco Chip Cookie incorporated with 5% Drumstick leaves powder was acceptable. The prepared product is high in Iron and Calcium when compared to the standard product. The prepared product is acceptable till 12th day without any microbial deterioration if it is stored in Air tight container. In the popularization study, the entire participants accepted the product.

RECOMMENDATIONS

- Studies can be carried out by incorporating Drumstick leaves powder in other food products.
- Long term shelf life study can be done using modified atmospheric storage.
- Study the impact of supplementation of drumstick leaf powder incorporated Choco Chip Cookie to anemic subjects.

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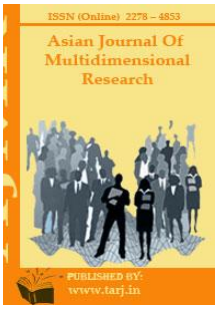

Asian Journal of Multidimensional Research (AJMR)

(Double Blind Refereed & Reviewed International Journal)

UGC APPROVED JOURNAL

TRANS Asian Research Journals

HOUSEHOLD METHODS AND CHALLENGES FOR FOOD SAFETY

Dr Renu Agarwal*; Ms S Kanchana Priya**

*Head,
Department of Home Science
SDNB Vaishnav College for Women,
Chromepet, Chennai, TN, INDIA

**Department of Home Science
SDNB Vaishnav College for Women,
Chrompet, Chennai, TN, INDIA

ABSTRACT

Main objective of this study was to find out various household methods and challenges for food security in Indian context.A normative survey was done on total 104 houses with average SES from Chennai city. Result indicates that food insecurity is due to Changes in our food production and supply, including more imported foods, the environment leading to food contamination, New and emerging bacteria, toxins, and antibiotic resistance, consumer preferences and habits and tests that diagnose foodborne illness. Various methods for food security observed through this study were - Clarifying and standardizing food labelling, Setting targets for food waste prevention and Aiming targeted awareness campaigns at households and the general public.

KEYWORDS: *Food Security, Household, Challenges*

INTRODUCTION

The nutritional status of each member of the household depends on several conditions being met: the food available to the household must be shared according to individual needs; the food must be of sufficient variety, quality and safety; and each family member must have good health status in order to benefit from the food consumed.

FAO recognizes that healthy, well-nourished people are both the outcome of successful social and economic development and constitute an essential input into the development process.

Food insecurity is widespread across the globe. Measuring and quantifying food insecurity is a crucial component of making progress towards the improvement of food security. How smallholders may contribute to food and nutrition security remains a key challenge in many developing countries like India. This study discusses the potential role of smallholders in food security. This paper presents one possible approach towards measuring the share of the population that might be affected by food insecurity and to what extent. This approach relies on primary data sources.

Laura Riesgo (2016) outlines a group of recommendations for improving the food security of smallholder farms in developing countries and developed a model which considers not only food availability (production) but consumption decisions, assuming the dual character of households as producers and consumer, the effects of transaction costs on markets, the heterogeneity of farm households, and crop rotations and resource use (land and labour).

Stacey Rosen and ShahlaShapourifound in their study that incomes in the lowest income group are roughly equal to the food security threshold for the low-cost basket.

OBJECTIVES

- To study about various challenges for food security at household level.
- To study various methods adopted for food security at household level in Chennai city.

METHOD

One normative survey was conducted for this study. 104 homes were sampled with average SES (socioeconomic status) from Chennai city, India. Questionnaire with open ended questions was developed by the investigator self. Data from survey were recorded, classified and interpreted in percentage as result.

RESULTS

Results demonstrate that women play a major role in producing and providing food for their households in this high-risk climate and conflict area, while men are more likely to migrate seasonally and even permanently. In addition, women are responsible for food preparation, processing, and food preservation and are wholly responsible for attending to household garden plots. They therefore contribute more to household food security than men, though this contribution is not recognized in official statistics.

Food security challenges at household level

The key issue which creates the problem of food insecurity in urban areas and needs to be addressed is the large proportion of informal workforce resulting in unplanned growth of slums which lack in the basic health and hygiene facilities. The children are food insecure because of factors attributed to overpopulation, poverty, lack of education and gender inequality. Poverty is a major cause as it

limits the amount of food available to children. Overpopulation is linked to competition for food and can lead to malnutrition amongst children, especially in rural areas where access to food is limited.

S NO	CHALLENGES FOR FOOD SAFETY	RESPONSES IN %
1	Changes in our food production and supply	24
2	Including more imported foods	22
3	The environment leading to food contamination	21
4	New and emerging bacteria, toxins, and antibiotic resistance	18
5	Consumer preferences and habits	16
6	population , poverty and gender inequality	15
7	Faulty food distribution system	10
8	Unmonitored nutrition programmes	8
9	Lack of intersectoral coordination	8

Inadequate distribution of food through public distribution mechanisms is also a reason for growing food insecurity in the country. The often inaccurate classification as above poverty line (APL) and below poverty line (BPL) categories had resulted in a big decline in the off take of food grains. Besides this, low quality of grains and the poor service at PDS shops has further added to the problem.

Hence, although a number of programmes with improving nutrition as their main component are planned in the country but these are not properly implemented.

Food security methods at household level

Food availability addresses the supply side of food security and is determined by the level of food production, stock levels and net trade. An adequate supply of food at the national or international level does not in itself guarantee household level food security. Concerns about insufficient food access have resulted in a greater policy focus on incomes, expenditure, markets and prices in achieving food security objectives.

Food utilization is commonly understood as the way makes the most of various nutrients in the food. Sufficient energy and nutrient intake by individuals is the result of good care and feeding practices, food preparation, diversity of the diet and intra-household distribution of food. Combined with good biological utilization of food consumed, this determines the nutritional status of individuals.

Whilepurchasing any food product,label should explain date of manufacture and expiry. The study findings indicate that the main problems women face as food producers and providers are a lack of access to the full package of improved production methods (improved seeds, fertilizers, modern farming methods, credit services, pesticides, appropriate technologies, and marketing facilities) in addition to gender disparities and gender-biased traditions. Other methods for food safety were found during the study were -Adverse weather conditions, political instability or economic factors (unemployment, rising food prices) may have an impact on food security status.

S NO	METHODS OF FOOD SECURITY	RESPONSE IN % (N=104)
1	Physical availability of food	26
2	Economic and physical access to food	20
3	Proper Food utilization	19
4	Clarifying and standardizing food labelling	19
5	Setting targets for food waste prevention	16
6	Aiming targeted awareness campaigns at households and the general public	16
7	Others-Adverse weather conditions, political instability, or economic factors (unemployment, rising food prices) may have an impact on your food security status	38

CONCLUSION

A complete community based approach needs to be adopted. Efforts should be made by the concerned health departments and authorities to initiate and supervise the functioning of the nutrition related schemes in an efficient way. Annual surveys and rapid assessments surveys could be some of the ways through which program outcomes can be measured. Evaluations must be timely performed and should provide relevant information regarding the effectiveness of interventions. Use of information technology to improve program monitoring can be thought of too.

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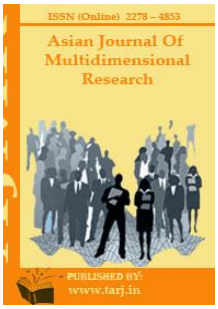

Asian Journal of Multidimensional Research (AJMR)

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SYNTHESIS OF FEW-LAYER GRAPHENE USING PLANT EXTRACTS AND ANALYSIS OF ITS APPLICATIONS IN FOOD INDUSTRY

Jannathul Firdhouse M.*; Lalitha P.**

*Assistant Professor of Chemistry,
Hajee Karutha Rowther Howdia College,
Uthamapalayam, Theni, Tamil Nadu, INDIA

**Associate Professor,
Department of Chemistry,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: goldenlalitha@gmail.com

ABSTRACT

Graphene is used in the quality assurance and assessing the food safety. Hence recent research in food science is focused on synthesis of graphene. An eco-friendly and facile method for synthesizing few-layer graphene using A. dubius, A. polygonoides and E. crassipes as a reductant was attempted. The few-layer graphene obtained was characterized by the UV-visible spectroscopy, FTIR and Raman spectroscopic analysis. UV-Visible analyses showed the concentration of phytoextracts and temperature to influence the extent of reduction of Graphene oxide (GO). The zeta potential measurements confirm the stability and biocompatibility of AKRGO and SKRGO.

KEYWORDS: *Graphene, XRD, TGA, SEM, FTIR.*

1. INTRODUCTION

Food plays a vital part in everyone's life giving us the energy and nutrients to grow, to be active and healthy. Food being biological in nature, supports microbial growth. Processed foods contain preservatives, colorants, and other additives that are used to enhance consumer preferences and/or shelf life. Many of these additives are deleterious necessitating evaluation of such foods before delivery to the market. The future of food security may depend on the technological advancements of graphene-based nanosensors, integration of a graphene sensor in a food container and generating breakthroughs in smart packaging solutions (**Sundramoorthy and Gunasekaran, 2014**).

Graphene has become a fascinating material due to its novel structural, electronic, thermal, and mechanical properties which arise from the collective behaviour of electrons. Its highly favourable optical properties find significant applications as photovoltaics and transparent conductors. rGO is used in nanoelectronics, biosensors, nanocomposites and in water treatment. Few-layer graphenes are used as flexible, transparent conductors and to reduce wear and friction on sliding steel surfaces. Chemical synthesis is one of the most popular methods of synthesis of graphene (**Alwarappan *et al.*, 2012; Roy-Mayhew *et al.*, 2010**). The present research work was aimed at synthesis of few-layer graphene using the aqueous extract of three plants viz. *A. dubius, A. polygonoides* and *E. crassipes* which are also easily available. This bioreduction method is simple, cost-effective and avoids the use of any toxic reagents and also it offers another route to the production of graphene.

2. MATERIALS AND METHODS

The methodology adopted for the reduction of graphene oxide to few-layer graphene using plant extracts is as follows.

2.1 Synthesis of graphene oxide

Graphene oxide was prepared by modified Hummer's method (**Marcano *et al.*, 2010**). The prepared graphene oxide was homogenized using an Ultrasonic homogenizer and dried in vacuum.

2.2 Preparation of phytoextracts for the synthesis of few-layer graphene

Aqueous extract of *Eichhornia c*rassipes (WH) (100 mg) was sonicated with double distilled water (100 mL) at 50 ºC by sonic bath for 30 min. Fresh plant of *Amaranthus polygonoides* (SK) and *Amaranthus dubius* (AK) (20 g) was washed, blended in a mechanical blender for 30 min, filtered and refrigerated for further use.

2.3 Bioreduction of graphene oxide to few-layer graphene

The stable graphene oxide was prepared by sonicating 60 mg in 120 mL distilled water for 30 min. Aqueous extract (10 mL each) of *A. polygonoides, A. dubius* and *E. crassipes* was added to the stable graphene oxide solution and refluxed until the brown colour solution changes to black. The black colour solution was filtered using Whatmann filter paper No. 42 and dried to get reduced graphene oxide (RGO).

2.4 Characterization of biosynthesized graphene

The formation of few-layer graphene were characterized by UV-Visible spectroscopy using a Double beam spectrophotometer 2202-(SYSTRONICS). The particle size and zeta potential of the dispersed solution of few-layer graphene in water were analyzed using NanoPartica SZ-100 series (Horiba) maintained at a temperature of 25 ºC for 2 min. The FTIR spectra of the synthesized powdered form of few-layer graphene was performed using Fourier Transform Infrared spectroscopy

8400S (Shimadzu). The Raman spectrum for the biosynthesized few-layer graphene (AKRGO, SKRGO and WHRGO) was obtained using R-3000 QE with an excitation wavelength of 785 nm and optical resolution of 6 cm^{-1}.Scanning Electron Microscope (e-SEM, FEI Quanta 250) was used to examine the morphology of the few-layer graphene (AKRGO) coated on the glass substrate.

3. RESULTS AND CONCLUSION

Graphene oxide treated with aqueous extracts of *A. dubius* (AK), *E. crassipes* (WH) and *A. polygonoides* (SK) separately on continuous reflux produced a black solution followed by precipitation. Similar observation was noted with WH and SK extracts. The production of graphene was confirmed from its UV–Visible spectrum. Agglomeration occurred on addition of plant extract and dispersed finally, after refluxing for 1 h for all three aqueous plant extracts. The time taken for the reduction of graphene oxide to graphene under reflux was found to vary for the three plant extracts.

It is quite obvious from the results (**Table 1**) that under refluxed conditions, the brown colour solution changes to black after 4, 6 and 7 h for WHRGO, AKRGO and SKRGO respectively. The difference in the time of the reduction is due to the difference in the phytoconstituents present in the aqueous extracts of the chosen plants. The aqueous extract of WH contain more phytochemicals *viz.* alkaloids, flavonoids, terpenoids, steroids, quinone, carbohydrates, anthocyanin whereas, AK contains only alkaloids, flavonoids, tannins, terpenoids and only two constituents, namely, tannins and saponins was present in SK extract. This explains the formation of graphene in lesser time using the WH extract. These molecules play an important role in the bioreduction, formation and stabilization of nanomaterials.

To achieve complete reduction of graphene oxide and to increase the yield of graphene all the three mixtures were refluxed continuously for 3-5 h after the appearance of black colour, to remove the oxygen-containing moieties present in graphene oxide. It was noted that the temperature, concentration of the phytoextracts and time of reaction play a foremost role in the synthesis of graphene. Further, it was observed that more amounts of phytochemicals may directly affect the reduction time or the formation of graphene.

TABLE 1 TIME OF FORMATION OF GRAPHENE USING THE AK, SK AND WH EXTRACTS UNDER REFLUXED CONDITION

S.No	Plant extracts-mediated graphene	Time of formation (hours)
1.	AKRGO	6
2.	WHRGO	4
3.	SKRGO	7

Trial studies for synthesis of graphene using plant extracts by various other methods like sonication; higher temperature conditions *etc*. did not give expected results. Agglomeration of graphene was noted.

3.1 UV-Visible spectral analysis

The UV Vis spectrum of GO exhibits absorption bands at 236 nm and 300 nm corresponding to π-π* transitions and C=O bonds respectively. The red shift at 278, 274 and 270 nm obtained for the AKRGO, WHRGO and SKRGO respectively, corresponds to the deoxygenation and confirms the complete reduction of graphene oxide (**Figure 1 a, b and c**). It was observed that the optical absorption of AKRGO and SKRGO was higher than that of graphene oxide (GO) except for

WHRGO. The concentration of few-layer graphene and graphene oxide in the dispersed solution decides the intensity of absorption bands in the UV-Visible spectrum. A new absorption peak or red shift observed in the UV-Visible spectra proves reduction of graphene oxide and the gradual restoration of electronic conjugation state of graphene nanosheets.

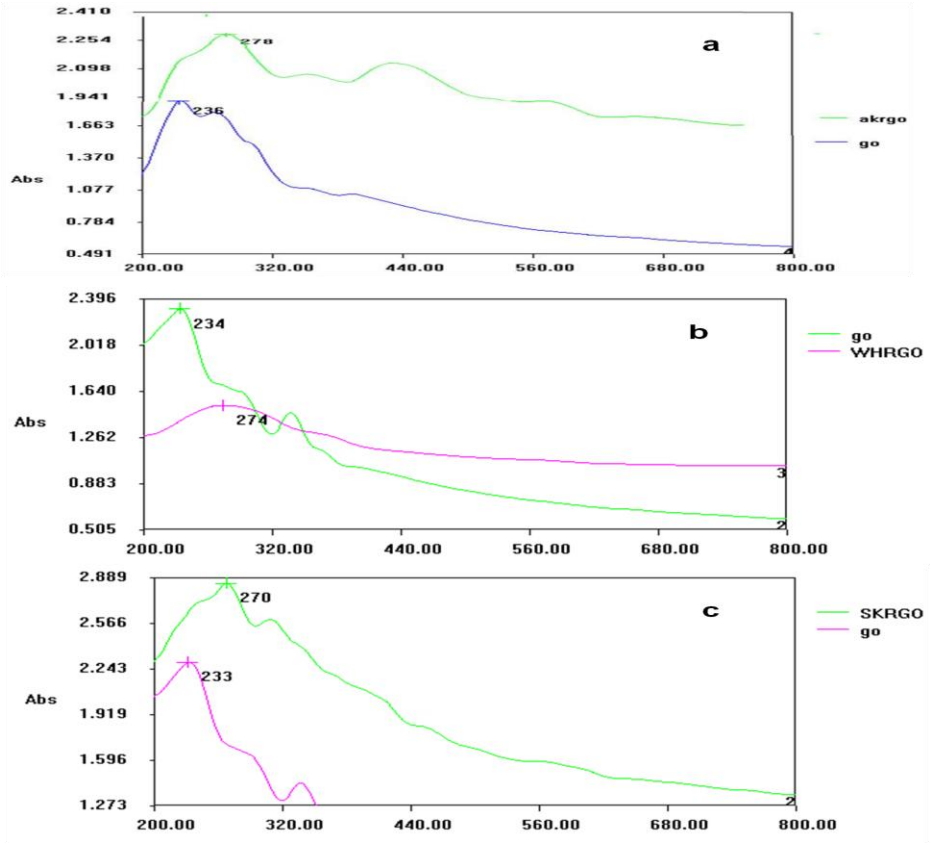


Figure 1. UV-Visible spectra of graphene oxide (GO), (a) AKRGO, (b) WHRGO and (c) SKRGO

3.2 DLS particle size analysis

Graphene is water insoluble.This limits its application in biomedical fields. Hence, to find out the biocompatibility of the synthesized few-layer graphene, the samples (AKRGO, SKRGO and WHRGO) were dispersed in water and sonicated. AKRGO was found to show good dispersability than SKRGO and WHRGO. The particle size of the dispersed solution of biosynthesized nanographene (AKRGO) was obtained using a particle size analyzer and confirmed as 4.8 nm (**Figure 2a**).

3.3 Zeta potential analysis

In the present study, the zeta-potential values of the biosynthesized graphene AKRGO, WHRGO and SKRGO are -47.4, -64 and -48.5 mV respectively (**Figure 2b and 3a and 3b**). The aforesaid values of zeta potential explain the relatively good stability of AKRGO and SKRGO than WHRGO.

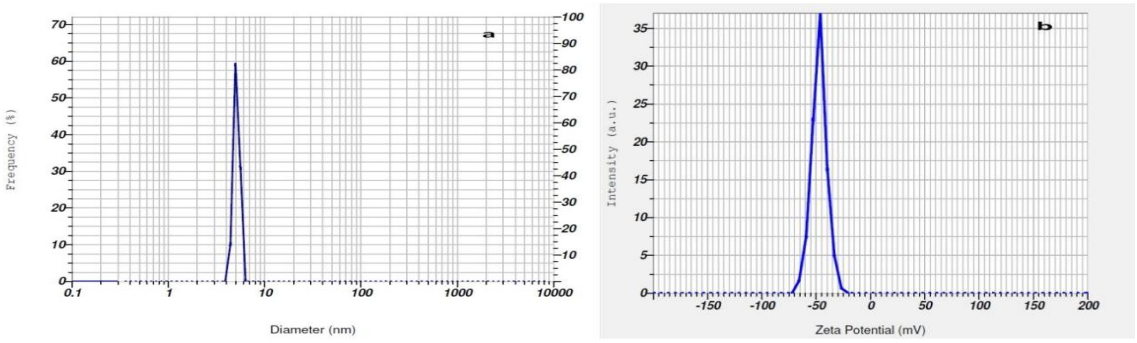


Figure 2. Results of Particle size (a) and zeta potential (b) measurement of the synthesized graphene (AKRGO)

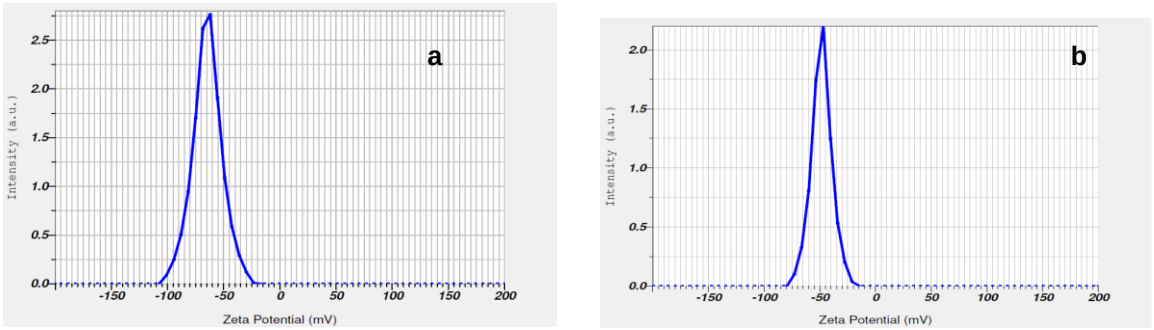


Figure 3. Zeta potential measurement of the synthesized graphene

(a) WHRGO and (b) SKRGO

3.3 Raman spectral analysis of few-layer graphene

The Raman shift of biosynthesized graphene AKRGO, WHRGO shows D band at 1350 cm^{-1} (**Figure 4a and b**) whereas, the D band appears at 1359 cm^{-1} for SKRGO (**Figure 4 c**). The G band of AKRGO was shifted to 1641 cm^{-1} instead of 1587 cm^{-1} which manifests that G peak is strongly temperature dependent. The peak at 1594 and 1591 cm^{-1} revealed the presence of G band for WHRGO and SKRGO respectively (**Figure 4 b and c**). The absence of 2D peak in all three biosynthesized graphene confirms the formation of few-layer graphene. In the present study, all the three biosynthesized graphene revealed the shift of D and absence of 2D peaks signifying the formation of few-layer graphene.

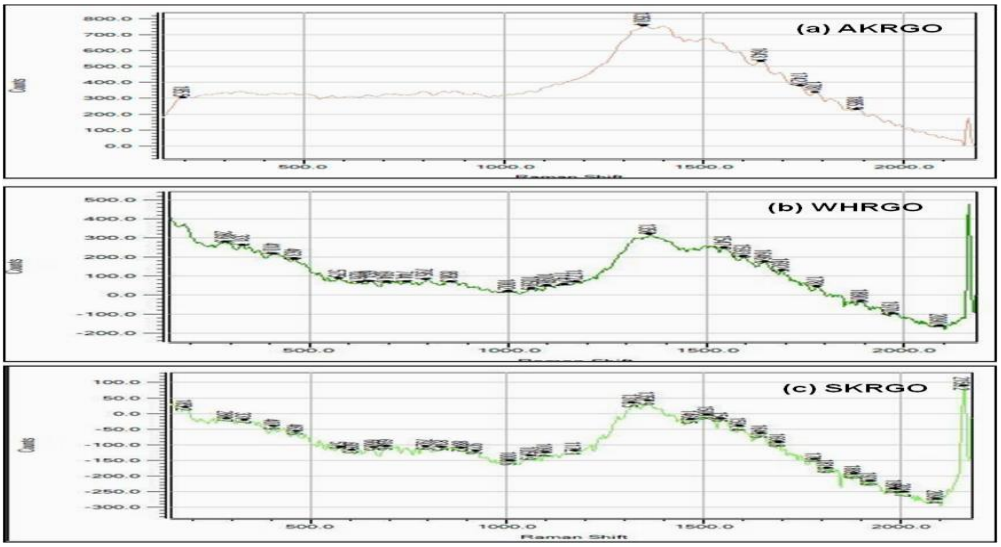


Figure 4. Raman spectra of synthesized graphene – (a) AKRGO, (b) WHRGO and (c) SKRGO

3.4 SEM analysis of few-layer graphene

SEM analysis of graphene may provide only its surface morphology. The formation of layers may not be clearly predictable in SEM micrographs. Hence one representative sample was chosen for this study. To ascertain the formation of single or few-layer graphene SEM analysis was carried out for the WHRGO and SKRGO (**Figure 5a and b**). The SEM–EDAX image of few-layer graphene synthesized using the aqueous extract of *A.dubius* is shown in **Figure 5**. The high magnification SEM image displays, thin and wrinkled platelets of transparent layers (**Figure 5c**). The surface of the AKRGO resembled smooth, transparent nanosheets as that of normal graphene (**Figure 6c**).The EDAX spectrum of AKRGO reveals graphene to mainly consist of elemental carbon and some other elements such as Na, Mg, Al, Ca and Si as impurities (**Figure 5d**) which are from the experimental procedure adopted in the synthesis of graphene. The EDAX spectrum of graphene oxide discloses the oxygen content to be 34.5 atom % (**Table 2**) and the atomic ratio of carbon to oxygen as 1.7.

TABLE 2 EDAX MEASUREMENTS OF GO AND AKRGO

Material	C (at. %)	O (at. %)	C/O ratio
Graphene oxide	62.7	34.5	1.7
Synthesized graphene (AKRGO)	75.6	20.2	3.7

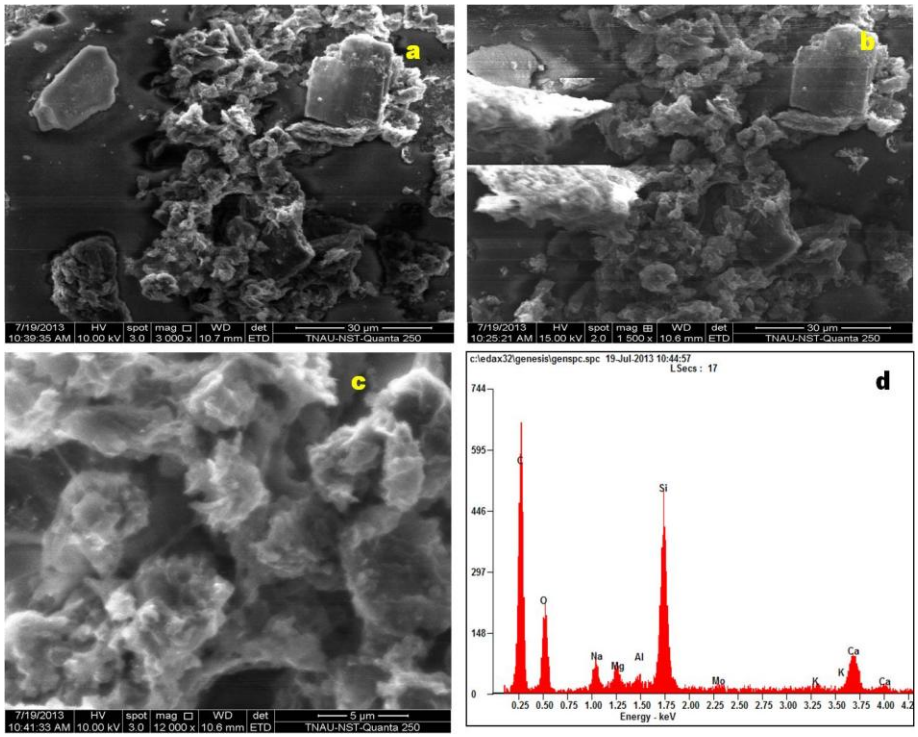
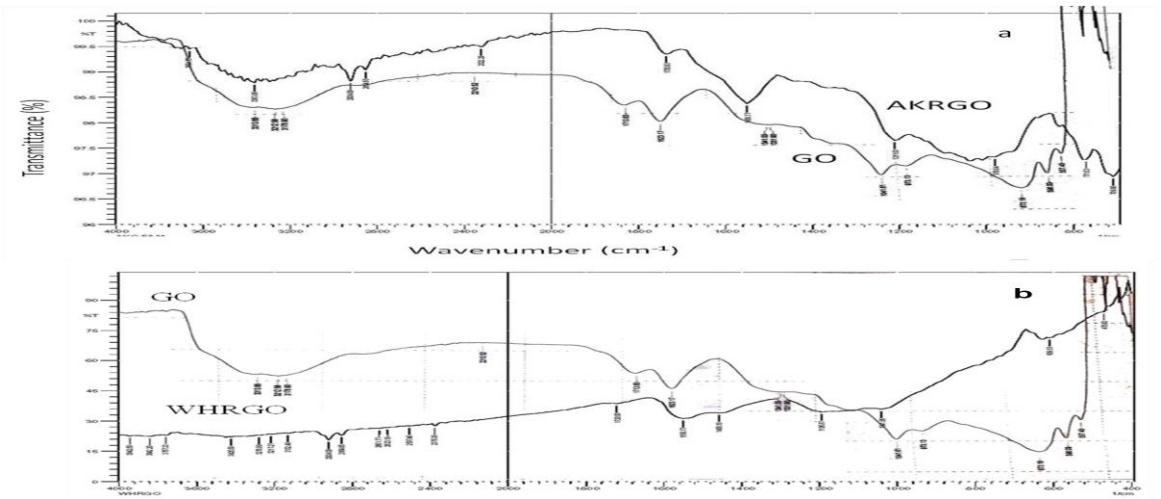


Figure 6. SEM images (a, b, c) of few-layer graphene (AKRGO) at different magnifications and EDAX spectrum (d)

3.5 FTIR analysis

The FTIR spectra of graphene oxide (GO) and graphene (AKRGO, WHRGO and SKRGO) are shown in **Figure 6 (a, b and c)** respectively. The two peaks at 1720 cm^{-1} and 1610 cm^{-1} was assigned to carbonyl and aromatic region, respectively, for graphene oxide (GO). The disappearance of the aforesaid peaks was observed for AKRGO in **Figure 6 a, b and c**, revealed the reduction of graphene oxide using the aqueous extract of AK, WH and SK. The absence of carbonyl peak in the FTIR spectra (**Figure 6 a, b and c**) indicates the formation of graphene AKRGO, WHRGO and SKRGO.



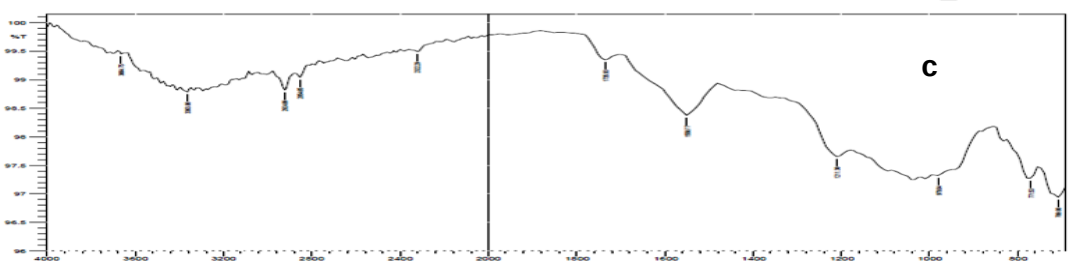


Figure 6 FTIR spectra of graphene oxide (GO), (a) AKRGO, (b) WHRGO and (c) SKRGO

3.6 Analysis and applications of graphene in food industry

The detection of the molecular contaminants or adulterants in complex food matrices can be accurately analyzed by the integrated nanomaterials due to their improved speed and sensitivity. In recent years, with these innovative developments, graphene-based applications have widened to ensure food quality, packaging and safety. A dye Malachite green is used as an antimicrobial agent in the food industry but it is highly toxic. Graphene quantum dot–AuNP–modified glassy carbon electrode have been proposed for enhanced detection of malachite green with an LOD of 1.0×10^{-7}mol L^{-1} (**Hou *et al.*, 2013**). **Chen *et al.*,** (2013) used a platinum NP- loaded graphene nanosheet -modified electrode to detect oxalic acid in the range 0.1–50 mM. Biosensors using TiO2–graphene–Pt–Pd nanocomposite coated with AuNPs have developed to determine cholesterol content in foods like animal brain, egg yolk, meat, seafood and milk-based products with sensitive upto (0.017 μM) (**Cao *et al.*, 2013**).

Bisphenol A (BPA), has been used in food-packaging materials which cause estrogenic adverse effects in human health. A graphene-packed solidphase extraction (SPE) column was used to extract BPA more effectively from dairy samples viz., packed milk, yoghurt, and canned infant formula samples (**Wang *et al.*, 2013**). E-noses (graphene-based sensor Arrays) were used as to analyze and detect the volatile organic compounds released from packaged foods (**Tung *et al.*, 2012**). Thus the synthesized few-layer graphene using A. *dubius, A. polygonoides* and *E. crassipes* are biocompatible, transparent, flexible and thermally stable. Hence these few-layer graphene may find applications in biosensors, food packaging and labeling.

4. CONCLUSION

Bioreduction of graphene oxide to graphene was achieved using AK, SK and WH extracts as a reductant. WH extract reduces graphene oxide to graphene at faster rate compared to other plant extracts. UV-Visible analyses, FTIR, TGA and Raman spectroscopic results provided evidence for the elimination of labile oxygen functional groups from the surface of GO. The zeta potential measurements confirm the stability and biocompatibility of AKRGO and SKRGO. Thus, this green method production of few-layer graphene will minimize the cost in sensing platform to detect the food quality and in future it might lead to its commercialization.

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SPECIAL ISSUE

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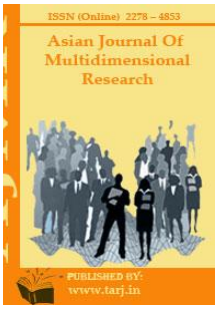

Asian Journal of Multidimensional Research (AJMR)

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ANTIOXIDANT ACTIVITY OF SEA BUCK THORN LEAVES AND ITS INDUSTRIAL APPLICATION IN OILS

L.R. Rajani*; Dr. Shilpa Jose**

*Faculty of Food science and Nutrition,
Department of Home Science,
St.Teresa's College, Ernakulam, INDIA
Email id:rajninair5@gmail.com

**Faculty of Food science and Nutrition,
Department of Home Science,
St.Teresa's College, Ernakulam, INDIA

ABSTRACT

Antioxidants are molecules that can neutralize free radicals by accepting or donating an electron to eliminate the unpaired condition. Quantitative assay of Sea Buck thorn Leaves was done to determine the presence of bio active compounds – Total polyphenols, alkaloid content, Total flavonoid content and Total antioxidant activity.Extract of the green leaf was applied to oils to determine the stability by rancimat method. Induction time is directly proportional to stability. From the results obtained it was found that the application of sea buck leaves in oils increased the induction time thereby increasing its shelf life.

KEY WORDS: *Sea Buck Thorn Leaves, Antioxidant Activity, Bio Active Compounds, Oil Shelf Life*

INTRODUCTION

Sea Buck Thorn (SBT) is a deciduous, branched, spiny shrub belonging to genus *Hippophae*and family Elaeagnaceae which usually forms shrub 3 to 15 feet height. Sea Buck Thorn *(Hippophaerhamnoides)* is a bush species widely distributed throughout the temperate zone of Asia, Europe and all over subtropical zones, being found especially at high altitudes. In India, species of Hippophae grow in five states; 3 in the North-West (Lahaul-Spiti districts of Himachal Pradesh, Uttaranchal and river belts of Indus, Nubra, Shyok, Zanskar etc. of ladakh) and 2 in the North- East (Sikkim and Arunachal Pradesh).

The antioxidant activity of sea buckthorn parts could be used to prolong shelf-life and quality of food. The peroxidation of lipids and oil-based food products is a major concern in the food processing industry. It causes the food quality deterioration and therefore, addition of synthetic oxidation inhibitors to improve stability of lipid products during storage is a common practice. Both antioxidant capacity and oxidative stability significantly were higher after enrichment with the extracts due to presence of phenolics like oleuropein, hydroxytyrosol, and quercetin.

Sea buckthorn contain antioxidants which are known to prevent rancidity of fats in foods and dietary antioxidants that reduce the adverse effects of reactive species such as free radicals of oxygen and nitrogen, in the normal functioning of the human body .The leaves of *H. rhamnoides*were considered for their antioxidant potential correlated to flavonoides and phenolic acids derivatives (Mousmi and Handique, 2013).

Following were the specific objectives of the study.

1. Quantitative assay of Sea Buck Thorn Leaves for Total poly phenol content, Alkaloids and Total flavonoid content

2. Determinationof total antioxidant activity of sea buck thorn leaves byDPPH assay.

3. Application of extracted anti oxidants in Oil to determine stability.

METHODOLOGY

Sea buck thorn leaves used for the present study were sourced from Ladakh. The raw samples of weight 1-2 gram was taken for determining the total polyphenol content, flavonoid content, alkaloid content and total antioxidant activity by DPPH assay. The solvent used for extraction was acetone.

Quantitative assay of selected sample of both raw and extract was conducted by the following methods.

Estimation of total poly phenols content by colorimetric method using Folin- ciocalteu reagent(ISO 14502-1, 2005); Determination of alkaloids- by gravimetric method(Prodromidis et al.,1994);Estimation of total flavonoid content – by using Aluminum chloride colorimetric method(Pallabet al., 2013);Determination of moisture content – by using moisture analyzer and Karl Fischer Titration(Kossakowska.A , 2016);Determination of total antioxidant activity of the Sea Buck Thorn Leaves was done by DPPH assay.(Kant.V et al., 2012).Application of extracted anti oxidant in Oil to determine stability was done by Rancimat analysis(Metrohm).

RESULTS AND DISCUSSION

The raw samples and the extract of Sea Buck Thorn leaves wereanalyzed by quantitative method for determining the bio active components – total poly phenol content, total alkaloid content , total flavonoid content and total antioxidant activity by DPPH.

TABLE 1: BIOACTIVE COMPOUNDS IN RAW SAMPLE AND EXTRACT OF SEA BUCK THORN LEAVES

Bio active compounds	Raw Sample Content in percentage (%)	Extract Content in percentage (%)
Total poly phenols	1.64%	7.77%
Alkaloid content	2.73%	39.70%
Total flavonoid content	0.124%	3.86%
Total antioxidant by DPPH assay	2.34%	20.34%

The total polyphenol content in sea buck thorn extract was 7.77%, alkaloid content was 39.70%, total flavonoid content was 3.86% and the total antioxidant activity was 20.34%.

The total poly phenol content in raw sea buck thorns leaves was 1.64%, total alkaloid content was 2.73%, total flavonoid content is 0.124% and the total antioxidant activity was 2.34% .

A related study by Javid et al., (2015) found that glycoside, terpenoids, steroids, flavonoids, reducing sugars and tannins were present in *H. rhamnoides.* The twigs *H. rhamnoides*extract showed Flavonoids (37.50 mg/mL) in methanol.SeaBuckThorn was also reported to have outstanding DPPH scavenging activity, which inhibited 46.5% of DPPH in two minutes.

In a pioneering study by Cameliaet. al (2008) ,Sea buckthorn alcoholic extract exhibited the strongest scavenging activity against superoxide anion and DPPH radical, while water-acetone extract exhibited a lower activity. Sea buckthorn extracts scavenged superoxide anion and DPPH free radical better than BHA and BHT. Alcoholic extract was the most efficient antioxidant, while BHT and BHA showed a lower antioxidant activity. These properties make sea buckthorn extracts applicable to be used as natural antioxidant in medical, pharmaceutical and food industry.

Application of extracted anti oxidants in Oils to determine stability:

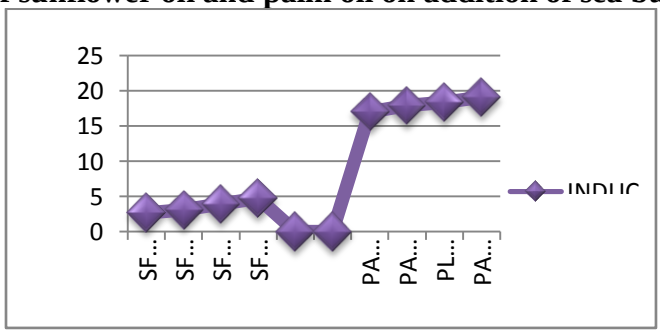
TABLE 2: RANCIMAT ANALYSIS OF SEA BUCK THORN LEAVES EXTRACT IN SUNFLOWER OIL AND PALM OIL

Sample	Induction time (Hours)
Sunflower oil	
a)Sunflower oil control	2.67
b)Sunflower oil with 200ppm Sea buck thorn leaves extract	3.1
c)Sunflower oil with 500ppm Sea buck thorn leaves extract	3.9
d)Sunflower oil with 1000ppm Sea buck thorn leaves extract	4.7
Palm oil	
a)Palm oil control	17.01
b)Palm oil with 200ppmSea buck thorn leaves extract	17.84
c)Palm oil with 500ppm Sea buck thorn leaves extract	18.31
d)Palm oil with 1000ppm Sea buck thorn leaves extract	19.06

- Temperature -110^{o}C
- Air flow -20Lph

Extracts of sea buck thorn leaves were applied to sun flower oil and Plam oil to determine the stability by rancimat method. The induction time determines the oxidation stability of oils and fats.. Induction time is directly proportional to stability.The leaf extract were applied in sunflower oil. In case of sunflower oil, the induction time of sunflower oil control was 2.67 hrs, by the application of 1000ppm sea buck thorn leaves extract, the induction time was found to be 4.7hrs. From the results obtained it was found that by the application of sea buck leaves in sunflower oil it increased the induction to twice when compared to sunflower oil control.In case of palm oil the induction time was lowest for palm oil control was (17.01 hr) and highest for 1000ppm sea buck thorn leaf extract (19.06 hr). Palm oil control got rancid very soon.With the addition of sea buck thorn leaves extract, which is a potent antioxidant into the oil , it was observed that the induction time was comparatively more, which signifies that the sample having the sea buck thorn leaves extract when subjected to high temperature and high air flow was more stable.

Fig 1: Stability of sunflower oil and palm oil on addition of sea buck thorn extract



CONCLUSION

Quantitative assay of Sea Buck thorn Leaves were done to determine the presence of bio active compounds – Total polyphenol, alkaloid content, Total flavonoid content, moisture content and Total antioxidant activity and from the result it was found that all the extracts of the green leaves had higher bioactive compounds than that of raw green leaves.Extracts of the green leaves were applied to oils to determine the stability by rancimat method. The induction time determines the oxidation stability of oils and fats. Induction time is directly proportional to stability. The leaves extract were applied in sunflower oil and palm oil.From the results obtained it was found that by the application of sea buck thorn leaves in sunflower oil it increased the induction time while the induction time was lowest for sunflower oil control..

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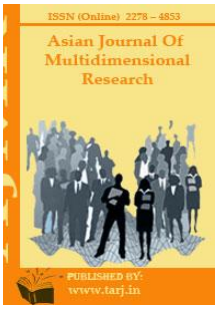

Asian Journal of Multidimensional Research (AJMR)

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FOOD AND NUTRITION SECURITY IN URBAN ADULTS OF BENGALURU WITH METABOLIC SYNDROME

Reddy Jyothsna Challagundla*; Dr. S. Kowsalya**

*Chief Clinical Nutritionist,
Clinical Nutrition Department,
Sakra World Hospital, Bengaluru, INDIA
Email id: jyothsnard@gmail.com

**Registrar,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

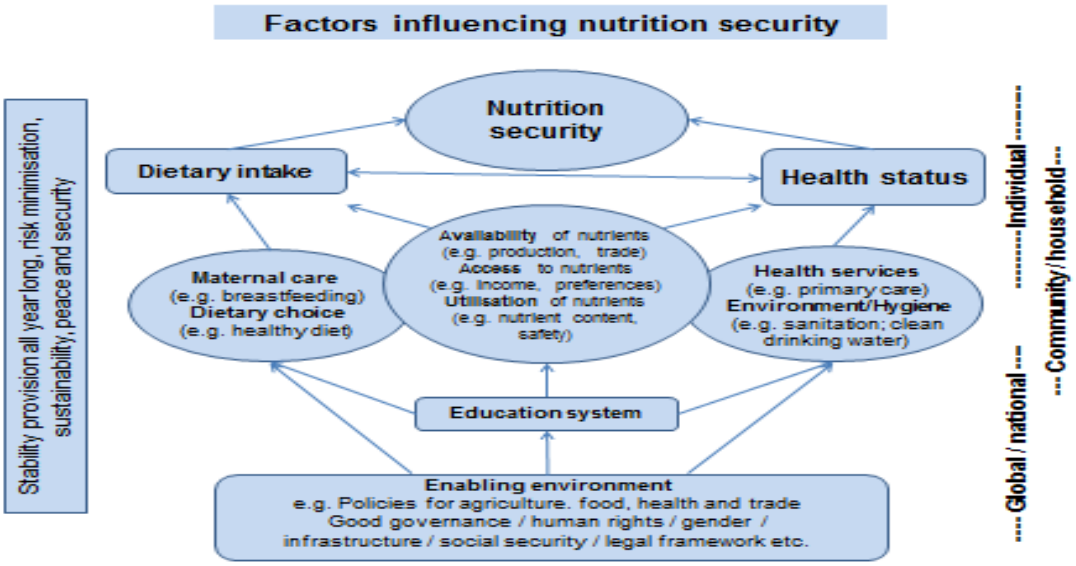
Food Security was said to be the major factor impacting on Public Health initially. Recently Food Security and Nutrition Security are integrated as Food and nutrition security (FNS) and this gained more prominence in Public Health Sector. So inspite of availability they were utilizing less. So we could observe the four pillars of Food security was better; but the Food Insecurity in this study group was due to worrying about ability to obtain food during travel at work, compromising quality and variety, reducing quantities and skipping of meal. Further; FNS can be taken up to target and address the most nutritionally vulnerable population and develop interventions to provide enhanced Food and Nutrition Security to such group. Moreover, food insecurity had a significant negative influence on dietary intake for families. Understanding strategies employed by households may help inform future interventions to address food insecurity. Later Nutrient Security was also mentioned to be taken into consideration. Also studies have shown the importance of Nutrition Security along with Food Security while determining the Health outcomes of the population.

KEYWORDS: *Nutritionally, Compromising, Interventions, Skipping*

INTRODUCTION:

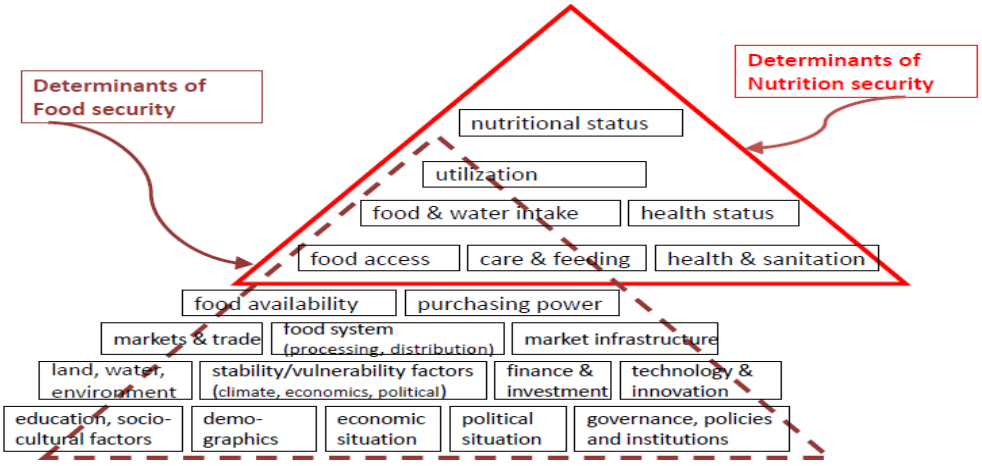
Food Security exists when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO 2000). This definition has widely established the four pillars of Food Security – Availability, Accessibility, Utilization and Stability. Food Security was said to be the major factor impacting on Public Health initially. In a recent 2017 study also the prevalence of food insecurity in American Indian households in the study sample was extremely high, and geographic designation may be an important contributing factor. Moreover, food insecurity had a significant negative influence on dietary intake for families. Understanding strategies employed by households may help inform future interventions to address food insecurity. Later Nutrient Security was also mentioned to be taken into consideration. A person is said to be Nutrition Secure when nutritionally adequate diet and the food consumed is biologically utilized such that adequate performance is maintained in growth, resisting or recovering from disease, pregnancy, lactation and physical work.UNICEF was among the first to capture the nutrient component of food security (UNICEF, 1990). In Figure 1, this concept is adapted to illustrate the role of food as a part of nutrition security, including external factors that influence health and nutrient intake, which are also contributing factors in nutrition security.

FIGURE 1: FACTORS INFLUENCING NUTRITION SECURITY (UNICEF, 1990)



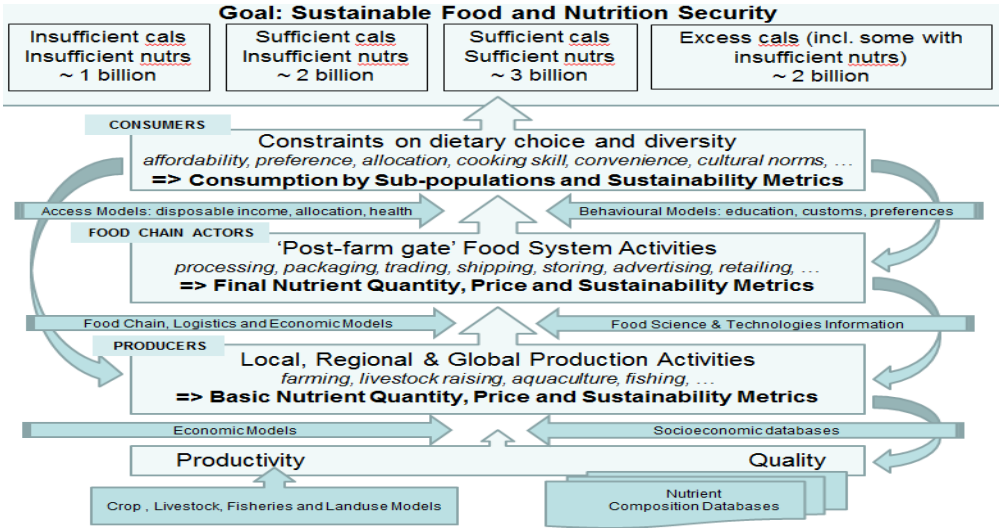
Recently Food Security and Nutrition Security are integrated as Food and nutrition security (FNS) and this gained more prominence in Public Health Sector. FNS exists when all people at all times have physical, social and economic access to food, which is safe and consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life (CFS, 2012). FNS is an integrated way to combine both concepts linguistically and conceptually and aim towards the developmental goals. The determinants of Food Security and Nutrition Security are interwoven in such a way that they are to be considered together to determine the Health status of an individual/ community. FNS actually facilitated in eradicating hunger and malnutrition. As per FAO, in CAPSA 2015 the Determinants of Food Security and Nutrition Security is represented in the picture below-

FIGURE 2: DETERMINANTS OF FOOD SECURITY AND NUTRITION SECURITY (FAO, IN CAPSA 2015)



Center for Integrated modeling of sustainable agriculture & Nutrition Security (CIMSANS) along with International Life Sciences Institute (ILSI) research foundation has given a schematic diagram demonstrating the multiple types of information that must be assembled in order to characterize sustainable nutrition security.

FIGURE 3: SCHEMATIC DIAGRAM-GOAL: SUSTAINABLE FOOD AND NUTRITION SECURITY (CIMSANS& ILSI, JUNE 2014)



Metabolic Syndrome (MetS) is a cluster of any three of the five risk factors such as Obesity, Hyperglycemia, Dyslipidemia (hypertriglyceridemia), Dyslipidemia (low HDL) and Hypertension as defined by the National Cholesterol Education Program – Adult Treatment Panel (NCEP_ATP III – 2005). MetS which is alarmingly increasing in its prevalence has to be prevented by all means and sources possible. In that context many research studies conducted in rural areas have clearly demonstrated that Food Insecurity is resulting in MetS. Also studies have shown the importance of Nutrition Security along with Food Security while determining the Health outcomes of the population. In Urban areas the FNS has to be studied with at most care to prevent the increasing rate of individual criteria of MetS which will impact on the overall productivity of the individual and the community and address them to reduce the incidence of Mets. In a U.S study it was concluded that

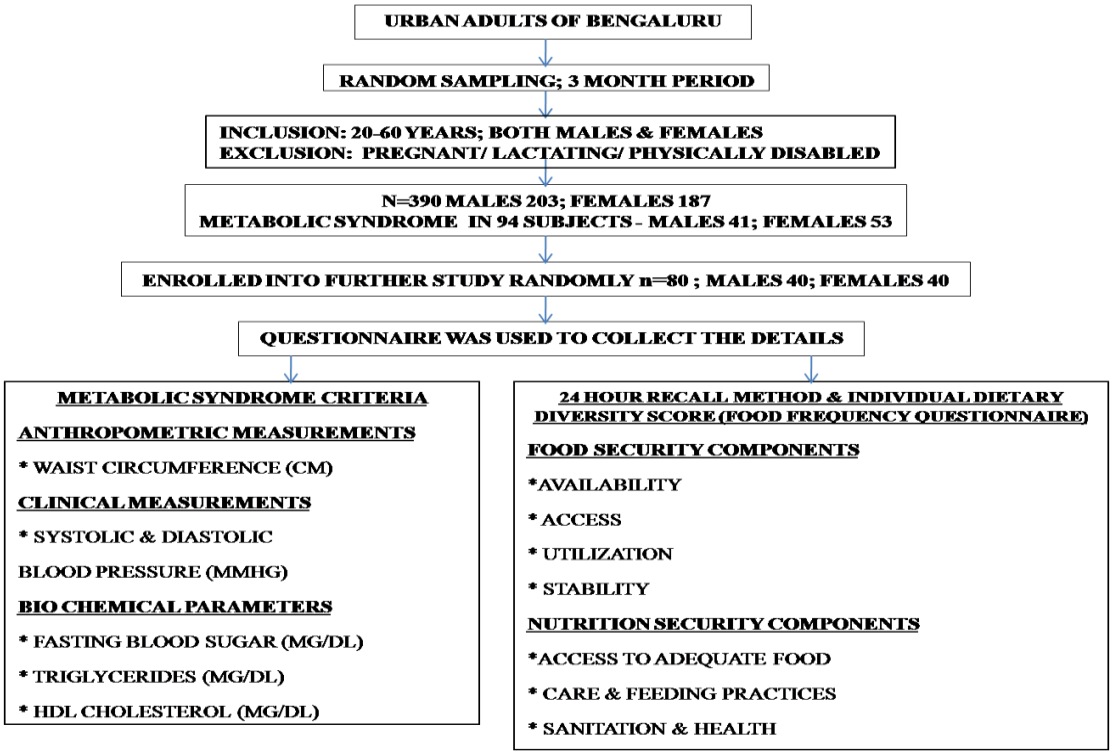
Members of households with marginal and very low food security are at increased risk of MetS. A mechanism may be that foods that are inexpensive and easily accessible tend to be energy dense and nutrient poor.

AIM/ OBJECTIVE:

To examine the Food and Nutrition Security in urban adults of Bengaluru with Metabolic Syndrome.

METHODOLOGY:

The subjects were screened for MetS (N=390- males-203, females-187). MetS was found in 94 (n) - 41 male, 53 female subjects. For further study 40 males and 40 females were taken up from the MetS group. A questionnaire was framed to capture the MetS criteria (NCEP- ATP III) and Food Security and Nutrition Security components (FAO) including the indicators of special interest from specific food groups to capture 24 hour recall and the Individual Dietary Diversity Scores of the subjects.



RESULTS:

A total of 390 (N) subjects- 203 Males and 187 Females were screened initially. Among them 94 (24%) subjects- 41 Males and 53 Females had MetS. From these MetS group 80 (n)subjects- 40 males and 40 females were enrolled further into the study. A questionnaire was used to record the Metabolic syndrome Criteria as per NCEP- ATP III. In the Study Group-Three criteria of MetS were observed in 60% subjects. Four criteria of MetS were observed in 30% subjects. All five criteria were observed in 10% subjects. While we examine the individual criteria of MetS; the High LDL was observed in 63%,Low HDL in 48%, High fasting blood sugars 35%, High Blood pressure in 29%, High Waist circumference in 29%. Obesity was observed in 16%; Overweight was observed in 43%.

Figure 4: METABOLIC SYNDROME (NCEP-ATP III CRITERIA)

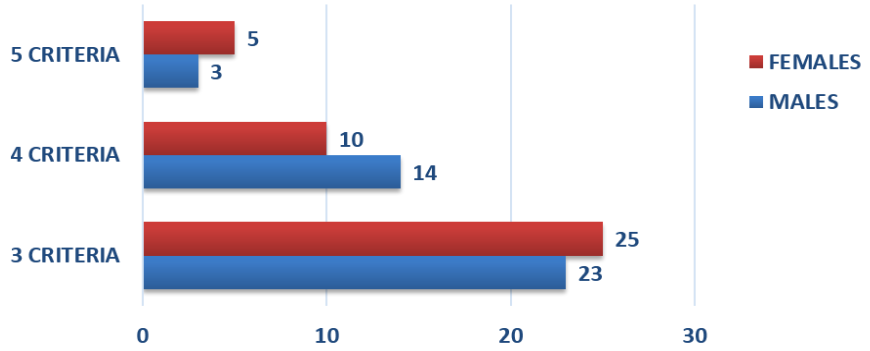
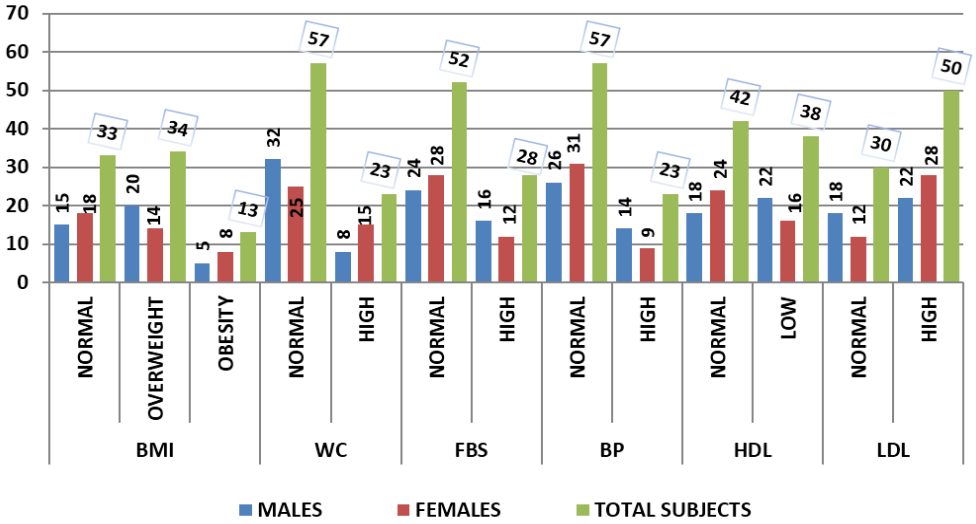
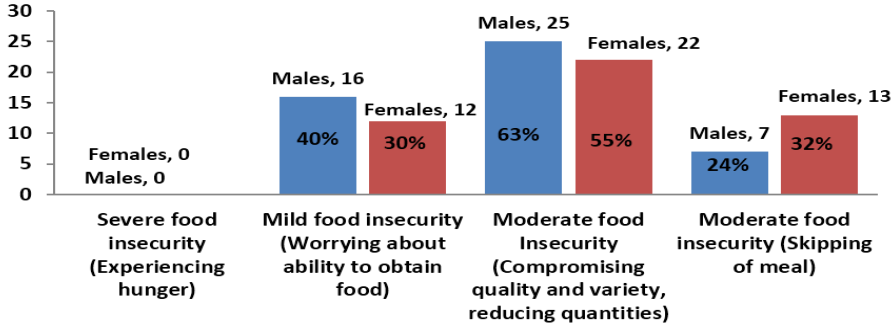


Figure 5: INDIVIDUAL CRITERIA OF METABOLIC SYNDROME



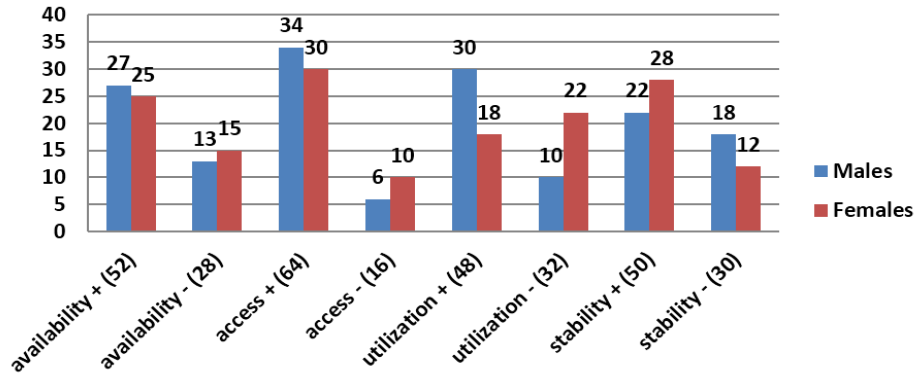
When we look into the details of Food Insecurity; severe food insecurity- experiencing hunger was not expressed by any subject. 16 (40%) males and 12(30%) females who had travel involved in their routine had mild food insecurity- worrying about ability to obtain food. Moderate food Insecurity- compromising quality and variety, reducing quantities was observed in 25 (63%) Males and 22 (55%) Females. Moderate food insecurity of skipping of meal was observed in 7 (24%) Males and 13 (32%) Females.

Figure 6: FOOD INSECURITY



The Pillars of Food Security were also assessed in the Study group. In Bengaluru the Access to Food was not a problem and 64 subjects had good access to Food. The access was limited only when travel was involved at the work. In the current study group the food purchasing was observed to be adequate. Availability and Stability were observed in 50-52 subjects. The Utilization factor was more in males (30) than females (18). In Urban set up also females were giving priority to feed the children and male member of the household. So inspite of availability they were utilizing less. So we could observe the four pillars of Food security was better; but the Food Insecurity in this study group was due to worrying about ability to obtain food during travel at work, compromising quality and variety, reducing quantities and skipping of meal.

Figure 7: PILLARS OF FOOD SECURITY



The Food Consumption Score (FCS) is a composite score based on dietary diversity, food frequency, and the relative nutritional importance of different food groups. The FCS is calculated using the frequency of consumption of different food groups consumed by an individual during a week. Scores are clustered into three groups; the results of the analysis categorize each household as having either poor, borderline, or acceptable food consumption. The FCS show a week long consumption of the Individual. International Food Policy Research Institute (IFPRI) stated that the 'Dietary Diversity appears to show promise as a means of measuring food security and monitoring changes the impact.' 24 hour recall and the Individual Dietary Diversity Scores (Table 1) of the subjects were obtained using a Questionnaire. Indicators of Special Interest from specific food groups (Table 2) were included in the questionnaire to determine the details of 12 food groups that are examined.

TABLE 1: FOOD GROUPS DIETARY DIVERSITY

	Low Dietary Diversity	**Medium Dietary Diversity**	**High Dietary Diversity**
	<=4 food groups	**5-8 food groups**	**>=9 food groups**
Males	14	16	10
Females	8	26	6
Total	22	42	16

Figure 8: DIETARY DIVERSITY (FOOD GROUPS)

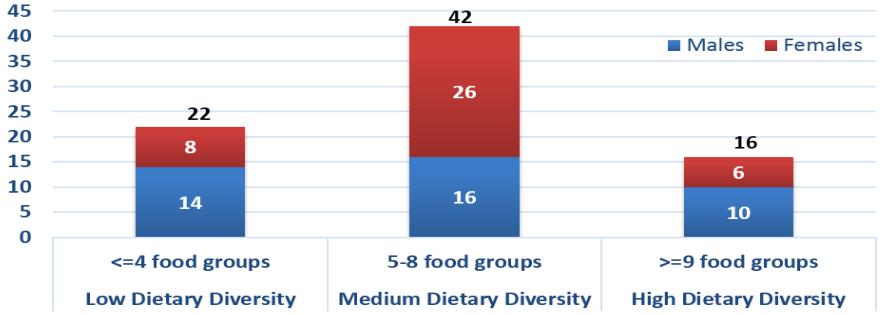
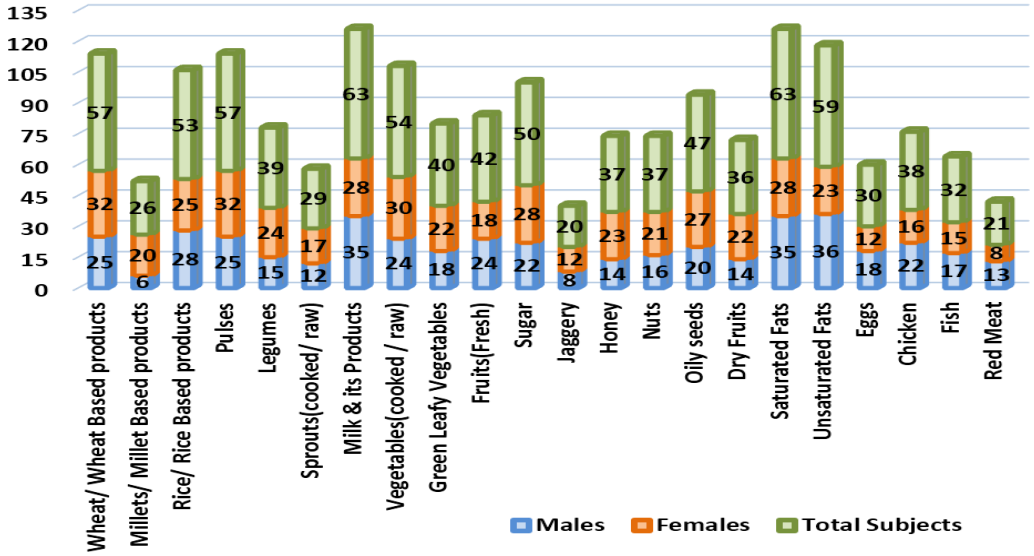


TABLE 2: INDICATORS OF SPECIAL INTEREST FROM SPECIFIC FOOD GROUPS

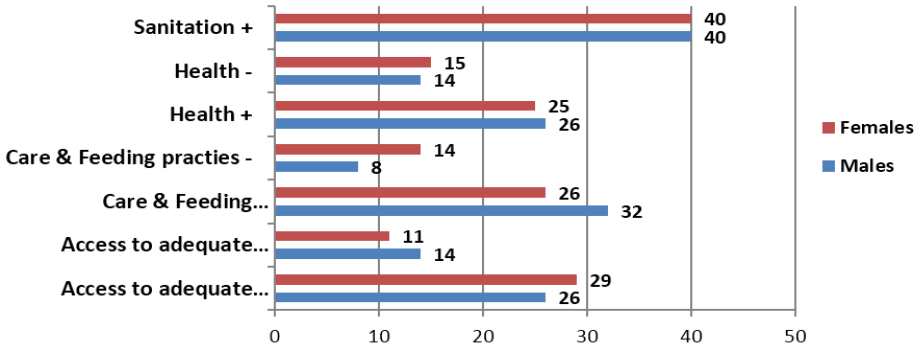
Food Item	Males	Females	Total Subjects
Wheat/ Wheat Based products	25	32	57
Millets/ Millet Based products	6	20	26
Rice/ Rice Based products	28	25	53
Pulses	25	32	57
Legumes	15	24	39
Sprouts(cooked/ raw)	12	17	29
Milk & its Products	35	28	63
Vegetables(cooked / raw)	24	30	54
Green Leafy Vegetables	18	22	40
Fruits(Fresh)	24	18	42
Sugar	22	28	50
Jaggery	8	12	20
Honey	14	23	37
Nuts	16	21	37
Oily seeds	20	27	47
Dry Fruits	14	22	36
Saturated Fats	35	28	63
Unsaturated Fats	36	23	59
Eggs	18	12	30
Chicken	22	16	38
Fish	17	15	32
Red Meat	13	8	21

Figure 9: FOOD ITEMS CONSUMED_24 HOUR RECALL



Nutrition security components were obtained using Individual Dietary Diversity Scores which had indicators of special interest for Metabolic Syndrome from specific food groups.

Figure 10: DETERMINANTS OF NUTRITION SECURITY



Nutritional status is a balance between food intake and health status. Mild to Moderate Food insecurity had a significant correlation with the prevalence of MetS criteria. The Dietary Diversity Scores of Food groups Nutrient wise when observed had significant correlation with the high intake of Fats & Oils; simple carbohydrates and Non veg proteins to the presence of MetS criteria. Low HDL cholesterol was associated with people who had low Dietary Diversity Scores. High Waist circumference was observed in both Moderate food Insecurity- compromising quality and variety, reducing quantities and Medium Dietary Diversity Scores.

CONCLUSION:

In the present study it was clear that Food and Nutrition security cannot be equated to food grains distribution alone. Food insecurity scales and Dietary diversity are complementary indicators for nutritional impact assessment. Food and Nutrition security expresses a single integrated development goal which might assist in reducing the prevalence of MetS as in the present study also Food and Nutrition Insecurity had an association with the people who had MetS. FNS in relation to MetS can

be taken as a research criterion. There is need to develop modules/ questionnaires by which the MetS prone population can be identified with these tools before they are victims of Food and Nutrition Insecurity. Further; FNS can be taken up to target and address the most nutritionally vulnerable population and develop interventions to provide enhanced Food and Nutrition Security to such group. Food and Nutrition Security can be made as a critical input that fuels economic growth, development and health by preventing the alarming raise of Metabolic Syndrome.

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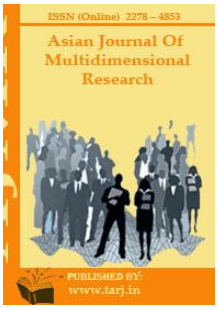

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EFFECT OF SOAKING TIME ON PHYSIO-CHEMICAL CHARACTERISTICS AND ORGANOLEPTIC QUALITY OF PROSOMILLET MILK

V. Subasshini*; Dr. S. Thilagavathi**

*Research scholar,
Department of food science and nutrition,
Periyar University, Salem, INDIA
Email id: v.suba@rediffmail.com

**Assistant professor,
Department of food science and nutrition,
Periyar University, Salem, INDIA
Email id: thilakachandru@gmail.com

ABSTRACT

Millets can grow in dry lands can be projected towards food insecurity and reduce the nutritional problems and are gluten free. The present study was undertaken with a view to analyze the physiochemical characteristics of millet milk and to compare the sensory quality of plant based milk with different soaking time which can be an alternative for Dairy milk. The millet milk was extracted from prosomillet with different soaking time like 4hours, 8hours and 12hours in distilled water and pasteurized. The chemical composition was analyzed with the standard procedure. Analysis revealed that the pH of the 4hrs, 8hrs and 12hrs soaked millets were 4.24, 4.25, and 4.46 respectively. The percentage yield of the milk was higher for 12hrs soaking [97.50%] when compared to 4hrs [84.6%]. Viscosity was measured from 4.24cst to 1.15cst. Analysis of Total solid content showed that the milk from 4hrs soaked millet was 20.8 but it decreased to 8.9% after soaking for 12hours. The Solid Non-fat also showed that 4hrs[19.8%], 8hrs[15.1%] and 12hrs[8.4%] .The millet based milk was subjected to sensory evaluation and the attributes like Appearance, colour, flavor and taste were analyzed using 9 point hedonic scale. The mean score and standard deviation for the colour of milk from Soaking time 4hrs, 8hrs, 12hrs were 7.5±0.85, 7.2±0.92, and 7.1±0.74 respectively. The mean score and standard deviation of the Appearance doesn't show much difference in soaking time and it was 7.0±0.82 when compared to flavor which slightly changed due to soaking hours and it was 6.9±0.74 to 6.6±0.52 whereas the mean score and standard deviation of the taste was 7.2±0.63to 7.4±0.52. The present study concluded that the millet based milk was

acceptable and has potential for the development of many fermented and Non-fermented products. Since the millet milk is gluten free and can also be recommended for Gluten Enteropathy.

KEYWORDS: *Millet, Soaking Time, Physio-Chemical Composition, Sensory Evaluation.*

INTRODUCTION

Millet holds the sixth position in the world in cereal grains, continuing more than one third of the population (Changmei S., Dorothy J. (2014). Millets are rich in nutrients like calcium, potassium, phosphorous, iron, magnesium, zinc, dietary fiber and protein content when compared to cereals (*Devi PB ET.AL, 2014].* Millets can be a good food for gluten enteropathy because they are gluten free (Santra D. K. 2013]. The following species of millet like include proso millet *(Panicum miliaceum* L.*)*, pearl millet *(Pennisetum glaucum* L.R. Br.), finger millet *(Eleusine coracana)*, kodo millet *(Paspalum setaceum)*, foxtail millet *(Setaria italica* L. Beauv.), little millet *(Panicum sumatrense)*, and barnyard millet *(Echinochloa utilis)* are generally grown (Wen Y., Liu J et.al, 2014).

Proso millet is adequately grown in summer and also considered as late-seeded summer crop [Williams M. M.et.al, (2007) with a life cycle of 60–100 days (Baltensperger D. D. (2002). They are 3mmlong and 2mm wide round in shape and are typically creamy-white, yellow or red and also grey, brown or black in colour (Changmei S., Dorothy J, 2014). The prosomillet is rich in protein (11% in dry basis) when compared to maize, rice and [Cedric etal. 2017, Kalinova and Moudry, 2006]

Generally processing techniques like soaking, milling, germination, cooking, fermentation will increase the nutrient quality, helps for digestion, bioavailability of nutrients and also reduce the antinutritional factors. Soaking is one of the traditional household technique which plays an important role in reducing the antinutritional factors like phytic acid and phytase activity thereby improves the bioavailability of minerals [Sarita et.al, 2016, Lestienne etal., 2005] and also decrease the polyphenols and increase the digestibility invitro and enhance the bioavailability of minerals such as iron and zinc [Sarita et.al, 2016, Pawar etal., 2006].

Milk is considered to be one of the nutritious beverages consumed by most of the population. Non-Dairy milk act in the place of dairy milk as a substitute for milk intolerance and allergy and celiac disease. But nowadays milk is giving harmful effects such as allergy towards cow's milk, Lactose intolerance and coronary artery diseases [kundu et.al, 2018, Kneepkens C. F, 2009]. Hence this plant based milk will be a better choice for vegan people and also who are in need for dairy alternatives. Hence the focus of the study was to formulate a well acceptable gluten free milk without any preservative and this can be used as an healthy option for celiac diseases conditions.

The objective of this study was

1. To formulate a millet based milk
2. To analyze the effect of soaking time on physio chemical characteristics of millet milk
3. To determine the organoleptic qualities of the milk obtained from prosomillet.

MATERIALS AND METHODS:

Source of Raw materials:

Prosomillet *[Panicum miliaceum*] was procured from Tamil Nadu Agricultural University, Coimbatore.

Preparation of Prosomillet milk

Prosomillet was cleaned and washed well to remove dirt. The process parameters like soaking time was carried out. Prosomillet was soaked in distilled water separately for about 4hrs, 8hrs and 12hrs. Millets and water were taken in the ratio of 1:2 and it was grinded well in a mixer-grinder. After grinding the slurry was filtered through a muslin cloth to remove the solid residue and the milk was extracted. The milk was then pasteurized and allowed to resume the room temperature.

ANALYSIS OF PHYSIOCHEMICAL CHARACTERISTICS:

Physio chemical characteristics of the samples were evaluated for Percentage yield, pH, Viscosity, Total solid content and Non-solid fat.

Percentage Yield was expressed as:

Y (%) = W2 / W1 x 100, where W2 is represented as weight of the millet milk extracted, W1 is weight of the millet slurry +distilled water added.

pH was measured using a digital pH meter[AM-P-Aquasol] by pouring 100 ml of the millet milk in a beaker.

The viscosity of the millet milk was determined by Cannon fensky viscometer [MODEL_ASTM D 445 & 446]. Select a clean, dry calibrated cannon fensky viscometer having a range covering the expected kinematic viscosity, so that the flow time shall not be less than 200 seconds and also adjust the bath. The end of the narrow tube immersed in the sample liquid. Draw the sample upto the end mark of the capillary tube. Mount the viscometer tube upright in the constant temperature bath and allow the viscometer tube remain in the bath long enough (approximately 15 minutes) to attain the test temperature. . Use suction or pressure to adjust the head level of the sample to a position in the capillary arm of instrument about 7 mm, above the first timing mark. Measure the time required for the meniscus to pass from the first to the second timing mark. Repeat the above procedure to check for the concordant values.

Total solid (TS) content and Solid Non-fat of the millet milk was determined using the Association of Official Analytical Chemists [AOAC, 2005] method. Total solids are determined by weighing milk, drying milk and weighing the dried milk residue. Total solids content of milk is weight of dried milk residue as % of original milk weight. Weigh predried aluminum dish pipette 10 g 38ºC±1 ºC prepared milk test portion directly in to preweighed dish. Place test portion dishes on steam water bath, dry milk until there is little or no free liquid movement in dish. Keep the aluminum dish in the hot oven at 100 ± 1°C for 3 h at 100 ± 1°C. Remove dishes from oven and cool to room temperature in desiccators. Weigh the dish.

$$\text{Total solids \%} = \frac{(W2 - W)x\ 100}{(W1 - W)}$$

Where, W= weight of dish,

W_1 = weight of dish + milk test portion,

W_2 = Weight of dish + dry milk

Solid Non Fat –It was determined by the formula

% of solid Non Fat = 100 – (Moisture + Fat)

ORGANOLEPTIC EVALUATION OF THE MILLET MILK

Generally in food science the 9-Point hedonic scale has been used for the last 60years[Sukanya etal., 2015,Peryam etal,1957] .The scale comprises of nine categories which includes dislike extremely to like extremely and considered in various sensory evaluation. It was generally described as 9-Like Extremely, 8-Like Very Much, 7-Like Moderately, 6-Like Slightly, 5- Neither Like nor Dislike, 4-Dislike Slightly, 3-Dislike Moderately, 2-Dislike Very Much, 1-Extremely Dislike. Nine point Hedonic test was used to judge the different organoleptic attributes, i.e., appearance, colour, taste, flavor of the three different samples for the prepared millet milk was evaluated by a trained panels comprising of 10 panelists drawn from post graduate students of the clinical nutrition and department, SDNB vaishnav college for women, chrompet, Chennai.The panelists were informed to record their observations on the sensory evaluation sheet based on 9 point hedonic scale. Mean and standard deviation were calculated for each attribute of organoleptic analysis.

RESULTS AND DISCUSSION:

TABLE 1: EFFECT OF SOAKING TIME ON PERCENTAGE YIELD AND PH OF MILLET MILK

SAMPLE	SOAKING TIME[HRS]	PERCENTAGE YIELD[%]	PH	VISCOSITY[Cst]
A	4	84.6	4.24	4.24
B	8	86.95	4.25	3.15
C	12	97.50	4.46	1.15

From the TABLE 1 it was revealed that the percentage yield of the millet milk was 84.6% after 4hrs of soaking and it was slightly increased to 86.95% in 8hrs and was increased to 97.50% after 12 hrs of soaking. Hence the more hours of soaking gives the highest yield of milk.There was not much change in the pH of the milk after soaking hours. The pH of the sample ranges from 4.24 in 4hours of soaking, 4.25 after 8hrs of soaking and slightly increased to 4.46 after 12hours of soaking. The viscosity of the samples was in range of 4.24cst to 1.15cst. The maximum viscosity was observed as 4.24cst after 4hrs of soaking time but the value decreased to 3.15cst, 1.15cst in 8hrs and 12hrs of soaking respectively.

TABLE 2: EFFECT OF SOAKING TIME ON TOTAL SOLID CONTENT AND SOLID NON-FAT OF THE MILLET MILK

SAMPLE	SOAKING TIME[Hrs]	TOTAL SOLID CONTENT[%]	SOLID NON-FAT[%]
A	4	20.8	19.8
B	8	15.5	15.1
C	12	8.9	8.4

Total solid content and Non-solid fat is usually measured to ensure the quality of *milk. From the Table 2 it was found that there was a drastic change in total solid content and Solid non-fat after different hours of*

soaking. It was 20.8% Total solid content in 4hours of soaking, reduced to 15.5% after 8hrs of soaking and further decreased to 8.9% after 12hours of soaking time. The Solid Non-Fat also reduced from 19.8% to 15.1% after 4hours to 8hours respectively. But it was highly reduced to 8.4% after 12hours of soaking time. This denotes that the more hours of soaking time will decline the Total solids and Solid Non fat content of the millet milk.

Millet milk was prepared from prosomillet by soaking in distilled water for different duration of time. Then the milk was presented to the taste panel for sensory evaluation using 9 point hedonic scale and the results are given below.

TABLE 3: EFFECT OF SOAKING TIME ON APPEARANCE AND COLOUR OF THE MILLET MILK

SAMPLE	SOAKING TIME[Hrs]	APPEARANCE [Mean±SD]	COLOUR [Mean ±SD]
A	4	7.0±0.82	7.5±0.84
B	8	7.0±0.66	7.2±0.92
C	12	7.0±0.66	7.1±0.74

Table 3 reveals that mean hedonic scores with standard deviation of Appearance was 7.0 ±0.82 and the colour scores were more than 7.2±0.84 indicating that these attributes were moderately liked by the tasting panels. The mean score of the Appearance of the sample doesn't show much difference while in colour 4hours and 8hours of soaking time gave better score than the 12hrs of soaking time but all the samples were acceptable.

TABLE 4: EFFECT OF SOAKING TIME ON FLAVOUR AND TASTE OF THE MILLET MILK

SAMPLE	SOAKING TIME[Hrs]	FLAVOUR [Mean±SD]	TASTE [Mean±SD]
A	4	6.9±0.74	7.2±0.63
B	8	6.7±0.82	7.2±0.42
C	12	6.6±0.52	7.4±0.52

From the Table 4 it was depicted that the average scores with standard deviation for flavor ranged between 6.6±0.52 to 6.9±0.74. 12hours of soaking time shows the lowest score as 6.6 when compared to 4hours and 8hours of soaking time whereas the average scores of taste increased in 12hours of soaking time which was 7.4±0.52 when compared to 4hours and 8hours of soaking time with a mean score of 7.2±0.63 and was acceptable.

CONCLUSION:

Millets are really super foods which are sufficient in all kinds of micronutrients and also gluten free. Millets can be cultivated even in dry lands and are productive and ensure food security and nutritional security. The results depicts that soaking millets as a pretreatment for the production of millet milk improves the flavor and also reduce the antinutritional factors and also more acceptable in all attributes but a fluctuation in Total solid content and Non-solid fat was noticed as soaking progress. Soaking for 8hrs will give milk with 86.75%, 4.25 pH, 4.24cst viscosity, 15.5% and 15.1% of Total solid content and Solid Non fat respectively. The mean score of the sensory attributes like appearance, colour, flavor and taste was also acceptable. Based on the analysis it can be concluded that plant based milk prepared from prosomillet can be a good alternative which are gluten free and

better in sensory evaluation. But certain modifications can be made in addition of sweetners, emulsifiers for further development of value added products from this millet milk in future.

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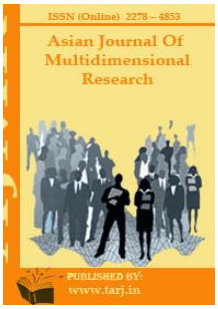

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RECONSIDERING SOYBEAN FOR IMPROVED NUTRIENT SECURITY – A TRANSITION FROM HUNGER/FOOD SECURITY

Sethuraman Vishnupriya*; Kowsalya S**

*Research Scholar,
Department of Food Science and Nutrition,
Avinashilingam Institute of Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: sethuramanvishnupriya@gmail.com

** Registrar and Professor,
Research Supervisor,
Department of Food Science and Nutrition,
Avinashilingam Institute of Home Science and,
Higher Education for Women,
Coimbatore, Tamilnadu, INDIA

ABSTRACT

Legumes have long been recognized as one of the edible food worldwide, Soybean (Glycine max.) is one such legume belongs to the Fabaceae family broadly cultivated for various purposes starting from food, fodder to fuel. Soybean is actually a warehouse of plenty of likely chemicals/ nutrients which serves millions of people in terms of its therapeutic action and protects them against from various fatal disorders. There are intriguing facts and data's representing that even a small quantity of soy consumed over a period of time during their lifecycle reduces the risk of many deadly disorders viz. cancers, coronary artery disease, post menopausal problems and other chronic diseases. Despite having so much of nutrient load and almost no plausible data is available to suggest traditional/ modern soy foods exert a positive effect in healthy individuals when consumed in considerable amounts. So an attempt to analyze the awareness on health benefits, consumption pattern of soy based foods and exploring the nutrient potential was made. In summary, the epidemiologic and analytical data of the study indicate that several socio-economic characteristics of consumers have a significant influence on awareness of soybean and different soyfood consumption patterns, and adding soy foods to the diet may contribute to the wellbeing of every individual which may require more intrinsic clinical evidence to support the findings.

KEYWORDS: *Soybean, Soya bean, Glycine max., Soy foods, chronic diseases, Phytochemicals Health benefits*

INTRODUCTION

Soybean (*Glycine max.)* is one of the important food crops from the fabaceae family that has been widely researched for its ample amount of health benefits. Enormous data suggests that these soybean constituents are protective against a number of chronic diseases, but they are not without controversy[1]. In fact, the whole of the available evidence indicates that soy foods can be healthful additions to the diets of human beings of all age, but more research is required to allow definitive conclusions to be made.

The research interest in soy was influenced mainly for its geographic epidemiology—people from eastern Asia who consume lot of soy and soy based products were found to have less chance of different types of cancer[2-5], cardiovascular[6-8] and other bone related disorders[9-12]. Furthermore, women were also stated to have significantly lesser menopausal and post menopausal symptoms and both men & women were also reported to have a lower occurrence of aging-related brain diseases[13-15]. Since lifestyle can affect chronic disease development, and diet is a major lifestyle factor, traditional Asian diets drew considerable attention. All these factors pull the tag of whether soy may be a marker for other dietary and lifestyle behaviors that influence disease risk. The objective of this study was to assess the reliability and validity of a food-frequency questionnaire (FFQ) among different people of varying age group, to identify dietary and nondietary factors associated with their consumption pattern & awareness on soya bean and finally exploring the nutrient potential of soybean and comparing it with the nutrient content of common edible pulses consumed by the respondents.

MATERIALS AND METHODS

The cross sectional study that includes the 104 human subjects of both sex aged from 20-70 years were contacted either personally or emailed. Exclusion criteria for the study included the people aged less or higher than the above mentioned age, people with chronic disorders and people who were not willing to take part. The participants were provided with two different questionnaires *viz.* Soya bean specific Food Frequency Questionnaire (FFQ) and a well structured closed ended comprehensive questionnaire. All procedure was carried out prior obtaining the written consent from all the human subjects.

Comprehensive questionnaire includes the age, sex, education, marital status, family composition, physical activity – frequency and duration, Physical activity was evaluated by the questionnaire involved separate sections on leisure time activity, household activity and work-related activity[16, 17]. food habitat, dietary intake was recorded using 24 hrs food recall method, lifestyle habits – smoking, alcohol pan or tobacco chewing, food security – soy & legumes based food products availability in the market, accessibility and acceptability, key issues in purchasing soy based foods, their views or perceptions over the relationship between diet and disease prevention and finally their height, weight, BMI *etc.* were recorded. The 24hr food recall method yielded detailed information on foods/meals, type of fat used for cooking and added while eating, snack pattern and beverages consumed on a given day. The total amount of each specific food and beverage consumed is captured. *Soya bean specific Food Frequency Questionnaire (FFQ)* included the 15 questions that cover the data on awareness and consumption on different soyfoods viz., traditional soyfoods, commercial soyfoods, soy supplements – consumption, frequency & No. of serving, purpose of

soybean usage, method of soy bean cooking, allergic reaction pertaining to soyfood consumption were all collected.

Phytochemical analysis

Sample preparation

Soybean was purchased from the local market, soaked in water overnight for 10 hrs, Batches of 100 g was roasted in a rotating metal round tray set in an oven for 230°C for 25 min. Sample was powdered using Mechanical Milling. Stored in amber bottle and refrigerated until use. The roasting conditions were pre-experimented with different temperatures (ranging from 160 to 250°C) with varying time (15–45 min). The accepted condition chosen is that the soybeans should be palatable and have a well roasted flavor. *For Raw soybean*, soybean was cleansed and graded, soaked in water overnight for 10 hrs, de-hulled manually, shade dried, milled mechanically and stored in amber bottle and refrigerated until use. Qualitative analysis covered a wide range of phytochemicals and major nutrients viz. Carbohydrate, protein lipid, fiber, ash and moisture content, minerals and most important phyto-estrogens (Isoflavone) contents were all quantified using standard AOAC protocols.

Statistical analysis

Significance was defined as $P < 0.05$. Analyses were conducted with Statistical Software SPSS, release version 16 and basic standard deviation and mean were calculated using Microsoft excel 2007.

RESULTS AND DISCUSSION

The mean (±SD) age of the 104 participants was 41 ± 11 y. Most of the participants (89%) were female, 59% of participants had earned at least a Bachelor's degree, and 67% of participants were married or living as married. 81 percentages of participants were non-vegetarians 74 percentage of the respondents lead the nuclear family system. 78 % of the respondents were ≤ 4 people in their family composition. 60Percentage of male population studied were alcoholics and tobacco smokers. 12 percentage of female were tobacco chewers. None of the participants were observed for any allergic reaction to either other than soy or soy foods during the study period.

Mean height of both the male and female respondents were comparatively low when compared with ICMR referral standard but the mean weight of 14.2% female respondents were mere equal to ICMR referral standard than 85.5% number of male respondents enrolled. High Body Mass index (BMI) was associated with increased risk of certain life style diseases. Hence the need arise to calculate the BMI of enrolled respondents. Based on the calculated results, utmost number of 59.1% respondents was at normal BMI grade and 31.2% respondents were at overweight grade. Only 6.4% respondents fall under low BMI grade. 3.3 were under grade I obesity. Sex wise analysis revealed Men with increased height showed an increased BMI which is inversely proportional in women. Women with decreased height with increased weight showed higher BMI

Based on the pulses intake assessed by using the FFQ and comprehensive questionnaire, the range of intakes was liberal however most participants, consume a large amounts of cereals along with pulses in the form of idli, roti and dal or rice with sambar etc., combination of the two has an effect on the improving quality of the food they consume. Though both cereals and pulses have lower amino acid score or biological value, what is limiting in one is partly supplied by the other thereby made the food one complementing the other.

A meager of 13 percentages of respondents expressed their knowledge on awareness over soy based foods. Most respondents find the taste of Soy products repulsive. Although it is slowly being accepted, the reason behind the less consumption and awareness was the less availability of Soy based food products in the market except for soya sauce and soya chunk none were aware of different soy based foods. The key point behind the popularity of soy chunk and soya sauce among the respondents was they finds its application in variety of Chinese items sold in the small petty junk food shops and vegetarian and non veg. children are very fond of chunks for its juiciness and resemblance like meat. But to the point of interest, approximately only one sixth of the participants consumed the mere or even less equivalent of one-fifth serving of soy based food/wk and was evident from the FFQ. It was apparent that a least of only 30.7 percentage of participants consumed soy based food with a frequency of 1-3/month and 31.7 percentage of people consumed soya based pharmaceutical products like protein powder and capsule for their physical ailments (menopause, post menopause and bone problem).

Of the twenty phytochemicals screened for, eight were found in all 3 solvent extracts. Preliminary phytochemical screening indicated the presence of phenols, cardiac glycosides, steroids, saponins, flavonoids in all 3 ethanol, methanol and aqueous extracts. Crude protein had the highest value (44.9) while moisture content (5.8) was the lowest among raw soybean.

TABLE 1. QUANTIFICATION OF MAJOR NUTRIENTS OF RAW & ROASTED SOYBEAN

S. No.	Parameters	Raw	Roasted
1	Moisture*	5.8 ± 0.6[b]	4.3 ± 0.5
2	Ash	3.4 ± 0.2 [b]	3.0 ± 0.1[a]
3	Carbohydrate	24.3 ± 1.5	26.7 ± 1.8 [a]
4	Protein	44.9 ± 2.1[b]	36.7 ± 1.4
5	Lipid	18.7 ± 0.1	22.1 ± 0.2[a]
6	Fibre	5.9 ± 0.1	6.13 ± 0.4[a]

Mean ± standard deviation;

a. Significantly higher than Raw ($P < 0.05$).

b. Significant differences were evaluated by Fisher's exact test

* Moisture is expressed based on fresh weight

Atomic absorption analysis of Soybean also revealed the rich source of the minerals calcium, magnesium, phosphorus, and potassium. When comparing the same with other popularity based pulses Table 2.

TABLE 2 QUANTIFICATION OF MINERAL CONTENTS OF ROASTED SOYBEAN

S. No.	Mineral content	mg/Kg
1	Calcium	204.0
2	Iron	3.2
3	Magnesium	199.1
4	Zinc	1.8
5	Manganese	0.418
6	Phosphorous	527
7	Potassium	934.7

8	Sodium	1.3
9	Copper	0.98
10	Selenium	12.1 mcg

TABLE 3. QUANTIFICATION OF ISOFLAVONES CONTENTS (MG/G) OF RAW AND ROASTED SOYBEANS

S. No.	Soy Isoflavones	Raw soybeanµg/g	Roasted soybean (230°C) 25 min. µg/g
1	Daidzin	32.3	416.5
2	Glycitin	84.6	90.2
3	Genistein	397.4	528.7
4	Daidzein	172.7	126.3
5	Glycitein	163.8	247.4

It also contains the high amount of phytoestrogens (isoflavones) like Genistein and Daidzein. Phytoestrogens mimic estrogen because their similarity in chemical. The presence of these phytoestrogens with proven pharmacological actions in several studies could be considered as better choice from natural food sources.

CONCLUSION

Eating more plant based foods specially soya and soy based foods and replacing some of the meat and dairy products that participants eat with these can help to improve the nutritional quality of their diet. Soya can be a great addition to a plant based diet. The whole bean or soya products are naturally low in saturated fat, a source of good plant protein and possess calcium, other essential minerals and phytoestrogens – a healthy choice that everyone have to enjoy. As well as an alternate to milk, cream and yogurt, soya is incredibly versatile, fitting into a plant based diet in any number of contexts that would bring variety and flavor to any recipes.

An overall positive evaluation of this study among the participants supports the flexibility and potential applicability of consuming more soy based foods and sets a positive suggestion for improved dietary/nutrient monitoring and surveillance. Following these findings, prerequisite for future implementation and/or adaptation of soy based Diet in rural and urban setup, a meticulous and vigorous capability as well as awareness transfer with standard protocol to execute the knowledge on accessing and consuming soya for its therapeutic and nutrient stack across unreachable in remote/overall localities will definitely offer a wider scope in transmitting the hidden nutrient hunger in terms of food security. In addition, this study further sets a platform for isolating and understanding the characteristics of each & specific compound for it pharmacological properties.

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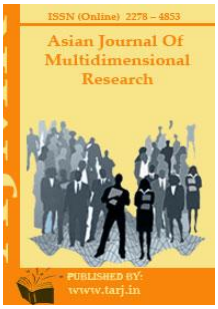

Asian Journal of Multidimensional Research (AJMR)

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INVITRO ANTIOXIDANT SCREENING OF PROTEASE ENZYMEISOLATED FROM TERMITE SOIL BACTERIA

A.Sujatha*; Anitha Subash; A.Shobana*****

*Research Scholar,
Department of Biochemistry,
Biotechnology and Bioinformatics
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: sujamphil@gmail.com

**Professor,
Department of Biochemistry,
Biotechnology and Bioinformatics,
Avinashilingam Institute for Home Science and,
Higher Education for Women
Coimbatore, Tamil Nadu, INDIA

***Assistant Professor,
Department of Biochemistry,
Biotechnology and Bioinformatics,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Enzymes catalyze nearly all the chemical reactions that occur in biological systems. Microorganisms represent an excellent source of enzymes owing to their broad biochemical diversity and their susceptibility to genetic manipulation. Bacteria present in soil represent a potential source of compounds especially protease enzyme. An extracellular protease producing strain was isolated from Karur District, Tamil Nadu and identified to be Bacillus subtitles ASASBT. Morphology of the newly isolated strain was confirmed by scanning electron microscopy. Further more, the antioxidant activities of the isolated protease with the commercially available protease were evaluated using in vitro antioxidant assays, such as DPPH radical scavenging activity, ABTS radical scavenging activity, superoxide radical (O_2^-) scavenging activity, hydrogen peroxide scavenging activity, nitric oxide scavenging activity and reducing power assay. The results showed

that the protease enzyme exhibited maximum antioxidant potential with IC_{50} value of 1.2 mg/mL. These findings suggest that the isolated protease enzyme may be used in the pharmaceutical industry.

KEYWORDS: *Morphology, pharmaceutical, Microorganisms*

INTRODUCTION

Enzymes are natural catalysts. They are produced by living organisms to increase the rate of an immense and diverse set of chemical reactions required for life. One of the most important biological catalytic reactions is proteolysis and this is known as proteolytic activities, which have attributed to a class of enzymes called proteases. Proteolysis is the hydrolysis of peptide bond by attacking the carbonyl group peptide. Proteases are of broad class of enzyme distribution. In human, there are about 990 known protease genes are present. In addition, about 1605 known protease inhibitor genes have reported in human (Eatemadi*et al*., 2016). Proteases in normal cells are very essential in carrying out important biological processes and can regulate a diversity of different cellular processes such as gene expression, differentiation and cell death (Egeblad and Werb, 2002). Microbial proteases have interesting characteristics in the sense of low cost of production, good stability and specificity representing a powerful tool in the development and production of new protein hydrolysates with characteristics that can be explored industrially (Jessika and Helia, 2018). Proteases are widely used in several bioremediation processes, pharmaceutical, nutraceutical, food and detergent industries.

An excessive amount of reactive radicals can result in cellular damage which, in trun, initiates several diseases. Antioxidants are substances used to remove reactive species, inhibiting or reducing damage caused by theirs deleterious action to biological macromolecules such as DNA, proteins and lipids (Barbosa *et al*., 2010). The antioxidant properties of hydrolysates have been investigated and have been demonstrated by the hydrolysis of several proteins by gastrointestinal enzymes or acid hydrolysis. The exact mechanism of the antioxidant activity is not well understood, but several studies show that the hydrolysates are lipid oxidation inhibitors which are capable of scavenging free radicals and chelating metal ion activity (Elessandra*et al*., 2014). To overcome this limitation and enhance the use of microbial protease in food, therapeutic and other industry, it is important to investigate the antioxidant activity of the enzyme.

MATERIALS AND METHODS

Isolation and Purification of Protease

The newly identified*Bacillus subtilis* ASASBT strain was isolated from termite soil sample which was collected from an agricultural area in Karur District. The isolated strain was purified by different purification techniques involving ammonium sulphate precipitation, dialysis, DEAE-Cellulose and sephadex G-100 chromatography (Sujatha and Anitha, 2018).

Scanning Electron Microscopy of *Bacillus subtilis*ASASBT

The morphological characteristics of the isolated bacterial strain was further investigated by Scanning Electron Microscopy (SEM) analysis.

Antioxidant activity of the *Bacillus*protease

The newly isolated protease and commercially available protease was assayed for various free radical scavenging activity such as DPPH radical scavenging activity, ABTS radical scavenging activity, hydrogen peroxide scavenging activity, nitric oxide scavenging activity and reducing power assay at various concentrations from 0 – 3 mg/mL.

DPPH radical scavenging activity

DPPH radical scavenging activity of both the isolated and commercial protease was determined as described by the method of Shimada *et al*., (1992).

ABTS radical scavenging activity

The antioxidant activity of the isolated and commercial protease was also evaluated by 2,2´-azino-bis 3-ethylbenzothiazoline-6-sulphonic acid (ABTS) radical cation decolorization assay with α-tocopherol as the standard, based onthe method given by Re *et al*., (1999).

Superoxide radical scavenging activity

The superoxide radical scavenging activityof both the proteases was based on the method given by Martinez *et al*., (2001).

Hydrogen peroxide scavenging activity

The hydrogen peroxide scavenging activity of the proteases was determined by the method of Muller (1985).

Nitric oxide scavenging activity

The nitric oxide scavenging activity of the proteases was determined by Sreejayan and Rao, method (1997).

Determination of reducing power

The reducing power assay of protease was determined according to the method of Oyaizu, (1986).

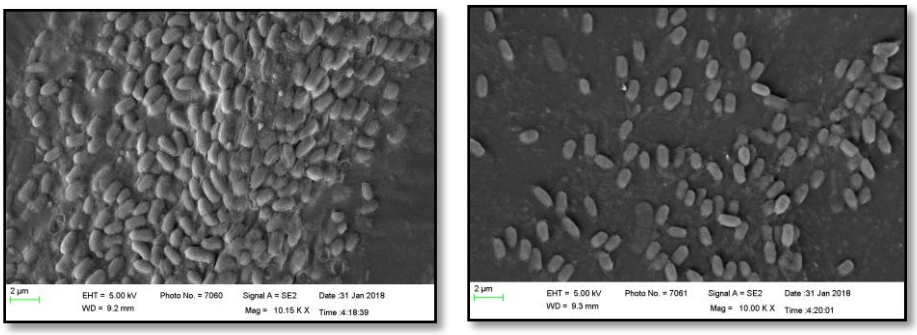
RESULTS AND DISCUSSION

Scanning Electron Microscopy

The morphology of the newly isolated strain *Bacillus subtilis* ASASBT showed gram positive rod shape under scanning electron microscopy.Figure 1 (a) and (b).

Figure 1: Scanning Electron Microscopic view of *Bacillus subtilis* ASASBT

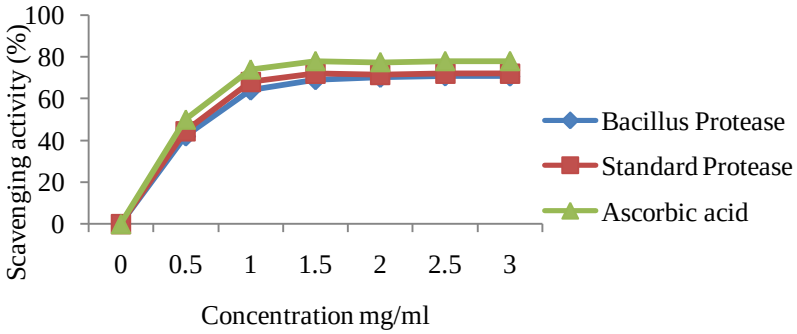
(a) **(b)**



DPPH radical scavenging activity

DPPH is a stable free radical that shows the maximum absorbance at 517nm. The decrease in absorbance was taken as a measure for radical scavenging activity. The DPPH radical scavenging activity was investigated at different concentrations from 0-3 mg/mL of the isolated and commercial protease. The results presented in the Figure 2clearly show that the protease exhibited a radical scavenging activity with an IC_{50} value of 0.59 mg/mL.The protease isolated from *Streptomyces* sp. MAB18 using poultry waste showed better free radical scavenging activity (Manivasagan*et al.*, 2013).

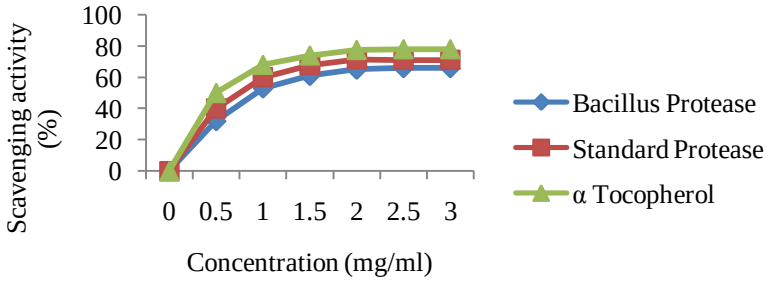
Figure 2: DPPH radical scavenging activity of protease



ABTS radical scavenging activity

ABTS radical scavenging assay measures the relative ability of antioxidant to scavenge the ABTS generated in the newly isolated protease compared with the standards. The reduction of blue green ABTS radical solution by hydrogen donating antioxidant is measured by the suppression of its absorbance at 734nm. In the present study, the scavenging activity of the enzyme increased in a dose dependent manner. The scavenging of ABTS radical was found to increase from 53 to 66 percent at concentrations ranging from 1 to 2.5 mg/mL. The IC_{50}value of the enzyme was found to be 1.2 mg/mL. Therefore, the ABTS radical scavenging activity of *Bacillus* protease indicates its ability to scavenge free radicals, thereby preventing the lipid oxidation (Figure 3).

Figure 3: ABTS radical scavenging activity of protease

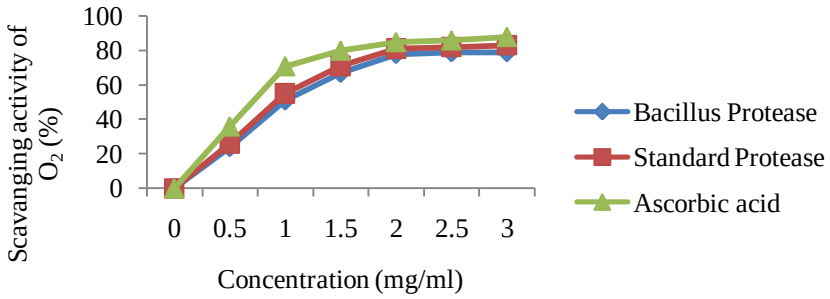


Superoxide radical scavenging activity

Superoxide radical scavenging activity of the protease was measured by the riboflavin-NBT-light system. Superoxide radical is known to be very harmful to cellular components as a precursor of more reactive oxygen species. The photochemical reduction of flavins generates superoxide, which reduces NBT, resulting in the formation of blue formazan. The protease was found to be a moderate scavenger of superoxide radical generated in riboflavin-NBT-light system. The protease inhibited the formation of the blue formazan and inhibition was proportional to the concentration with an IC_{50}

value of 1mg/mL. These results indicated that the tested protease had a notable effect on scavenging of superoxide when compared with standard protease and ascorbic acid which was used as a positive control (Figure 4).

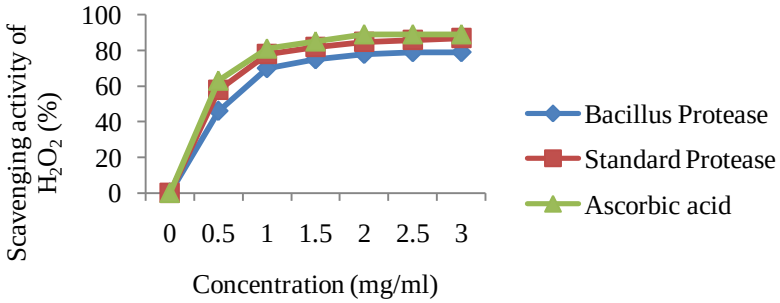
Figure 4: Superoxide radical scavenging activity of protease



Hydrogen peroxide scavenging activity

The hydrogen peroxide scavenging activity of the *Bacillus* proteaseand standard protease are depicted in Figure5. Based on the results, maximum scavenging effects of the enzyme was observed in hydrogen peroxide scavenging assay compared to the other scavenging assays. It revealed that the scavenging effect was equal to that of the commercial antioxidants.

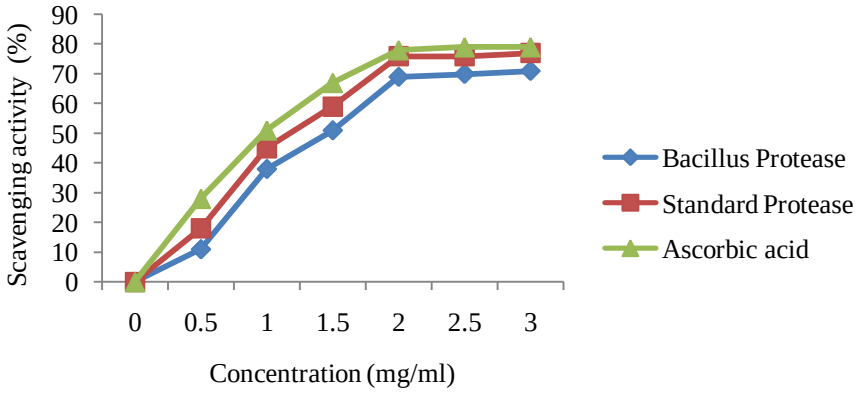
Figure 5: Hydrogen peroxide scavenging activity of protease



Nitric oxide scavenging activity

Protease also showed an increasing nitric oxide scavenging activity at different concentrations (0.5-3 mg/mL) in a dose dependent manner (IC_{50} value of 1.5 mg/mL). Nitric oxideis an essential bioregulatory molecule required for the several physiological processes like regulation of blood pressure, prevention of adhesion and aggregation of platelets, assisting the immune system to destroy a wide variety of pathogens and block viral replication and promotion of certain type of cancer. In addition to reactive oxygen species nitric oxide is also implicated in inflammation, cancer and the other pathological conditions. The results suggest that the isolated protease is a potent and novel source of therapeutic agents for nitric oxide scavenging and regulates the pathological condition caused by over production of nitric oxide. The percent inhibition was increased with the increasing concentration of the protease (Figure 6). Antioxidant property of cysteine protease from *Zingibermontanum*rhizome showed the nitric oxide generation was effectively reduced an IC_{50} values of 9.06 and 4.79 µM respectively (Jamir and Seshagirirao, 2017).

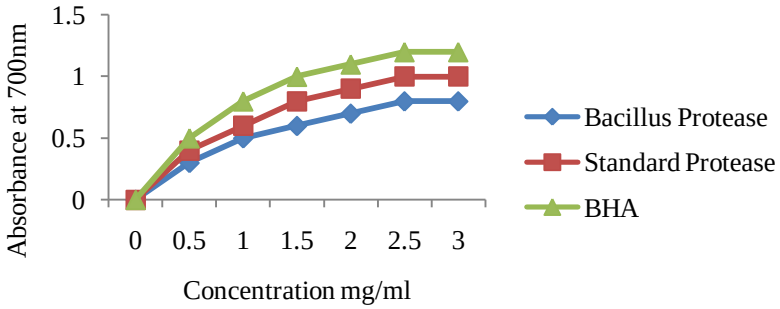
Figure 6: Nitric oxide scavenging activity of protease



Determination of reducing power

Figure7 shows the reductive capabilities of the isolated protease and standard protease compared to BHA. Investigated the Fe^{3+} -Fe^{2+}transformation in the presence of protease using the standard method, for the measurement of the reductive ability. The reducing properties are generally associated with the presence of reductones, which have shown to exert an antioxidant action by breaking the free radical chain by donating a hydrogen atom. The antioxidant activity of compounds have been attributed to various mechanisms such as prevention of chain initiation, binding of transition metal ion catalysts, decomposition of peroxides and prevention of continued hydrogen abstraction. Similar to the antioxidant activity, reducing power of the isolated protease increased with the increasing amount of sample. However, the reducing power of standard protease and BHA was relatively more prominent than that of*Bacillus* protease.

Figure 7: Determination of reducing poweractivity of protease



CONCLUSION

In the present study, the bacteria present in the termite soil was successfully identified and confirmed based on the morphology by scanning electron microscopy. The protease obtained from the isolated bacterial strain under optimum conditions was assayed for antioxidant activity using battery of free radicals such as DPPH radical scavenging activity, ABTS radical scavenging activity, superoxide scavenging activity, hydrogen peroxide scavenging activity, nitric oxide scavenging activity and reducing power assay, the protease enzyme was found to possess good antioxidant activity.The decrease in optical density indicates the significant free radical scavenging activity of the protease. It indicates a potential use for the production of bioactive compounds from the microbes of low

commercial value. A greater use of these proteases and knowledge of their characteristics depends on the studies carried out in search of innovations, isolation of new enzymes and improving the function of existing enzymes.

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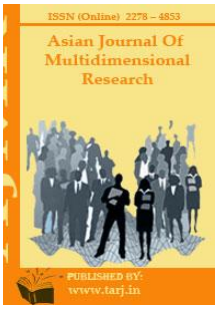

Asian Journal of Multidimensional Research (AJMR)

(Double Blind Refereed & Reviewed International Journal)

UGC APPROVED JOURNAL

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THEME: YOUNGER GENERATION AS STAKE HOLDERS IN FOOD AND NUTRITIONSECURITY OF THE COUNTRY INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) – AN EFFECTIVE TOOLFOR NUTRITION EDUCATION AMONG YOUNG ADULT WOMEN (17-23 YEARS) ONPOLYCYSTIC OVARIAN SYNDROME TO ATTAIN FOOD SECURITY

AT. Agilandeswari*; A.Thirumani Devi**

*M Phil Scholar,
Department of Food science and Nutrition,
Avinashilingam Institute for Homescience and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: atagilandeswari@gmail.com

**Professor and Head of the Department,
Department of Food science and Nutrition,
Avinashilingam Institute for Homescience and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Polycystic ovarian syndrome, is an endocrinal dysfunction common among the young women belonging to reproductive age group .On an average PCOS affects 5-10% of the women in reproductive age group worldwide and prevalence in India is also rising rapidly. It contributes to hormonal imbalance leading to irregular menstruation, hirsutism, hyperandrogenism, obesity, and diabetes. When left untreated may leads to infertility and other reproductive disorders. Hence to promote awareness on food security and PCOS among the younger generation Nutrition education was given to them trough modern digitalized methods. A study was conducted to impart nutrition education and to assess the knowledge, attitude and practice of the selected subjects before and after nutrition education intervention on PCOS relatable to socio economic, dietary pattern, physical activity and case history which were collected and used for further in depth study. The prevalence was also noted with normal BMI, WHR and Body fat. The present study indicated that PCOS is not only associated with obesity but also with other environmental factors like faulty eating habits and lifestyle pattern. The statistical analysis revealed that the impact of ICT enabled education module

related to PCOS on nutritional knowledge test 0f significance as 0.000, standard deviation and the mean difference is -2.090±1.55 had improved and found to be one percent significant. Nutrition education through ICT enabled tools lectures and physical activity intervention had improved the knowledge and overall acceptability of what's app was found to be high (4.7±0.509).It also bought behavioural change on eating pattern among the young women population. The findings from this study states that Mobile phone based primary intervention strategy supports and increased the awareness on PCOS and promote healthy lifestyles dietary pattern among the younger generation.It also promotes their healthstatus and also the community as it can be followed, shared and also spread.

KEYWORDS: *Polycystic ovarian syndrome (PCOS), Information communication technology (ICT), Nutrition Education, Behavioural change and Food security.*

INTRODUCTION:

PCOS an endocrinal dysfunction which is a common threat among the young women belonging to reproductive age group which is caused due to life style changes and genetic predisposition. Estimates of PCOS in migrant Indians have been estimated at 52% level. And about 10.97% among the Indian adolescent girls have been estimated to suffer from PCOS (Nidhi et al, 2011). There is a consistent association between PCOS and other metabolic and reproductive disorders (Zargar et al 2015). In this digitalized era even though there is many methods for nutrition education, ICT enabled education modules plays an effective role to create awareness among the young generation. Mobile technologies were accessible to 95.5 percent of the world population particularly younger generation. Use of Instagram, face book and what's app are the powerful mode of communication among younger generation especially adolescence. In this study Nutrition education platform had been produced in the form of text messages, videos, audios, postures, pamphlets and booklets integrated with mobile communication.

OBJECTIVES:

To elicit information on the demographic profile, dietary and lifestyle pattern of the selected young adults (18-23 years).Assess the Nutritional status by Anthropometric measurements and Clinical examination. Assess the pre and post Knowledge of the selected subjects on PCOS. Create awareness among the selected participants on Nutritional management of PCOS. Develop and evaluate nutrition and health 'e'module used to impart Nutrition education and find out the improvement in the knowledge and behavioural changes in the selected subjects on food security and PCOS.

METHODOLOGY:

A.Selection of sample and area:

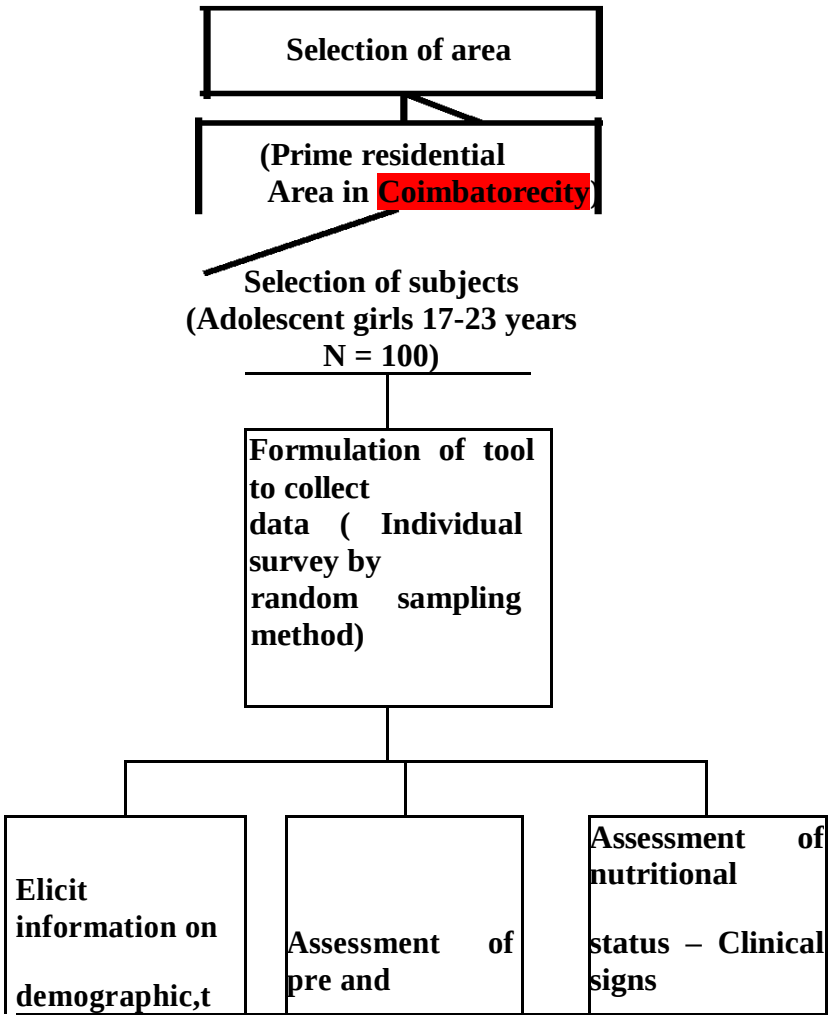
The area selected for this study was three private ladies hostels located in the residence areas, nearer to Avinashilingam university campus in Coimbatore city. These three ladies hostels were selected because of easy accessability of subjects and convenienvce of the investigator. The purpose and procedure involved in the study were explained and effectively motivated them through nutrition education tools. They were more interactive and the selected subjects solicit their full cooperation for the conduct of this study. At this modern scenario, younger generation is health conscious and seeks information about their health care and health problems. A structured education e-module was

developed and able to create awareness among the adolescent girls in terms of their diet and lifestyle pattern, management of health problems especially PCOS.

A total of 100 young adult women (17-23 years) who were living in hostels and using mobile regularly were selected to this study. Random sampling was adopted to select subjects. The selected subjects were catagorized into four different groups. Each group consists of 25 subjects.One group was considered as the control group, to them leaflets and pamphlet were distributed without any kind of education. Rests of 75 were in the experimental group.

B. Conduct of the Study- Formulation of tools for collection of data:

In the pre test, a small number (N=10) of interviewers were selected (17-23 years) to revise the questionnaire. On the basis of the corrections and comments from them, further modification was carried out for the effective implementation. A well structured questionnaire was formulated to collect the background information regarding socio-economic profile, dietary pattern, nutritional and health status, case history, health and nutritional knowledge related to PCOS from the selected subjects. The research design and the protocols used for the study were submitted for the Ethical clearance Approval to the Institutional Ethical committee and got approved with the approval number AUW/IHEC/FSN-17-18/XPD/21.

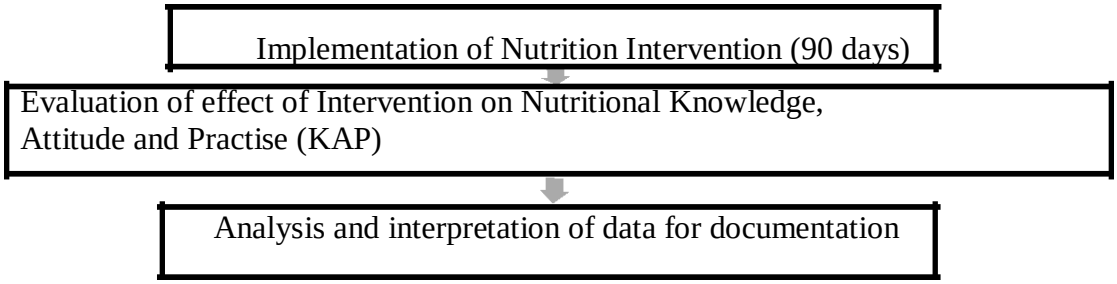


rait, **dietary and lifestyle** **pattern**	**post knowledge on PCOS**	**and Anthropometry** **(N= 100)**

Pre knowledge assessment

Development of Nutrition Intervention Module

Control Group	**Expt group** I	**Expt group II**	**Expt Group III**
Pamphlet, Leaflet alone is Distributed (self learning) n=25	Pamphlet, Leaflet, oral Lectures, chalk and talk with PPt (n=25)	ICT tools such as Face book, Watsapp, Instragram as information or as videos on food security (n=25)	Pamphlet, Leaflet, oral Lectures and physical intervention (aerobics, walking, Zumba, Exercise) .(n=25)



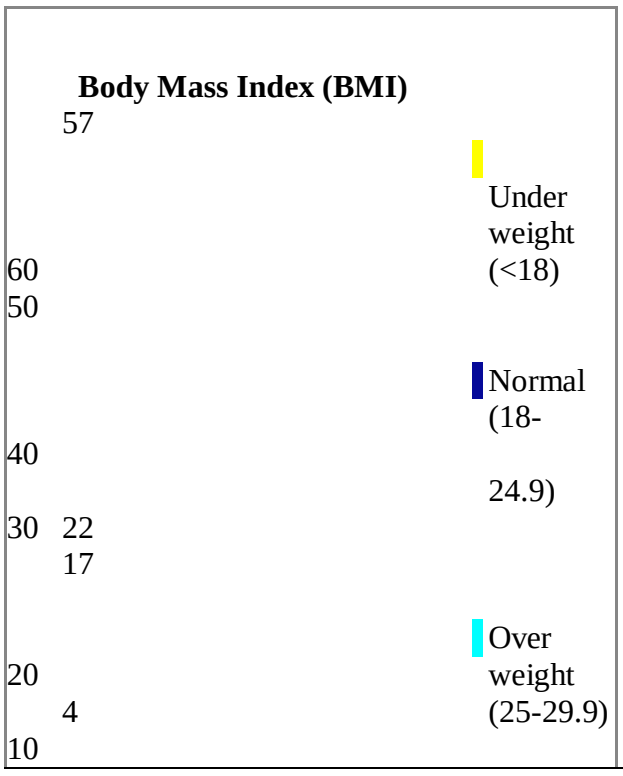
RESULTS AND DISCUSSION:

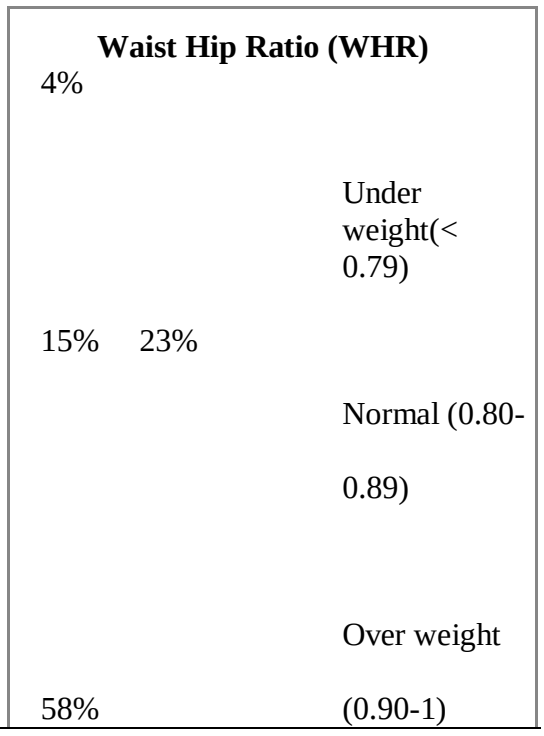
Assessment of nutritional status of the selected subjects:

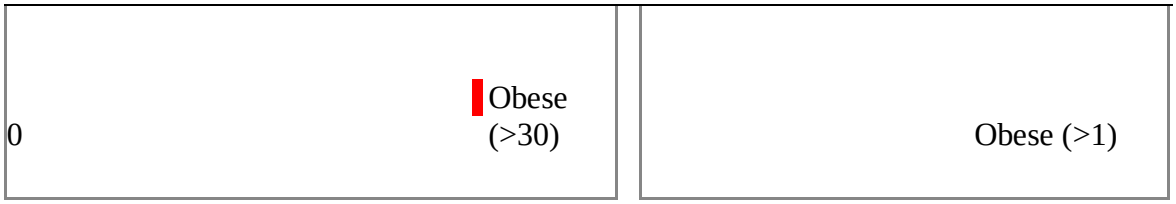
Anthropometry is the universally applicable, inexpensive and most sensitive parameters for assessing the nutritional status of the selected subjects (N=100). It reflects both health and nutritional status and also predicts performance, health and survival of an individual . The most commonly used indicators of the nutritional status are i) Standing height ii) Body Weight iii)

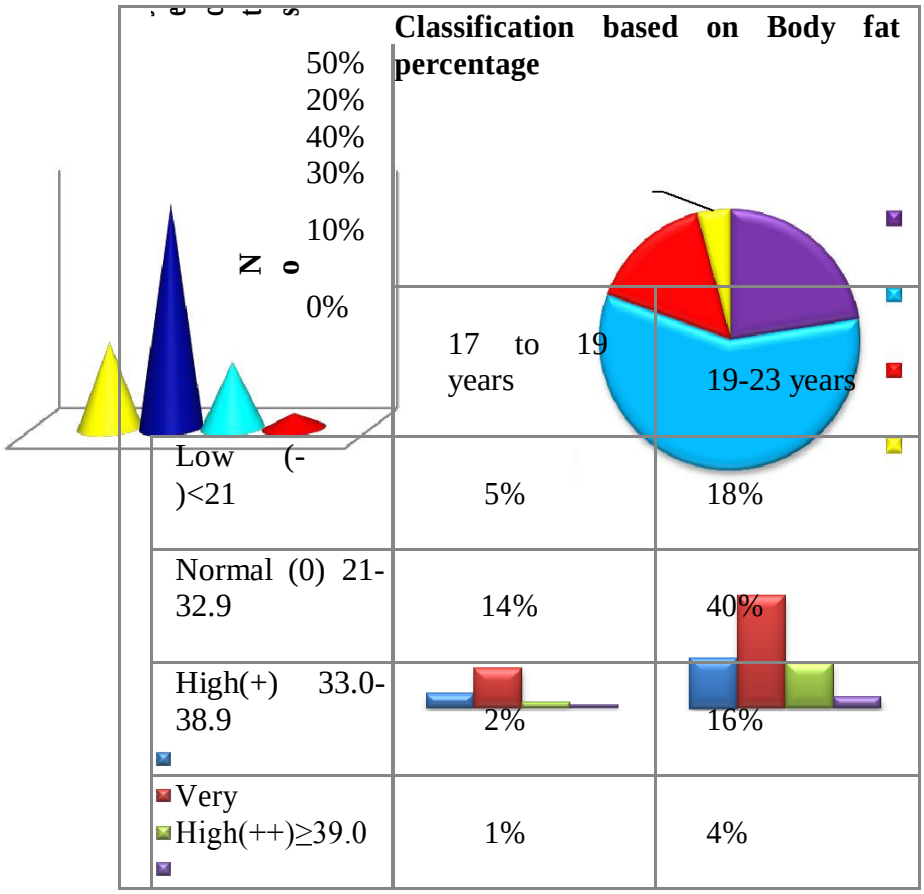
Computation of Body Mass Index, Body Fat, BMR iv) Calculation of WHR using circumferance of Waist Hip Ratio.

Among the selected subjects, 22 percent were underweight,57 percent were normal, 17 percent were over weight and four percent were obese. Among the selected subjects, were 58 percent of them had the normal WHR, 23 percent were under weight, 15 percent were overweight and 4 percent were obese. Among the selected subjects 23percent had low body fat who belonged to the category of underweight, 54 percent had normal body fat, 18 percent have high body fat who were in the category of overweight and 5 percent had very high body fat who were in the category of obesity.









Clinical Examination

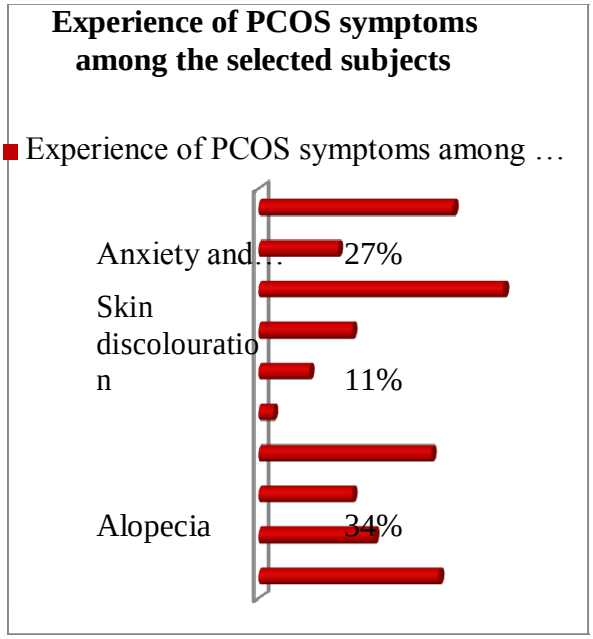
Clinical Examination assesses level of health of individuals or population group in relation to the food they consume. It is the simplest and practical method. When two or more clinical signs characteristic of a deficiency disease are present simultaneously, their diagnostic significance is greatly enhanced. Hirsutism, Irregular periods, Obesity, Deepening of Voice, Acne, Hair Loss, Inability to lose Weight are the majority of the clinical signs observed in people having PCOS.

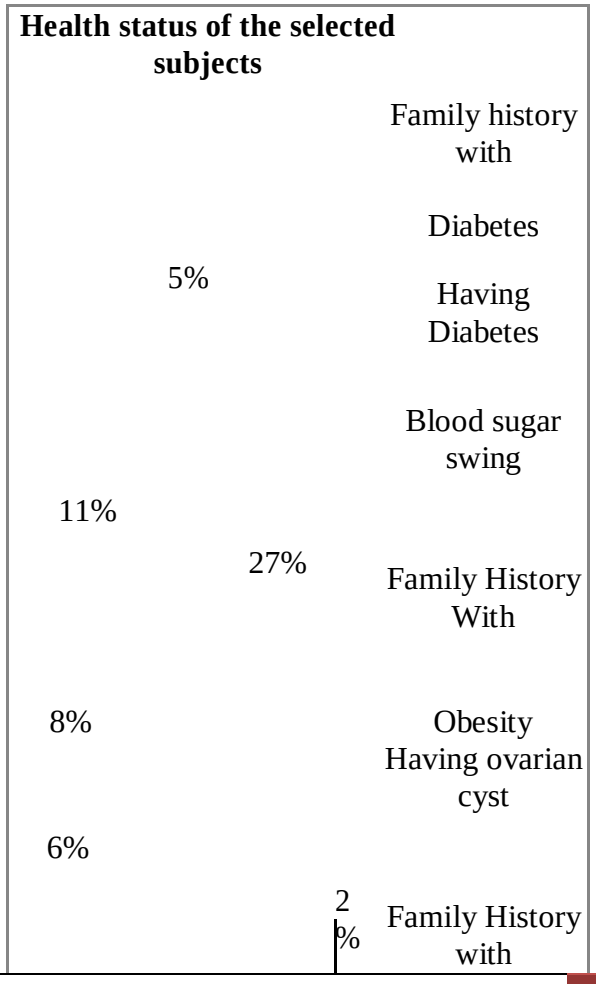
Among the study subjects, the incidence of Prevalence of PCOS ranges in an average of 17.2 percent and the symptom that is found to be more common among the participants is Alopecia and its prevalence rate is 34percent. Next is anxiety and depression (27 percent), over weight is

25% and irregular menstruation is 24%. These are the common problems that are related with PCOS but while coming to the specific symptoms 16 percent had excess body weight around their middle, 13 percent had difficulty in losing weight, 13 percent had prolonged acne, 11 percent had skin discolouration, seven percent had excessive hair growth on neck, chest area and other area in the

body (hirsutism), two percent consumed birth control pills to control pain. While considering the health status two percent of the selected subjects were diabetic with fluctuated blood sugar level and six percent had ovarian cyst.

According to the family history of the selected subjects majority (39 percent) subjects had the family history of having obesity, 27 percent with diabetes of the family history, 11 percent of the selected subjects found difficulty in conceiving, eight percent of the subject's family women are detected with ovarian cyst and five percent were diagnosed to note the presence of PCOS.





25%

over weight

Ovarian Cyst

2%

Family History With difficulty on Conceiving

39%

Dietary habits and lifestyle pattern

As the lifestyle pattern and Dietary pattern plays a major role in cause of metabolic disorder and has the key role in cause of PCOS, their lifestyle pattern Such as physical activity and the dietary pattern were considered to assess the nutritional and Health status. The related data were collected using the open and close ended questionnaries. With having this as base nutrition education modules is prepared to have effective impact. The frequency of consumption of meals per day by the selected subjects revealed that the majority (58%) of them had the habit of having three meals per day, 46 percent of them have the habit of having four meals per day and very less of two percent of them have the habit of having 2 meals per day. Among the subjects selected, 57 percent used to skip breakfast, 25 percent skipped lunch and 14 percent skipped dinner and four percent skipped meal of the entire day.

The food choice, type of food they consume, preference and place they consumed were noted among the selected subjects 75 percent consume food from outside and 25 percent do not consume food outside of their house. While coming to the eating habits and preference of eating among the subjects, a majority of (83 percent) preferred to have fried food items and only 17 percent preferred to have healthy balanced diet.

Type and intensity of physical activity done before and after education is discussed in the following table:

physical Activity	**Percentage**	**Frequency and duration of doing exercise**		**Mean difference (M Diff)**
		Before education (Mean ± SD)	**After education (Mean ± SD)**	
Aerobics	10 %	2.22 ± 1.99	3.66 ±1.52	+1.44
Yoga/ stretching	20%	3.01 ± 1.42	5.11 ± 1.39	+2.10
Walking/ jogging/ cycling	75%	5.68 ± 0.53	6.1 ± 0.48	+0.42
Heavy exercise(gyming)	3%	0.77 ± 0.86	0.86 ± 0.83	+0.09
Strength training	2%	0.48 ± 0.76	0.62 ± 0.80	+0.14

The mean difference on doing exercise is increased after giving nutrition education and there is significant change in the physical activity opted by the selected subjects.

Assessment of Pre and post knowledge:

After the nutrition education was given to the subjects, the knowledge assessment is done with the same pre knowledge assessment questionnaire and evaluated the knowledge gained by the selected subjects. The effect of Nutrition education was assessed by Data Analysis using 't'Test

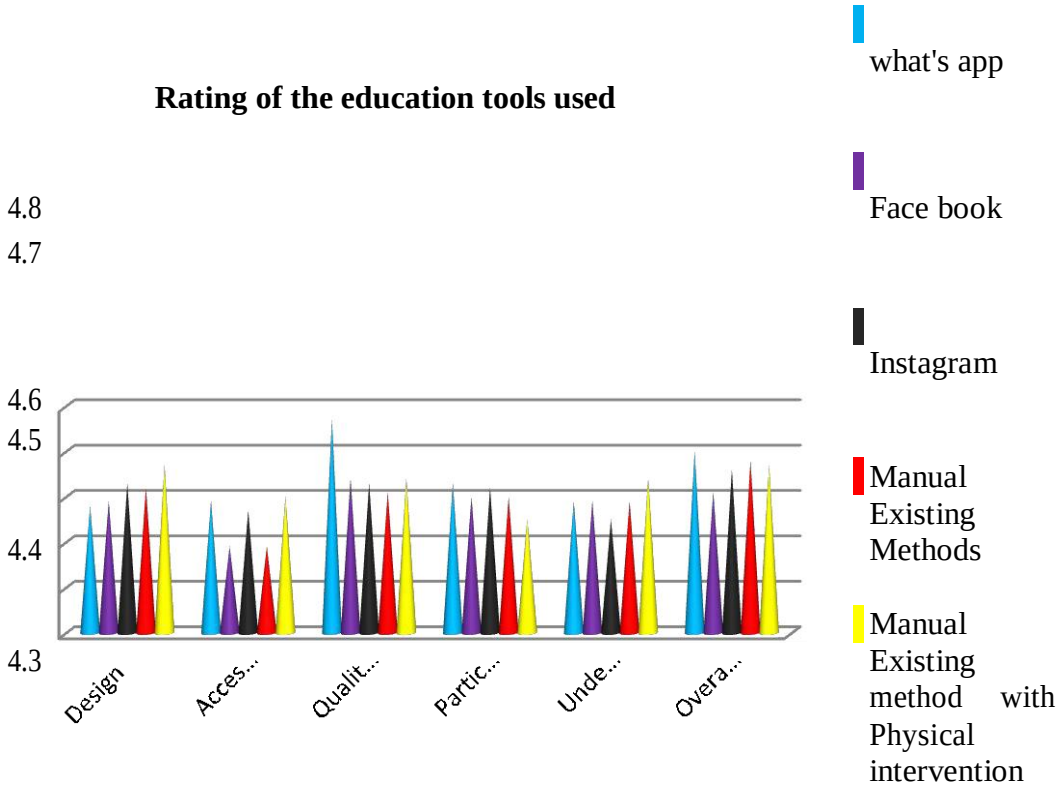
– (Test of significance**)**

Paired Samples Test (Knowledge assessment)

PCOS (N=100)	Paired Differences					Correlation	T	Df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference					
				Lower	Upper				
Preknowledge – post knowledge	- 2.090	1.54459	.1545	- 2.3965	-1.7835	0.681	-13.531	99	.000

Evaluating the best method for imparting nutrition education

The statistical analysis revealed that the impact of ICT enabled education module related to PCOS on nutritional knowledge test of significance as 0.000, standard deviation and the mean difference is -2.090±1.55 had improved and found to be one percent significant. Nutrition education through ICT enabled tools lectures and physical activity intervention had improved the knowledge and overall acceptability of what's app was found to be high (4.7±0.509).It also bought behavioural change on eating pattern among the young women population.



Summary and Conclusion:

The Nutrition education through ICT enabled tools lectures and physical activity intervention had improved the nutritional knowledge on Poly cystic ovarian syndrome and bought behavioural change among the young women population. The findings from this study provide a Mobile phone based primary intervention strategy to increase awareness and promote healthy lifestyles in college going young women. Thus the study supports in preventing the problem of PCOS and related issues from becoming more widespread.

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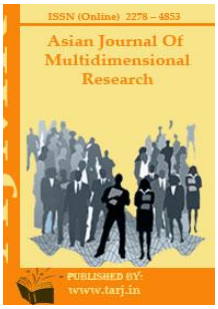

Asian Journal of Multidimensional Research (AJMR)

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SUB THEME – "FOOD SECURITY, POVERTY AND SUSTAINABILITY" NUTRITIONAL STATUS "AN IMPORTANT VARIABLEFORBETTER ACADEMIC PERFORMANCE OF SCHOOL CHILDREN (10-12 YRS)"

Mrs.R. Anitha*; Pa.Raajeswari**

*Ph.D. Scholar,
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: anithadiet2008@gmail.com

**Assistant Professor (SG),
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Under-nutrition is a multidimensional issue in India affecting young children. Undernourished children are more prone to illness. By the time they reach school-age, they have a much lower potential to learn compared to their well-nourished peers. This study aimed to assess the relationship between nutritional status and academic performance of school children (10-12 yrs).Fifty school children (10 -12 yrs) including 23 girls and 27 boys were selected from a Government higher secondary school in Vellore with the inclusion criteria of acceptance in the study and mother as an informant. A structured questionnaire was administered to mother of each child. Anthropometrics such as height, weight and head and chest circumferences were measured using a portable weighing balance and a measuring tape from which the body mass index (BMI) was calculated. Nutritional status of the children was assessed. Academic performance of the children was obtained by finding the mean of five subjects taken during term examination. This study results showed that undernourishment was more prevalent among boys than girls. Stunted, wasted and underweight children have obtained lower marks in most of the subjects. From the results, it was observed that nutritionally adequate children performed better academically when compared to undernourished children.

KEY WORDS: *Under-Nutrition, Nutritional Status, Academic Performance, School Children, Structured Questionnaire, Body Mass Index.*

INTRODUCTION

Food insecurity is an important determinant for under nutrition among children. Consuming a sufficient, safe and nutritious food is critical for child growth and development. Intrauterine growth restriction, suboptimum breastfeeding, wasting, stunting, and micronutrient deficiencies is the major contributor to disease burden and poor cognition among school children[2].Adequate nutrition is essential to ensure healthy growth, proper organ formation and its function, neurological and cognitive development and strong immune system. The National Family Health Survey (2016)[5] reported that 38.4% of children below 5 years of age are stunted and 21% are wasted in growth. The numbers are alarming when the UNICEF/WHO/World Bank Group joint Child Malnutrition Estimates (2017)[10] categorized India under the critical zone in Southern Asia region with respect to childhood wasting. It also reported that more than half of all wasted children in the world live in Southern Asia[10.]

Child malnutrition impacts cognitive function and contributes to low learning ability and poor academic performance. Evidence has shown that physical growth and cognitive development in children are faster during early years of life. By the age of four years, 50% of the adult intellectual capacity has been attained and before thirteen years, 92% of adult intellectual capacity is attained[11.] Poor nutritional status is also the major cause of low productivity in primary education which may affect the physical and cognitive development in children during their early years of life[4]. Identifying the variables that influence the achievement of school children is of great importance because it would serve as an essential tool for design of education policies.

Over the years, the existence of a link between nutrition and the development of a child's brain has been described by many researchers. Hence, it can be implied that under-nutrition in early life may impact negatively on the future cognitive potentials. Nutritional status and intelligence are influenced by several factors that include parents' socio-economic status, family type, parents' literacy level and family size [3].

Strong evidence exists that poor feeding practices are associated with stunted growth and delayed mental development. Thus, there is a relationship between impaired growth status and both poor school performance and intelligence quotient (IQ) [7]. Hence, this present study is aimed to investigate the relationship between nutritional status and academic performance of school children.

OBJECTIVES

Objectives of the study are to,

1) Assess the nutritional status of children (10-12 years)

2) Study the academic performance of children (10-12 years)

3) Evaluate the association between nutritional status and academic performance of children.

MATERIALS AND METHODS

1. Selection of Locale and Sample

This study was carried out by purposive sampling method. About fifty children (27 boys and 23 girls) were selected from the government higher secondary school, Thorapadi, Vellore, Tamilnaduwith the following inclusion criteria.

Inclusion Criteria

- Children aged between 10- 12 years.
- Mother as an informant
- Subjects who were able to consent for the participation in the study

Exclusion Criteria

- Subjects who were not willing to participate
- Subjects above or below the specified age group

2. Collection of data

Data was collected after getting permission from school head master. A structured interview schedule was developed and administered to the mother of each children and information regarding age, sex, date of birth, socio economic back ground, birth weight were collected.

3. Anthropometric Assessment

Anthropometric measurements such as height, weight, body mass index, head and chest circumferences of the children were collected by using portable weighing balance and inch tape. Nutritional status of children were assessed by calculating height for age, weight for age and body mass index for age with the help of WHO(2007) growth chart.Children were categorised in to different classes in accordance to their values with standard deviation units of Z scores for comparison.

TABLE 1 NUTRITION STATUS BASED ON STANDARD DEVIATION Z SCORE OF BMI, HEIGHT AND WEIGHT FOR AGE

S.No	Standard deviation Z Score Value	BMI[12]	Height for Age[13]
1	-1 to -1.99	Mild Thin(Grade I)	-
2	-2 to -2.99	Moderately Thin(Grade II)	Stunted
3	Below -3	Severely Thin(Grade III)	Severely stunted
4	+ 2 to +2.99	Overweight	Above normal
5	Above + 3	Obesity	-

3.1 Height measurement:

Height was measured by using a fixed measuring inch tape on the vertical flat surfaced wall. The children were made to stand erect, shoulders straight with bare foot. The Measurements were noted with the help of wooden scale touching on the head of child proportionate to values on the scale.

3.2 Weight measurement:

Weight was measured by a portable weighing balance. Children were asked to stand on the weighing machine with minimal clothing and bare feet. The values were noted.

3.3 Head circumference

Head circumference is measured by passing an inch tape across the forehead and around the full circumference of head of an each child. The head circumference is a physical index of both past

nutrition, brain development and a good predictor of later intelligence of a child[1],and it is used as the most sensitive anthropometric index of prolonged under nutrition associated with intellectual impairment[4].

3.4 Chest circumference

Chest circumference is measured by passing an inch tape around the fullest part of the chestof all children.

3.5 Body Mass Index (BMI)

BMI was calculated by dividing weight (kg) of the child with the square of height (M). It was further categorized by plotting their BMI values on the age and sex specific WHO growth charts and the Z score were calculated.

3.4 Academic performance of children in term examination

Academic performance of the children was collected by taking average marks of all subjects (Tamil, English, Mathematics, Science and Social science) in term I and term II examination.

3.5 Statistical Analysis

SPSS version (16.0) was used to analyse the data. Data were expressed in terms of mean and standard deviation for comparison and specific conclusion were derived.

RESULTS AND DISCUSSION

1. Anthropometric Assessment of children according to their sex

TABLE 2 ANTHROPOMETRIC ASSESSMENT OF THE CHILDREN (N=50)

Anthropometric Indices	WHO[13]		Boys N=27		Girls N=23	
	Boys	Girls	Mean ±SD	Minimum - Maximum	Mean ±SD	Minimum -Maximum
Age (years)	10.72	10.79	10.72±1.21	9.9-11.6	10.79±1.37	10.16-11.6
Weight(kg)	-	-	31.15±8.44	20.2-55.0	33.83±9.04	21.1-55.3
Height(cm)	141.3	143.38	136.71±7.61	122-153	137.7±5.93	127-150
BMI	16.76	17.0	16.47±3.05	12.99-23.8	17.54±3.61	13.08-25.9
Head Circumference(cm)	-	-	50.66±1.79	47-54.8	49.71±1.06	46.0-53.0
Chest Circumference(cm)	-	-	62.39±6.60	55-81	64.72±7.37	54.0-81.0

The **Table 2** stated the mean anthropometric indices of studied children. A total of 50 children in the age 10 -12 years were included in the study. This study comprised of 27 boys (55%) and 23 girls (45%) with the overall mean age of 10.75 years. Mean age of the boys and girls were 10.72 and 10.79 respectively. The results showed that girls are having higher values in height (137.7), weight

(33.83), BMI (17.54) and chest circumference (64.72) when compared to boys. It may be concluded from the **Table 2**, the girls had higher values in weight, height, chest circumference and BMI than boys which may be due to the fact that the body physique is influenced by climatic, hereditary, nutritional, and racial factors, as reported by Rastogi*et al* (2008). Mean Body mass index of all girls wereslightly above the values of WHO standard indicates that girlswere in standard categories when compared to boys in over all observation. Higher value of BMI of girls may be due to the age of the study population which is closer to the age of growth spurt.

4.2 Nutritional status of the children

TABLE 3 NUTRITIONAL STATUS OF THE CHILDREN (STANDARD DEVIATION UNITS OFZ SCORE) (N=50)

S. No	Categories	Nutritional status of the children	Standard Deviation Units of Z Score	Boys (N=27)	Girls (N=23)	Total (N=50)
1	Height for Age HAZ	Normal(Good nutrition)	-1 to+1	88.88	86.95	88
		Stunted	-2 to -2.99	7.4	13	10
		Severely stunted	Below -3	3.7	-	2
		Above normal	+ 2 to +2.99	-	-	
2	BMI for Age	Normal(Good nutrition)	-	37	43.47	40
		Mild Thin(Grade I)	-1 to -1.99	22.2	30.44	26
		Moderately Thin(Grade II)	-2 to -2.99	18.5	13.04	16
		Severely Thin(Grade III)	Below -3	7.4	-	4
		Overweight	+ 2 to +2.99	14.8	13.04	14
		Obesity	Above + 3	-	-	

*Number in parenthesis indicates percentage

The above **Table-3** represents the nutritional status of children. It was assessed by using WHO standard deviation Z Scores. Overall about twelve percent of the total sample (stunted10% and severely stunted 2%) were identified as stunted children. There was no much difference studied between boys and girls in regard to their height for age. Based on BMI for age, overall about forty six percent of the children were undernourished (Grade I(26%), II(16%), III(4%)Thinness) whereas only 40 percent of the children were in normal category.Girls were reported slightly higher in Grade I thinness (30.44%) when compared to boys (22.2%). In contrast boys were noted higher prevalence of thinness in moderate (18.5%) and Severe (7.4%) category. There is no much significant difference exist in percentage of overweight among boys and girls.

4.3 Association between nutrition status and academic score

TABLE 4 ASSOCIATION BETWEEN NUTRITIONAL STATUS AND MEAN ACADEMIC SCORE (N=50)

S.No	Nutritional status of the children	Mean Academic Score	
		Boys (N=27)	Girls (N=23)
1	Good Nutrition(Normal)	45.8	48.73
2	Mild Thin Grade I	40.3	44.50
3	Moderate Thin Grade II	34.95	41.06
4	Severely Thin Grade III	30.0	-
5	Over weight(Above normal)	42.15	57.3

From the Table-4 it is evident that mean academic score of the children is dependant to the nutritional status.Girls are having higher academic mean score than boys. Well nourished girls had secured highest score (48.73 and 57.3) among all other categories. Lowest academic scores were observed in moderately thin boys and girls. Similar results were found in a Nigeria study "A weak relationship exists between nutritional status and academic performance and the variation could be as a result of genetics and environmental factors such as a result of imbalance in food intake of the population.Well nourished children performed academically good than the others, which could mean that the children who were well fed and well nourished tend to do better academically than those who are not[6].

CONCLUSION

This study results revealed that totally around46% of children were suffering from one or the other form of under nutrition, possibly due to inadequate diet and food insecurity. Undernourishment was prevalent among boys than girls in studied population. Well nourished children performed better academically than undernourishedchildren. The girls had higher academic scores than boys though the difference was not significant.Strengthening of food and health services in school and creating awareness about food safety and security among parents isrequired for better future.

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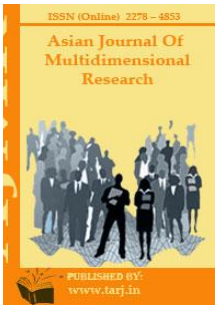

Asian Journal of Multidimensional Research (AJMR)

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STREET FOOD PRODUCTION SURVEY IN PONDICHERRY DISTRICT: FSSAI BASED SURVEY

Bharathiganesan* Prathapkumar Halady Shetty**

* Guest Lecturer,
Department of Home Science,
Government Arts College for Women,
Nillakottai, Tamil Nadu, INDIA
Email id: bharathireddy388@gmail.com

**Department of Food Science-Pondicherry University,
Tamil Nadu, INDIA

ABSTRACT

India has a rich history of street food vendors reflecting the traditional local cultures. They don't forget the comparative low prices; have made street foods popular with all sections of society including the elite and international tourists. In India every few hundred meters the food culture and variety has changed this is not surprising to see. The process of creating conditions that promotes the safe production. Street food often highly nutritious, tastes superb with great culinary heritage and one can never get enough it. They are typically operated from semi-permanent premise and use portable booths food carts or trucks to sell their items. Mainly these types of street food run by their families or individuals. There has been no census of street food vendors in the country. The ministry of urban poverty alleviation, government of India has estimated that there are 100 lakh street vendors in the country about 20 % of them that is 20 lakh are expected to be street food vendors .The aim of the study were to assess the demographic profile of street food vendors and food safety used hygiene practice used in critical point of food production and selling areas. 51 samples were taken and specially designed questions were used for primary data collections. WHO reported that food born diseases were found to affect more than 30% of the population in developed countries. Street foods are mainly focus to run for tourist and this data helps to ensure the quality and hygiene of the street foods.

KEYWORDS: Street foods, hygiene

INTRODUCTION

Street-vended foods are defined as those foods prepared on the street or at home and ready to eat, they are consumed on the street without further preparation. They include foods such as meat, fish, fruits, vegetables, grains, cereals, frozen product and beverages prepared and/or sold by vendors; especially on streets and public place. They may be consumed where it was purchased or can be taken away and eaten elsewhere. In developing countries, drinks, meals and snacks sold by street food vendors are widely consumed by millions of people. Pondicherry is popular tourist place in south India so that street food vendors are mainly focusing tourist people in Pondicherry and certain type of tourist who wants to fully experience a place, culture, through ethnic foods. Variety of foods available on road side you can find the smell to get foods. Food survey provides data and information about socio economic impact, legislative frame work, vendors training, consumers awareness, nutritional improvement, official control and relevant policies (Joanna Trafialek et.al., 2018). The street food trade is an ancient practice (Taylor et al., 2000) common in several countries (WHO, 1996) as a source of in-come. It is a provision of inexpensive meals accessible to the population and can also represent the culture of typical and local food. There are increased interests worldwide on the importance of street food as part of a general concern for food security and health.

Food safety is defined as the degree of confidence that food will not cause sickness or harm to the consumer when it is prepared, served and eaten according to its intended use. Food and Drug Administration and the Department of Agriculture, conducted cross-sectional survey every 3-5 years to track consumer awareness, perceptions, and behaviors toward food safety issues. It was started by FDA in 1988.The survey results are used to measure trends in consumer food safety habits, to better understand consumer attitudes about novel technologies, and to evaluate educational messages directed at consumers. Specific topics may be added to individual surveys. Food safety survey information will be used to develop strategies to communicate food recall information to the public more effectively.

OBJECTIVE OF THE STUDY

The aim of this study was to assess the demographic profile of strees food vendors and food safety uses hygiene practice which is used in critical point of food production and selling areas.

- To asses the Characteristics of strees food vendors in pondicherry
- To verify eating pattern of street foods.
- To analyse food safety aspects of street food vendors.
- To look over food safety aspects related to consuming street foods.

RESEARCH METHODOLOGY

The methodology pertaining to the study of FSSAI **Food Safety And Hygiene Survey At Street Food Production In Pondicherry District** and the research survey was based on qualitative nature. The study was organized in Pondicherry in the union territory of Pondicherry. According to the study, primary data's were collected by specially designed questions and through observations, allowed fast data collections. 51 samples were taken randomly and this paper is discussed based on the following headings

Selection of particular shops

Specially designed questions

Collection of data

Evaluation and statistical analysis

Street food survey

Survey design:

A cross-sectional study was conducted on food safety survey in street food vendors from September to February 2018. A questionnaire was developed in order to assess the food safety knowledge and food handling practices, license, daily income and family background.

The demographic characteristics survey includes:

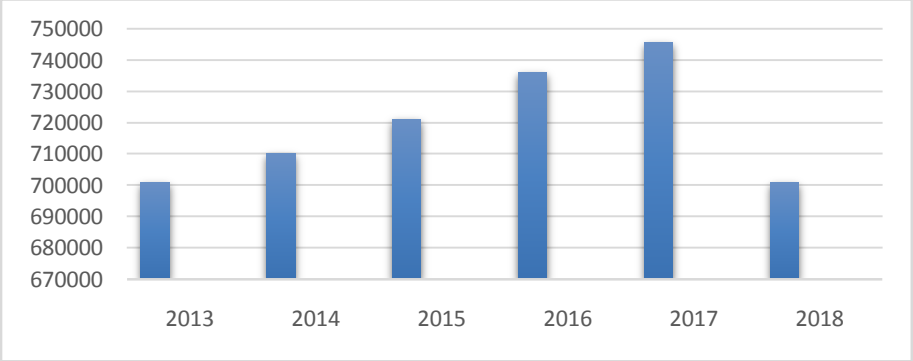
1. Gender
2. Age
3. Field of Study
4. Maternal Status
5. Residential Status
6. Income per day etc.

SCOPE OF THE STUDY

The purpose and scope of the study is to know about the food hygiene practice among street food vendors and this study observed how they were aware of food hygiene during handling, preparation and serving. This paper further helps to improve the quality of street foods.

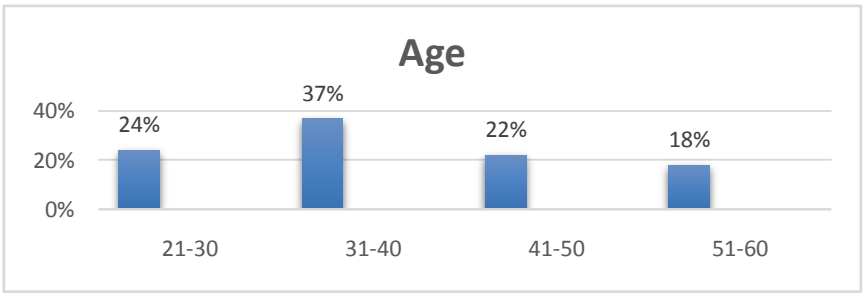
DATA INTERPRETATION & ANALYSIS

Population in Pondicherry



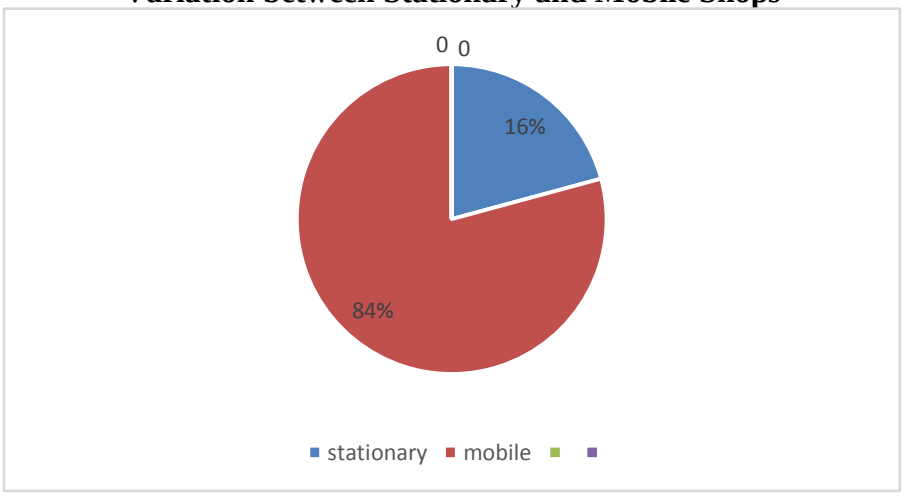
The population of Pondicherry in the year 2018 as per estimated data is 754,520. Comparing to male, female holds half of the population. It has a literacy rate of 76%, higher than the national average of 59.5%. There is a French community in the city and different French foundations was also present, these are the main reason that focus them to run street food. Food vendors are focusing to run shops at schools, colleges, government sectors, beach areas and large number of tourist visiting areas. This study sample was collected randomly from the whole city of Pondicherry.

Characteristics of street food vendors



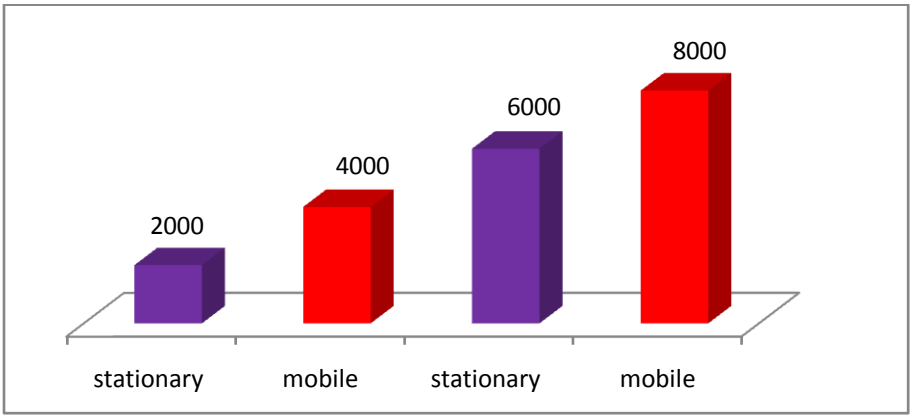
Above chart shows the frequency of different age food vendors who are selling food. In this data majority of the street food vendors are women (75.7%) and men (24.3%) who fell into the average age group of 31-40 years

Variation between Stationary and Mobile Shops



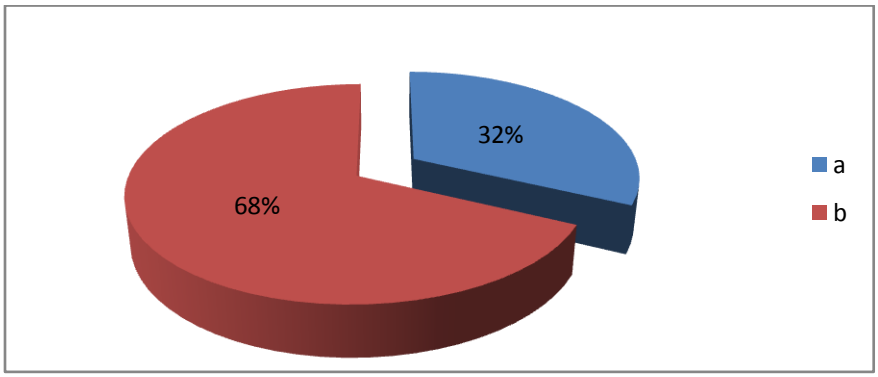
The above study shows 84% of street food vendors having stationary shops and 16% of street food vendors having mobile shops. One third of the street food vendors prepare the food to sell at the stalls, they also learn food handling and vending, while acquiring their knowledge by observation or taught by their parents.

Profit variation



Street food vendors typically operate from semi-permanent premises and use portable booths, food cars or trucks to sell their items. According to that shops their daily income was based on giving salary to labour and the stationary shops per day profit is 2000 – 6000 and mobile shops 4000 – 8000.

Hygiene awareness in street food vendors



Above pie chart shows 68% of the food vendors wear head cover and cloves while cooking foods, serving and handling and majority of them aware that it was necessary to wash their hands before cooking.

CONCLUSION

Food safety is most important to concern and to give safe food to the consumers which consider way of food handling, preparation, storage and it can prevent food borne illness. Street food shops are back bone of Pondicherry economy. Based on the above study results was found and most of the street vendors lack in availability of basic infrastructures in their working sites which include portable water, electricity, raw materials, hand wash. The above data was shows the lower educational level of street food vendors leading to food contamination during handling, storage, preparation because the majority of street food vendors acquired their knowledge by self-teaching and food vendors has only one shop because of their poor economic background and the total time value shows that the street vendors got more profit than the average restaurant.

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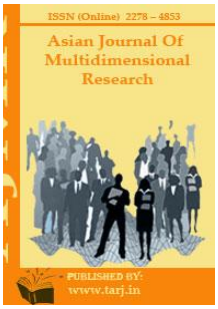

Asian Journal of Multidimensional Research (AJMR)

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MALNUTRITION, POVERTY AND FOOD INSECURITY IN OLD AGE

P.Sofia Helen Ponmalar*
Assistant Professor
PSGR Krishnammal College for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: sofiahelen@psgrkcw.ac.in

ABSTRACT

Food insecurity in older adults is a multidimensional phenomenon and is associated with numerous unfavorable nutrition- and non-nutrition related outcomes that may affect the health and well-being of the older population. The world's population is ageing. Underlying causes of malnutrition in older persons are household food security, inadequate care, unhealthy household environment and lack of access to health services. The immediate causes of malnutrition affecting late stages of life are influenced by three underlying determinants: household food insecurity, inadequate care for the older person, as well as an unhealthy household environment with a lack of access to health services. Food-insecure elderly persons had significantly lower intakes of energy, protein, carbohydrate, saturated fat, niacin, riboflavin, vitamin B6, vitamin B12, magnesium, iron and zinc, as well as lower skin fold thickness. Low socioeconomic status is a known cause of malnutrition in older adults, due in part to the limited resources for purchasing food; often, money goes toward less expensive and less nutritious foods.

KEYWORDS: *Food Security, Malnutrition, Poverty, Functional impairment, Dietary diversity.*

INTRODUCTION

Food is one of the most significant aspects in the life cycle of a human being and plays a significant role to ensure a healthy and active life. Every human being has the right to constant access to nutritious food, which maintains human dignity. Maintaining good health, consuming a nutritious diet, managing an existing chronic disease, or a combination of these can be a challenge for those struggling with poverty or food insecurity for a variety of reasons, including limited finances and resources, competing priorities, and stress. There is a direct association between people's nutritional status and food intake and the latter is dependent on income and food security. These variables cannot be seen in isolation but have to be studied simultaneously (Dewbre 2010).

Food Insecurity in Old age

Food security encompasses the ready availability of nutritionally adequate and safe food for an active, healthy life. The concept of food security is defined as including both physical and economic access to food that meets people's dietary needs as well as their food preferences.(Lee JS,2010).Food insecurity in older adults is a multidimensional phenomenon and is associated with numerous unfavorable nutrition- and non-nutrition related outcomes that may affect the health and well-being of the older population (Lee JS,2010).Food insecurity affects individuals in critical stages of the life cycle. Older people living under constrained socioeconomic circumstances are, for instance, more likely to become food insecure.

Ageing and Demographic Trend

The world's population is ageing. Globally, the number of older persons is growing faster than the numbers of people in other age groups. Elderly or old age consists of ages nearing or surpassing the average life span of human beings. According to census, 2011, elderly population (age 60-years and over) constitutes about 8% of total population (Census2011). According to the United Nations Population Division report, India's older population will increase dramatically over the next four decades, constituting 19% of total population of India by 2050(United Nations Population Division,2012)

The increasing proportions of countries' oldest populations are associated with greater vulnerability and high-risk of development of chronic diseases and disabilities. These negative health outcomes have direct effects on access to adequate food and result in food insecurity King, C. (2016).In older populations, food insecurity results from more than financial resource constraints. Functional impairment, not owning a home, isolation, gender, financial vulnerability, and poor health have statistically significant associations with food insecurity. These associations suggest that differences in food use between older and younger populations should be considered. These important risk factors for food insecurity tend to occur together, which results in a much higher risk for food insecurity in older populations (Lee JS, 2011).

According to a report of *Ministry of Statistics &Programme Implementation* ,2010 one half of the rural elderly had a monthly per capita expenditure of Rs.420/- to Rs.775/ which indicates that rural elderly lack adequate financial resources at their disposal to spend on food which have a direct impact on quality and quantity of food consumed.

Variables Associated with Food Insecurity

In the developing world, much nutrition research and many nutrition programmes focus on children, pregnant women and other population groups undergoing critical physiological processes under less

favorable circumstances. However, there is an increasing realisation that older people also constitute a vulnerable group in both biological and socioeconomic terms.

Household Food Insecurity

The concept of quality of life encompasses several components. Some of the known causes of declining QOL in older people include risk or existence of chronic illness, decline in functional ability, reduced financial independence, inadequate healthcare, poor shelter and social isolation (Bazaadut, 2014; Khan &Tahir, 2014).Underlying causes of malnutrition in older persons are household food security, inadequate care, unhealthy household environment and lack of access to health services**.** The immediate causes of malnutrition affecting late stages of life (i.e. inadequate dietary intake and disease) are influenced by three underlying determinants: household food insecurity, inadequate care for the older person, as well as an unhealthy household environment with a lack of access to health services.

The household is a difficult-to-measure concept, involving a great number of dimensions, and susceptible of being studied from diverse Perceptions of food deprivation, anxiety resulting from not having enough money to afford food, running out of food or monotonous eating patterns resulting from scarce food availability, to mention just a few examples, have been the cornerstone of subjective measures of food security and insecurity (Radimer*et al,*1992; Kendall *et al,* 1995 and 1996). Findings of the study on food security in old age reveals that for the self-reported non communicable diseases suggested that older adults with chronic diseases (i.e., diabetes, pulmonary disease, cardiac disease, digestive disease, mental disease, and urinary disease) had increased odds of living in a food-insecure household.

Access to food involves the availability of financial resources. Items from the most commonly used food security and insecurity scales are based on the relationship between economic resources and hunger satisfaction over time. Hence, the poorer the household and the individual, the higher the food insecurity.

Malnutrition in Older Persons: Consequence of Food Insecurity

Studies on food security in indiareported that fat intake was correlated to food insecurity that can lead to fat-frail. The resulting difference might be due to the respondents in this study were mostly have food security with consumption of poor quality diet, i.e. high in fat. Security and food safety as well as knowledge of necessary measures to protect oneself from unbalanced or hazardous nutritional habits are essential for active aging. In fact, older adults are more vulnerable to food-borne illness. (Bigitendriya 2013; Maiti et al. 2013)

In people >85 years, the risk for infection and deaths related to food-borne pathogens increases, because of the decrease in immune function, concomitant chronic diseases, malnutrition, immobility and other factors. Knowledge of safe food handling helps older adults stay healthy. As with the total population, older people are a heterogeneous population with varying needs. Some older adults are homebound and must rely on delivered food. Others have minimal cooking experience. Practicing the safeguards necessary to avoid food borne illness is the best way to stay healthy. Study on prevalence of malnutrition in elderly people residing in Lucknow city states that, when elderly people were asked about balanced diet, 51.67% elderly were said YES and 48.33% said NO. And among them 36.67% subjects had balanced diet and 63.33% were not.

Health problems and limitations of activities of daily living may result in altered food use if older adults are not able to buy their own food or prepare their own meals. Medication can interfere with

micronutrient absorption in certain diseases Study carried out in Chinese Inpatients by Lei et al. (2009) using the 18 items of the MNA scale, found that 19.6 % of the elderly were malnourished (vs. 11.6% in the present study), with 53.2% at risk of malnutrition (vs. 46 % in the present study), and 27.2 % with a good nutritional status.

It was found that from many studies that there was weak association between height and food insecurity. Reducing in height is an important marker for chronic malnutrition. The height of the elderly might also reduced due to spinal shortening as consequence of degenerative bone disease (Han et al. 2011). Gulliford et al. (2003) found that subjects with food insecurity were shorter in height. Occasionally, food inadequacy in the elderly would lower nutrient intake that will impact the nutritional status (Lee &Frongillo 2001).Nutritional deficiencies in the geriatric age group are common and often subclinical (Semwal et al., 2014). It is vital for older people to maintain sufficient protein intake to help prevent loss of muscle mass, pressure sores and maintain immune-competence. Since protein intake is directly related to calcium intake, poor bone health is also a consequence of inadequate protein intake (Sharlin, 2010).

Poverty and Old Age

Older adults are considered a highly vulnerable population group to poverty (Samuel, 2000), given the serious threats that this condition represents to their quality of life . As poverty grows, more negative impacts on the health and the ability to function in a satisfactory ma nner have been observed among older persons from developing countries (Pallon*iet al,* 2002; Palloni&Pelaez, 2004).Prevalence of food insecurity among elderly individuals in Turkey was 21.7%, of which malnutrition and malnutrition risk was 2.7% and 28.0% respectively (Simsek et al. 2013) .

But despite controversial commentary about the relationship between poverty and ageing, scarce economic resources, a lack of opportunities to generate own income, restricted saving capacity and limited availability of safety net programmes account for social and economic vulnerability during late life (WHO, 2000).

Dietary Diversity among Old Age

Dietary diversity (DD) has been identified as a key predictable element of high quality diets in terms of nutrient adequacy globally. As a result, in most countries a diversified diet is prescribed as one of the dietary guidelines to improve health .Older people in both developed and developing countries are subject to nutritional deficiencies (Organization, 2002; Rosenberg &Gallego, 2002; Shatenstein, Nadon, &Ferland, 2003). In older adults, dietary diversity and adequate nutritional intake have highly influenced by the combination of several factors including, medical, socioeconomically, environmental, functional status and other age-related complications. Poor households from developing countries have been found to rely on monotonous diets predominantly based on starchy staples, including little or no animal products, with poor intakes of vegetables and fruits (Ruel, 2003).

Older adults are predisposed to nutrient deficiency due to a decline in total and resting energy requirements (physical inactivity, loss of lean muscle mass and increased adiposity) that gradually reduces food intake while vitamin and mineral needs remain unchanged or increased. Food-insecure elderly persons had significantly lower intakes of energy, protein, carbohydrate, saturated fat, niacin, riboflavin, vitamin B6, vitamin B12, magnesium, iron and zinc, as well as lower skin fold thickness Acham*et al* (2012) assessed dietary diversity, its relation to micronutrient intake and variability between age-groups among women 19–69 years old from informal settlements of Gauteng province,

South Africa. The results showed that on average, 26 foods and 7 food groups were consumed. There In seniors, dietary diversity are influenced by many factors such as(Jain P 2015) medical, socio-economic, functional status and other age-related challenges . Studies on food insecurity and diet quality in terms of diversity among seniors in the US, specifically for Texas, are scarce.

Low socioeconomic status is a known cause of malnutrition in older adults, due in part to the limited resources for purchasing food; often, money goes toward less expensive and less nutritious foods. Previous reviews highlight nutritional outcomes associated with food insecurity such as inadequate calorie consumption, low consumption of nutrient-dense foods, and fewer meals per day. Additionally, food insecurity has been linked to poorer self-reported heath, lower quality of life, cardiovascular disease, diabetes, anemia, obesity, functional impairment, anxiety and depression, and cognitive function (Seligman HK, 2010)

CONCLUSION:

Aged people hunger is a rapidly growing problem in Indian Country. Understanding the associations between food insecurity, increasing access to healthy foods, chronic diseases, and quality of life is fundamental for improvement of health policies and resulting successful promotion of active and healthy aging populations.

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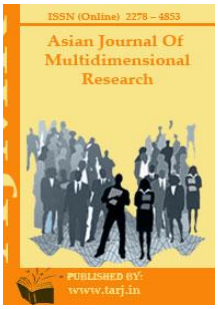

Asian Journal of Multidimensional Research (AJMR)

(Double Blind Refereed & Reviewed International Journal)

UGC APPROVED JOURNAL

TRANS Asian Research Journals

FOOD PROCESSING INDUSTRY AND FOOD SAFETY

W.Hilda Sahayarani*; Dr.R.Jansi Rani**

*Assistant Professor,
PSGR Krishnammal College for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: hilda@psgrkcw.ac.in

**Associate Professor,
Avinashilingam University,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Food safety is a global issue. Governments all over the world are working to decreasefood borne diseases and illnesses. Food safety and quality problems have become most frequent in India and other countries. Studies have indicated that with increasing awareness consumer today demand safe food. Food Safety and Standard Act is one law ensuring that all the food provided to consumer is safe. Food processing industries need to adhere to food safety standards to ensure safe food to consumers. However, there is a striking paucity of reliable data in quality evaluation and also food safety researches in food processing industries are very few in India.

KEYWORDS: *Food Safety, Food Hygiene, HACCP, GMP*

INTRODUCTION

Food is essential to life, hence food safety is a basic human right. Billons of people in the world are at risk of unsafe food. Many millions become sick while hundreds of thousand die yearly. The food chain starts from farm to fork/plate while challenges include microbial, chemical, personal and environmental hygiene. Historically, documented human tragedies and economic disasters due to consuming contaminated food occurred as a result of intentional or unintentional personal conduct and governmental failure to safeguard food quality andsafety. Food processing is the transformation of raw ingredients into food, or of food into other forms. Food processing typically takes clean, harvested crops or butchered animal products and uses these to produce attractive, marketable and often long shelf-life food products. Across the world, food-processing is considered to be a sunrise sector because of its large potential for growth and socio economic impact. It not only leads to income generation but also helps in reduction of wastage, value addition, and foreign exchange earnings and enhancing manufacturing competitiveness. In today's global market, quality and food safety have become competitive edge for the enterprises producing foods and providing services. "With proper investment in food processing, technical innovation and infrastructure for agriculture sector, India could well become the food basket of the world" **(Meeta P, 2007).**

An over view of Food processing industry

In India the food processing industry is ranked fifth in terms of production, consumption, export and expected growth **(Government of India,2007)** A strong and dynamic food processing sector plays a significant role in diversification of agricultural activities, improving value addition opportunities and creating surplus for export of agro-food products **(Merchant A ,2008)**. Food processing accounts for about 14% of manufacturing GDP, i.e. Rs. 2,80,000 crore, and employs about 13 million people directly and 35 million people indirectly. Its employment intensity can be seen by the fact that for every Rs. 1 million invested, 18 direct jobs and 64 indirect jobs are created in organized food processing industry only.**(Government of India,2010)**.

Snapshot of Food Processing Industry

- India's food processing sector ranks fifth in the world in exports, production and consumption
- Major parts of the food processing sector are milled grain, sugar, edible oils, beverages and dairy products.
- 100% FDI is permitted in the automatic route for most food products except for items reserved for micro and small enterprises.
- India's food processing industry has grown annually at 8.4% for the last 5 years, up to 2012-13
- Investment in fixed capital in registered food processing sector had grown annually at 18.8% during last five years ending 2012-13.
- The number of registered processing factories has increased from 36,881 in 2011-12 to 37,175 in 2012-13, marking a growth of 0.8%.

The processed food industry is divided into the following broad segments:

Primary processed food - which includes products such as fruits and vegetables, packed milk, unbranded edible oil, milled rice, flour, tea, coffee, pulses, spices, and salt, sold in packed or non-packed forms.

Value-added processed food - which includes products such as processed fruits and vegetables, juices, jams, pickles, squashes, processed dairy products (ghee, paneer, cheese, and butter), processed poultry, and processed marine products, confectionary, chocolates, and alcoholic beverages**(Meeta P ,2007).**

Role of Food Processing Sector in Improving Food Safety

Food safety means assurance that food is acceptable for human consumption according to its intended use and Food Safety Management System means the adoption of Good Manufacturing Practices, Good Hygienic Practices, Hazard Analysis and Critical Control Point and such other practices as may be specified by regulation, for the food business **(Jaiswal,2009).** Food quality is the quality characteristic of food that is acceptable to consumers. This includes external factors appearance (size, shape, consistency) texture and flavour; factors such as grade standard (eggs) and internal (chemical, physical, microbial). Food quality is an important manufacturing requirement, because food consumers are susceptible to any form of contamination that may occur during the manufacturing process. Many customers also rely on manufacturing processing standards.

- The Food & Agriculture Organization (FAO) has defined four major dimensions that contribute towards food security. These involve the pillars of availability, accessibility, utilisation and the stability of the environment in which they function.
- Within the food value chain, improvements to the food processing industry have the most significant multiplier effects. The health of the food processing industry goes a long way to determine the production of abundant good quality, nutritious and safe foods, which are readily available and affordable for consumers.
- Processing foods is fundamental to prevention of losses following harvest and to bridge the gap between seasons; it is also crucial to maximizing utilization of the harvest, particularly during droughts and periods of poor production.
- Beyond the production of food the industry supports the economy, creates expansion of other linkage industries and promotes beneficial infrastructure developments. The industry is the largest employer in the manufacturing sector; it is a major market for farmers and provides the staple finished products for consumers.
- The industry is also pivotal in supporting the availability of nutritional products and in the implementation of fortification to staple foods.

Integrated Approach to Attain Food Security

The attainment of food security will require an integrated approach incorporating:

- poverty reduction
- food production
- livelihoods
- gender
- environment
- climate change
- technology
- Policy and socio-cultural behavior.

The challenge will be to balance support and allow for greater efficiencies and cross sector linkages. Food processing is one such sector that provides for these efficiencies and cross cutting linkages, it is also a direct provider of food and nutrition and can improve the access, availability, affordability and stability of food. Opportunities for the food processing industry to further support food security include:

- Improved technology
- Quality improvements

- Opportunities for women
- Product diversification
- Food Aid markets
- Fortification and supplementation
- Animal feeds, and
- Improved support services and linkages

Food industry and food control

The current patterns of food consumption indicate a strong consumer preference for processed food products, as they are very economical and last much longer than fresh products which are not compatible with today's lifestyle. It is, therefore, very important to have a clear understanding of the principles of the processes involved as well as the methods employed to ensure quality standards. Thus, clear understanding in food processing systems and food quality management systems and principles of the various operations as well as the application of Hazard Analysis Critical Control Point (HACCP) to food production is required in producing quality food that meets consumer's expectations and quality standards.

Food processing is a shared responsibility of everybody in the complex food chain in providing safe and quality food to the consumers. Food has to go through several processes to ensure that food reaches the consumer in a healthy and safe condition. To deliver the desired level of food quality and safety, manufacturers use modern quality management systems. But the quality of food products also depends on the quality of raw materials and the quality of transport, storage, and conditions at the point of sale. Ensuring quality therefore involves working with suppliers such as farmers and wholesalers, transporters, and retailers to make sure that their quality assurance procedures are adequate.

The responsibility for food safety and quality must be shared by everyone in the chain of food production from farmers to food transporters and retailers. At a time when food safety standards have never been higher, it is vital that consumers also play their part in ensuring that the food they consume is safe, by practicing good food hygiene, proper food preparation, and safe storage.The food industry takes a broad view of the term food control, which includes a large number of factors such as:

- ***safety*** - setting standards for toxicological and microbiological hazards, and instituting procedures and practices to ensure that the standards are achieved;
- ***nutrition*** - maintaining nutrient levels in food ingredients and formulating foods with nutritional profiles that contribute to consumer interest in healthful diets;
- ***quality*** - providing sensory characteristics such as taste, aroma, palatability and appearance;
- ***Value***- providing characteristics of consumer utility and economic advantage, involving attributes such as convenience, packaging and shelf-life. Some of these factors, such as value, are exclusively in the domain of industry and consumers; while others, such as safety, are shared interests of government, industry and consumers. Setting and implementing food standards **(Codex Alimentarius Commission,1987)**

Role of Government in Food Security

At the heart of all food control activities is the establishment of safety, quality and labelling standards. These should be established on the broadest possible scale, in the recognition that food

production and marketing is truly a global industry. Governments and intergovernmental organizations such as the Codex Alimentarius Commission have the principal role in establishing certain food control standards. It is the role of national governments to establish uniform safety standards so that

- all consumers receive equal levels of protection;
- all food producers, whether domestic or foreign, are equitably treated through application of the same levels of safety;
- Consumers are informed about the standards of protection that are being applied.

In establishing safety standards, it is important that governments allow industry, the scientific community and the public to contribute information and ideas. Standards and guidelines should be sufficiently flexible to meet the needs of changing technology. At the same time, governments should apply those controls that will assure real and meaningful safety benefits rather than merely perceived benefits **(Labuza, T.P, &Basier, W. 1992)**

Food Safety Regulation and Current Status

Previously the Indian food processing industry was regulated by several laws which governed aspects of sanitation, licensing and other necessary permits required to start up and run a food business. The legislation that dealt with food safety in India was the Prevention of Food Adulteration Act (PFA), 1954. PFA had been in place for over five decades, there was a need for change because of the changing requirements of Indian food industry, consumer awareness of food safety and quality and changing eating habits. The Government realized the need for harmonizing the food laws as a prerequisite for fostering growth in the food processing industry and introduced the Integrated Food Safety Bill. In 2006, this bill ultimately became the Food Safety and Standards Act (FSS Act). The act specifically repealed seven laws which were in operation prior to the enforcement of FSS Act. As defined, "Food Safety and Standards Act, is an Act to consolidate the laws relating to food and to establish the Food Safety and Standards Authority of India for laying down science based standards for articles of food and to regulate their manufacture, storage, distribution, sale and import, to ensure availability of safe and wholesome food for human consumption and for matters connected therewith or incidental thereto." The purpose of the Act is to improve consumer safety through Food Safety Management Systems and to set standards based on science and transparency to meet the dynamic requirements of Indian food industry as well as international trade.

Minimizing Risk of Food Safety Problems in the Processing Industry

The modern consumer demands that food products be free from harmful contaminants that could lead to illness. Growers, shippers, retailers, wholesalers, and restaurants are all required to ensure there are no foods processing safety mistakes. The following is a list of how to minimize food processing safety mistakes.**I.Good Manufacturing Practices**

According to the Code of Federal Regulations (CFR), Good Manufacturing Practices (GMPs) are the controls, equipment, facilities and methods of producing processed foods. The goal of GMPs is to create the minimum sanitary and processing requirements for the production of safe food for consumption. These are critical to regulatory control and help eliminate food processing safety mistakes. **II.Hazard Analysis Critical Control Points**

The Food and Drug Administration (FDA) created Hazard Analysis Critical Control Points (HACCP) for the food processing industry to mitigate many food processing safety mistakes. The HACCP system requires food makers to follow seven principles:

- Analyze the Hazards
- Identify the Critical Control Points
- Create Preventative Measures using Critical Limits
- Establish Procedures to Monitor those Control Points
- Generate Corrective Actions when a Critical Limit has Not Been Met
- Create Procedures to Verify the System is Intact
- Establish a Record-Keeping System

Finally, create an effective record-keeping system which includes records of the hazards and the monitoring of safety requirements.

CONCLUSION

In general, to avoid any foodborne illness outbreaks, every aspect of the food supply chain must diligently follow GMPs and safety practices to provide the safest food to the consumer. Unsanitary practices put the consumers and the business at risk.For governments, there is the need for enforceable standards that are convincing to both consumers and industry. For consumers, food control systems must provide meaningful protection against real and important hazards. Finally, industry needs standards that permit flexibility and efficiency in producing and marketing foods that will serve their customers - the world's consumers.

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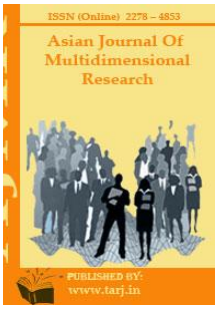

Asian Journal of Multidimensional Research (AJMR)

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EFFECT ON SUPPLEMENTATION OF MANGO KERNEL (MANGIFERA INDICA) POWDER INCORPORATED CHAPPATHI FOR TYPE- II (NIDDM) DIABETIC PATIENTS IN THIRUVARUR DISTRICT.

Ms. R. Kaviyarasi*; M. Kohila**

*PhD Scholar,
Department of food science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women
Coimbatore, Tamil Nadu INDIA
Email id: kavimanistet@gmail.com

**Department of food science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women
Coimbatore, Tamil Nadu INDIA

ABSTRACT

Introduction: *Diabetes mellitus is major public health problem in our country. Which co-exist frequently resulting in significant morbidity and mortality? Diabetes mellitus is the common endocrine disorder. It may be defined as a syndrome characterized by hyperglycemia due to an absolute or relative lack of insulin or insulin resistance Diabetes mellitus is ever growing disease and the prevalence is increasing day by day. The World Health Organization (WHO) estimates that diabetes mellitus resulted in 1.5 million deaths in 2012, making it the 8th leading cause of death. Type-II diabetes is now spreading quickest in the Eastern Mediterranean Countries. Each year 7 million people developing diabetes and that number is expected to 380 million by 2025. Mango seed are outstanding for lowering the levels of blood sugar and in the treatment of diabetes. So they are quite beneficial for those suffering from diabetes. These seeds are help to change the enzyme in the intestine and liver, so that they absorb less glucose.* ***Objectives:***

- *Io select the100 subject from the group in the age of 40-55 years includes50 male and 50 female*
- *To assess the nutritional status of the selected subjects*
- *To prepare and supplement the mango kernel powder incorporated chappathi for the selected subjects.*
- *To find out the blood sugar level of the subjects in before and after supplementation.*

Methodology: *The study was conducted in kudikaduand paruthikottai at Thiruvarur district... Hundred diabetic patients in the age group of 40-50 years were selected by purposive sampling method for the study. A well structured interview schedule was formulated to collect information from the selected samples. In order to assess the nutritional status of the respondents through before and after supplementation of mango kernel powder incorporated chappathi for the selected subjects by anthropometric measurement, biochemical estimation, clinical examination and dietary survey.****Findings:*** *The present study concludes that mango kernel powder is loaded with antioxidants and nutrients that have powerful effects on the body. the mango kernel powder to the type II (NIDDM) diabetic patients. Out of 100 subjects, after supplementation of fasting blood glucose mean value and post prandial blood glucose mean value was reduced.Hence diabetes mellitus is one of the greatest problems. The present investigation was undertaken to assess the quality characteristics, of value added mango kernel powder mainly helpful in diabetes mellitus.*

KEYWORD: *Type II (NIDDM) Diabetic Patients, Anthropometric Measurement, Biochemical Estimation, Clinical Examination, Dietary Survey, Fasting Blood Glucose Level, Mango Kernel Powder.*

INTRODUCTION

Adult development encompasses the changes that occur in biological and psychological domains of human life from the end of adolescence until the end of one's life. Chronic health problem such as Diabetes Mellitus, Heart disease mostly occur in adulthood. A well balanced diet and physical activity has lowering blood sugar and increasing neural plasticity.

Biologically, an adult is a human or other organism that has reached in maturity. In human context the term adult additionally has meanings associated with social and legal concepts. In contrast to a minor, a legal adult is a person who has attained the age of majority and is therefore regarded as independent, self sufficient and responsible.

Diabetes mellitus normally develops in adult at the age of 40 years and more frequently at the age of 50 years. Diabetes mellitus is a metabolized disorder characterized by altered glucose regulation and utilization, usually caused by insufficient or relatively ineffective insulin. Mellitus-honey-sweet (sugar in urine).

Mangiferaindica being the family provides referred "king of fruits". Mango is the national fruit of India. There are 30 varieties of mango in Tamil nadu famous is 8 varieties. These are totapuri, malgoba, saudersha, alphonso, rumani, neelam, badami and amarpalli. May are 400 varieties in over all world. It known as amm.mango is important herb in the various medicinal properties are different parts of mango tree.

Mango seed can help in digestion, lowering sugar level and reducing weight. Mango seed are high in fiber and have been shown to regulate glucose in blood**.** Mango leaves are anti-inflammatory, anti-refrigent and treated with tender mango leaves extraction and seed kernel powder treated diabetes mellitus.

OBJECTIVES

- Io select the100 subject from the group in the age of 40-55 years includes 50 male and 50 female
- To assess the nutritional status of the selected subjects
- To prepare and supplement the mango kernel powder incorporated chappathi for the selected subjects.
- To find out the blood sugar level of the subjects in before and after supplementation.

METHODOLOGY

SELECTION OF AREA

The study was conducted inkudikadu and paruthikottai in Thiruvarur district. This area is selected as it was observed. That there were many cases of diabetes mellitus in particular area.

SELECTION OF SAMPLE

Hundred diabetic patients in the age group of 40-65 years were selected by purposive, random sampling method for the study. Samples were selected to study and obtain the information on socio economic status, life style, health status, dietary patterns, etc.

FORMULATION OF INTERVIEW SCHEDULE

A well structured interview schedule was formulated to collect information from the selected samples. The data was collected by making use of interview method.

COLLECTION OF DATA

Collection of data is the process of enumeration together with the proper recording of results. The statistician counts or measures the characteristics under the study for further statistic analysis.

GENERAL INFORMATION AND SOCIO ECONOMIC STATUS OF THE SUBJECTS:

The interview schedule was used to collect the details regarding age, sex, marital status, educational qualification, occupational status and monthly income were collected from the selected subjects.

LIFE STYLE PATTERN OF THE SUBJECTS:

In order to find out the details about life style pattern, data was regarding personality type, working hours, habit of exercise, smoking, alcohol, family history of diabetes mellitus.

HEALTH STATUS:

Data regarding the medical information, symptoms, other disease such as kidney disease, hypertension and obesity were also collected through interview schedule method.

FOOD HABITS AND DIETARY PATTERN:

Food habits of the subjects were collected from interview method. It is the sample method to know the food habits of the subject. Dietary pattern was identified through 20 hours recall method. In this method the foods consume by them in previous day was collected randomly.

FOOD CONSUMPTION PATTERN:

Food consumption pattern of the subject were collected through the duration of using different food groups by them. The duration is splitted into daily, weekly, rarely, never and then the information was collected from the selected s

ASSESSMENT OF NUTITIONAL STATUS

Nutritional assessment provides a summary of the recommendations for uses of major nutrients. Nutritional assessment is the only method that can provide detailed data on food choices, which is ultimately the behavior that must be modified to improve health and to reduce the risk of disease**.** In order to assess the nutritional status of the respondents, anthropometric measurement, biochemical estimation, clinical examination and dietary survey carried out.

ANTHROPOMETRIC ASSESSMENT

Anthropometric measurement such as height, weight, mid are circumerence, body surface area[BBA], body mass index[BMI] and skin folds were recorded to assess their nutritional status as they have an influence on energy metabolic**.**

HEIGHT:

The height was marked where the tip of the scale rested on the wall. An inch tape with an accuracy of 0.1 cm measurement was used to measure the height from the floor up to making on the wall. Height may be measured in inches or centimeters. Adult and older children are measured standing with head erect, infants and young children lying on a firm flat surface**.**

WEIGHT:

Weight may be recorded is pounds or kilograms. If required the scale should be balanced before each measurement.

BODY MASS INTEX :

An index of a person's weight in relation to light, determined by dividing, the weight [in kilograms] by the square of the height [in meter.

BMI = Weight(kg)/Height(m2)

WAIST HIP RATIO :

The predominant distribution of fat in an obese person, whether in the upper part or the body, may determine the lower part of the body, may determine the disease pattern. But with upper body obesity the ratio is 0.85 in women and greater than 1.0 in males**.**

CLINICAL ASSESSMENT

The complications are common in patients with uncontrolled diabetes. Clinical examination is an essential part in the assessment of nutritional status. Clinical examination provides direct information of the signs and symptoms of the people.

BIOCHEMICAL ASSESSMENT

A normal blood glucose range is usually about 80-120 mg/dl. The blood glucose level decreased in fasting state. Fasting blood glucose level is 70-110 mg/dl. When this level goes up to 170 mg/dl, it shows the presence of sugar in urine. But severe diabetes, the glucose level may increase up to 400mg/dl.

PREPARATION AND SUPPLEMENTATION

200 gm of wheat flour and 5 gm of mango kernel powder add to make chappathi. Add salt to taste and then administered to selected subject. The supplementation is maintaining the blood glucose level.Mango kernel powders were supplemented to the selected 20 sub sample for period of 2 month.

Before and after supplementation of mango kernel powder incorporated chappathi for the selected subjects. If the diabetic patients nutritional status was assessed through anthropometric measurements and biochemical assessment

ANALYSIS OF DATA

After the data collection. The collected data was completed and interpreted statistically.

RESULT AND DISCUSSION

GENERAL INFORMATION OF THE SUBJECTS

AGE DISTRIBUTION OF THE SUBJECTS

The age distribution of subjects has been presented in Table – I

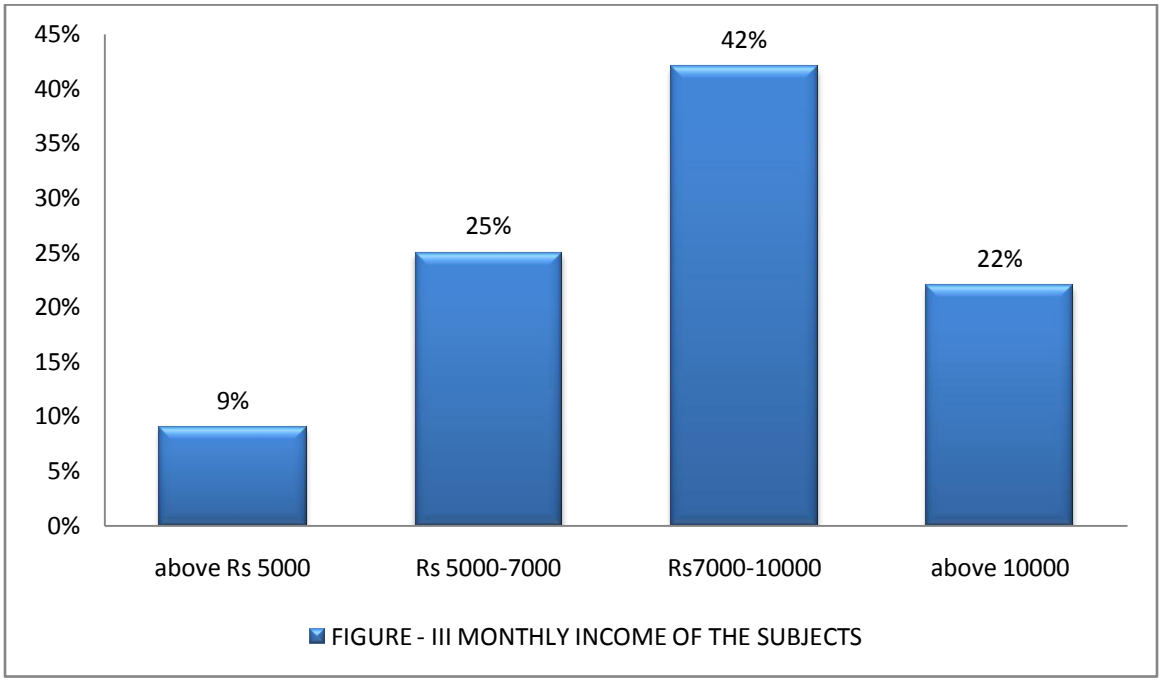
S.NO	Age Group (in years)	Number of the subjects
1.	40 - 4 3 years	18
2.	44 – 46 years	37
3.	46 – 50 years	25
4.	51 – 55 years	20
	Total	100

Table – I designates that majority 37 percent of diabetic subjects were in the age group of 44 – 46 years, 25 percent of diabetic subjects were in the age of 46 – 50 years, 20 percent of diabetic subjects in the age of 51 – 55 years and 18 percent of diabetic subject in the age of 40 – 43 years.

MONTHLY INCOME OF THE SUBJECTS

The monthly income of the subject has been presented in Figure–I

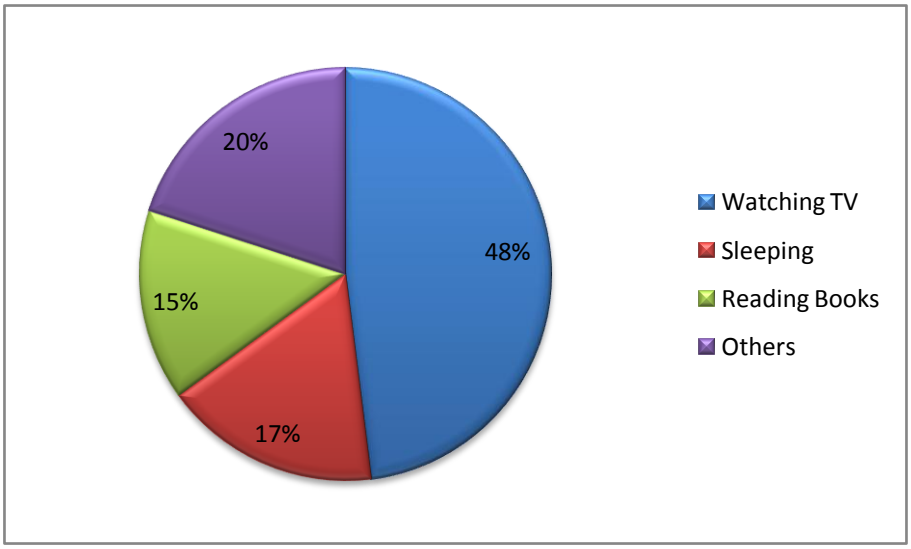
Figure–I indicates that 42 percent of the subject were Rs.7000-10000, 25 percent of the subject were Rs.5000 – 7000, 22 percent of the subject were above Rs.10000 and 9 percent of the subject were above Rs.5000.



LIFE STYLE PATTERN OF THE SUBJECTS

The study shows that majority 100 percent of the subjects were leisure time. The leisure time activity of the subjects has been presented in Figure- II

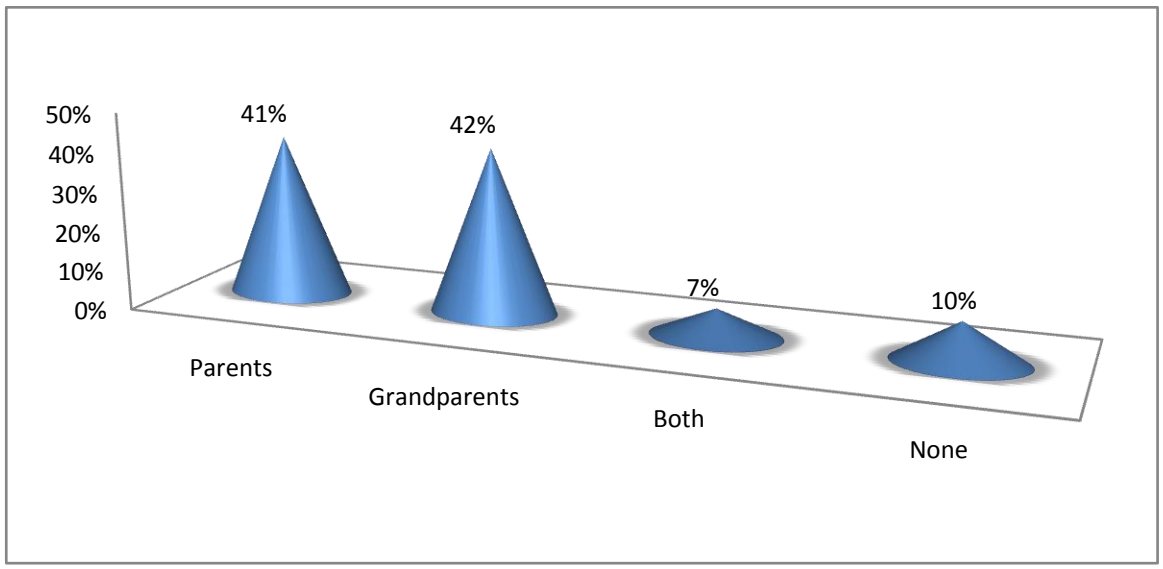
Figure–IIshows that 48 percent of the subjects were watching TV, 20 percent of the subject were others, 17 percent of the subject were sleeping and 15 percent of the subject were reading books.



FAMILY MEMBERS HAVE DIABETES MELLITUS FOR THE SUBJECTS

The family members have diabetes mellitus for the subject presented in Figure- IV

Figure- IV illustrates that 42 percent of the subjects grandparents were affected by diabetes, 41 percent of the subjects parents were affected by diabetes, 7 percent of the subjects were affected by diabetes and 10 percent of the subjects were not affected by diabetes.



ASSESSMENT OF NUTRITIONAL STATUS OF THE SUBJECTS
ANTHROPOMETRIC MEASUREMENT

S.NO	Measurement	Mean value	Standard value
1.	Height	165.68	±7.66
2.	Weight	60.08	±6.92
3.	BMI	21.94	±2.96

The Table – III indicates that mean value of height, weight and BMI of the subjects.

WAIST HIP RATIO (WHR) OF THE SUBJECTS:

Waist Hip Ratio (WHR) of the subjects were presented in TABLE-IV

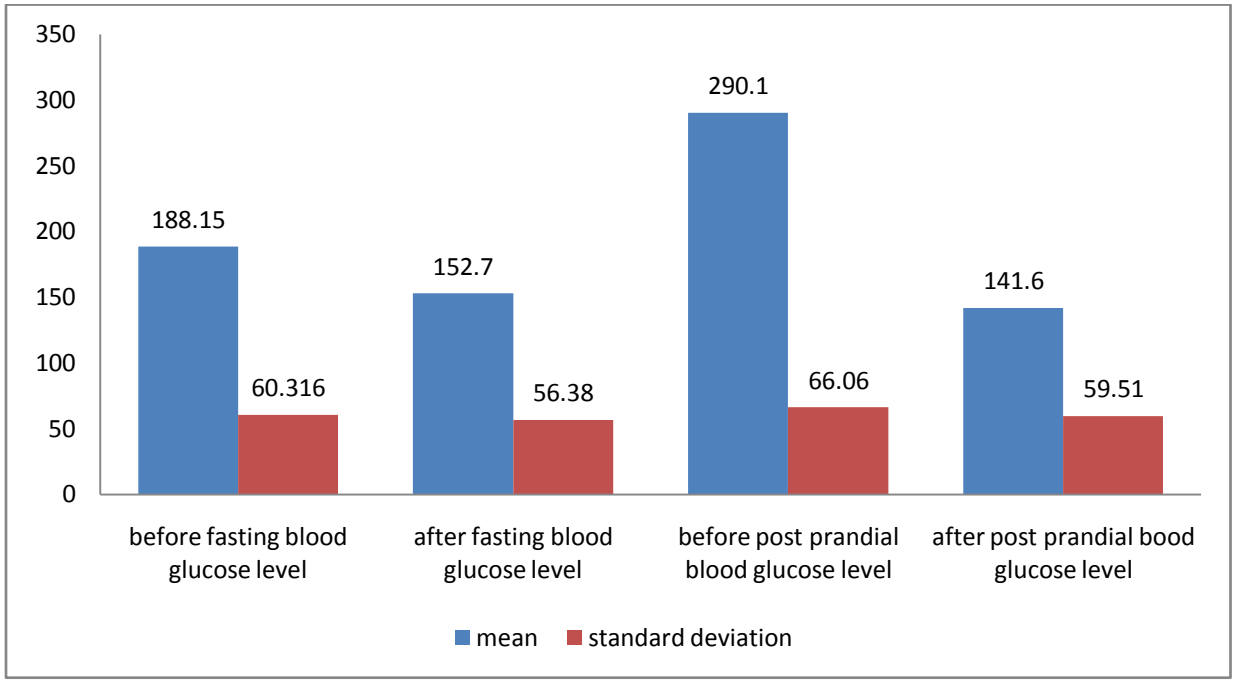
S.NO	Measurement	Mean value	Standard value
1.	Waist	46.64	±5.78
2.	Hip	48.25	±6.09
3.	WHR	0.961	±0.329

The Table – IV shows that mean waist hip ratio of the subjects.The risk factor recognized for development of diabetes in the global scenario are obesity (BMI) particular by central obesity (WHR). In India, particularly South Indian population is recognized to be a high risk group for development of diabetes.

BIOCHEMICAL ANALYSIS OF THE SUBJECTS

Biochemical analysis of the subjects presented Figure- V

In the course fasting glucose concentration of the blood is 70 – 110 mg/dl. When this level goes up to 70 110 mg/dl, its show presence of sugar in urine. But in cases of severe diabetes the glucose level shoot up to 400 mg/dl.



CLINCAL STATUS OF THE SUBJECTS

Majority 77 percent of the subjects had good general appearance, 21 percent of the subjects had fair general appearance and 2 percent of the subjects had poor general appearance. 36 percent of the subjects eyes were normal,59 percent of the subjects have impaired vision and 5 percent of the subjects eyes were pigmentation. 48 percent of the subjects were mouth is normal,41 percent of the subjects were dryness in mouth and 11 percent of the subjects were others.majority 53 percent of the subjects have good appetite, 35 percent of the subjects have very good appetite and 12 percent of the subjects have poor appetite. In symptoms of diabetes majority 52 percent of the subjects have increased hunger, 32 percent of the subjects have increased urination and 16 percent of the subjects have increased thirst.

FOOD CONSUMPTION PATTERN OF THE SUBJECTS

Rice is the common cereal to consumed by all the subjects. Red gram dhal was taken by all the subjects in the form of sambar or any of the dhal preparation, any one of the green leafy vegetables was included in the diet of the subjects once a week or daily. Beans, carrot and other common vegetables consumed by all the subjects in the form of beverages. Sugar also taken by all the subjects rarely.

MEAN VALUE OF NUTRIENT INTAKEOF THE SUBJECTS

The mean value of nutrient intake for the subjects were presented in Table-VIII

NUTRIENTS	RDA	INTAKE	DEFICIT	EXCESS
Energy (kcal)	2925	3580.65	-	
Protein (gm)	50	44.84	5.16	-
Fat (gm)	20	46.11	-	26.11
Fiber (gm)	40	2.75	37.25	-
Carbohydrate (gm)	250	294.94	-	44.94
Iron (mg)	30	13.19	16.81	-
Vitamin-c (mg)	40	14.31	25.69	-

The Table-VIII shows that all the subjects were take deficient amount of nutrients like energy, protein, fiber, iron and vitamin-c. fat consumption was higher among the subjects than carbohydrate. It is highly risk of developing diabetes and also the high intake of carbohydrate increases the sugar level.

CONCLUSION

The present study concludes that mango kernel is loaded with antioxidants and nutrients that have powerful effects on the body. The world is moving towards natural product, the study was conducted to find out the impact of the mango kernel powder to the Type II (NIDDM) diabetic patients. From the study indicates that a significant reduction in the blood glucose levels of the subjects who were administered the mango kernel powder.

The mango kernel incorporated chappathi contained increased level of nutrients like calcium, magnesium, potassium and fiber. This is also reduce the blood sugar level in the diabetic patients. Mango kernel is the convenient, low economical, most popular and widely considered way to reduce blood sugar and blood pressure level for the diabetics patients.

Hence diabetes mellitus is one of the greatest problems. The present investigation was undertaken to assess the quality characteristics, of value added mango kernel powder mainly helpful in diabetes mellitus.

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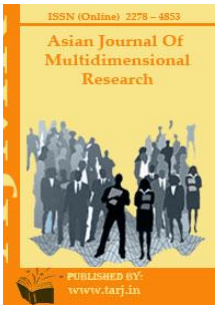

Asian Journal of Multidimensional Research (AJMR)

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THEME: EAT RIGHT, LIVE SAFE AND SECURE AND STAY HEALTHY RED ONION (ALLIUM CEPA) SEED VAR.CO5 RESERVOIR OF PHYTOCHEMICALS - A GC-MS STUDY

R.Pragatheeswari*; Pa.Raajeswari**

*Ph.D. Scholar,
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id:pragathirajamani@gmail.com

**Assistant Professor (SG),
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Onion is the one among the most common vegetables cultivated and consumed in large quantities all over the world. Literature reveals that red onion compared with white and yellow onions possess significantly high antioxidant content. The seed of red onion is one of the obscured and unexplored treasureswhich may help in the cure of many diseases. The main aim of the study is to identify the potentially beneficial compounds in red onion seed var.CO5 using Gas Chromatography- Mass spectroscopy (GC-MS). The preliminary phytochemical analysis showed the presence of significant groups of secondary metabolites such as alkaloids, terpenoids, saponins, phytosterol and tannins. The methanol extract of red onion seed var.CO5 revealed the presence of numerous compounds; among them 37 compounds were found to have significant health benefits. Thus, from the present study it is observed that the extracts of red onion seed var.CO5 showed an abundant presence of phytochemicals as secondary metabolites, which can be included as a part of daily diet as a functional ingredient to obtain immense health protecting benefits.

KEYWORDS: *Gas Chromatography- Mass spectroscopy (GC-MS), Phytochemical, Secondary Metabolites, Functional Ingredient.*

INTRODUCTION

The concept of growing crops for health rather than for food or fiber is slowly changing the field of medicine, nutrition and allied health systems (IlyaRaskin*et al*.,2002). Onion bulbs are the main edible part, with a distinctive strong flavour and pungent odour rich in antioxidants. Though *Allium cepa (*Red Onion) Seeds have been used as food rarely; its economical use in all areas throughout the world is limited as compared with onion bulbs. The potential health benefits of the same have not been scientifically explored. Out of interest to arrive at low cost natural healer and remedy; not only to cure but to prevent the occurrence of various degenerative diseases, the study was undertaken to analyze the potentially beneficial compounds in Red Onion (*Allium cepa*) Seed Var.CO5.

METHODOLOGY

COLLECTION OF ONION SEED AND POWDERING: The dried seeds of *Allium cepa* (var. CO5) Red Onion Seeds needed for the study were collected from Tamil Nadu Agriculture University (TNAU) Tamil Nadu, Coimbatore, India. The seeds were then washed and shade dried for a week and used to carry out the study. Initially the dried seeds were broken into small pieces using an electric grinder, as the seeds were very hard, the broken seeds were then crushed to produce fine powder using mortar and pestle from which the potential components were extracted.

PREPARATION OF EXTRACTS: Plant tissue homogenization is the extraction method adopted for the present study.Though traditional healers use primarily water but plant extracts from organic solvents have been found to give more consistent properties compared to water extracts. (Das *et al.*, 2010)

Methanol Extract

Methanol extracts of the seed sample was prepared by soaking 1.5 gram of the Red Onion Seed var.CO5 powder in 20 ml of methanol. It was mixed well and covered tightly with a polythene paper to prevent the evaporation of solvent. This was placed in a shaker incubator for 24 hours at room temperature after which the samples were filtered with Whatman No.1 filter paper and the extracts were used for further analysis.

Gas Chromatography –Mass Spectroscopy (GC-MS)

Gas Chromatography (GC) is one of the most versatile analytical techniques used in the food industry. GC is used to separate volatile organic components in a mixture. It enables fast separation and identification of components in a complex mixture using appropriate detectors.

GC - MS analysis for the selected study was done according the method described by Bilia et *al.*, 2001. It was carried out on a Thermo GC-trace ultra ver: 5.0, Thermo MS DSQ II. The column used was DB 35- MS Capillary standard non- polar column measuring 30m × 0.25mm with a film thickness of 0.25µm. The carrier gas used was Helium at a flow rate of 1.0 ml/min.

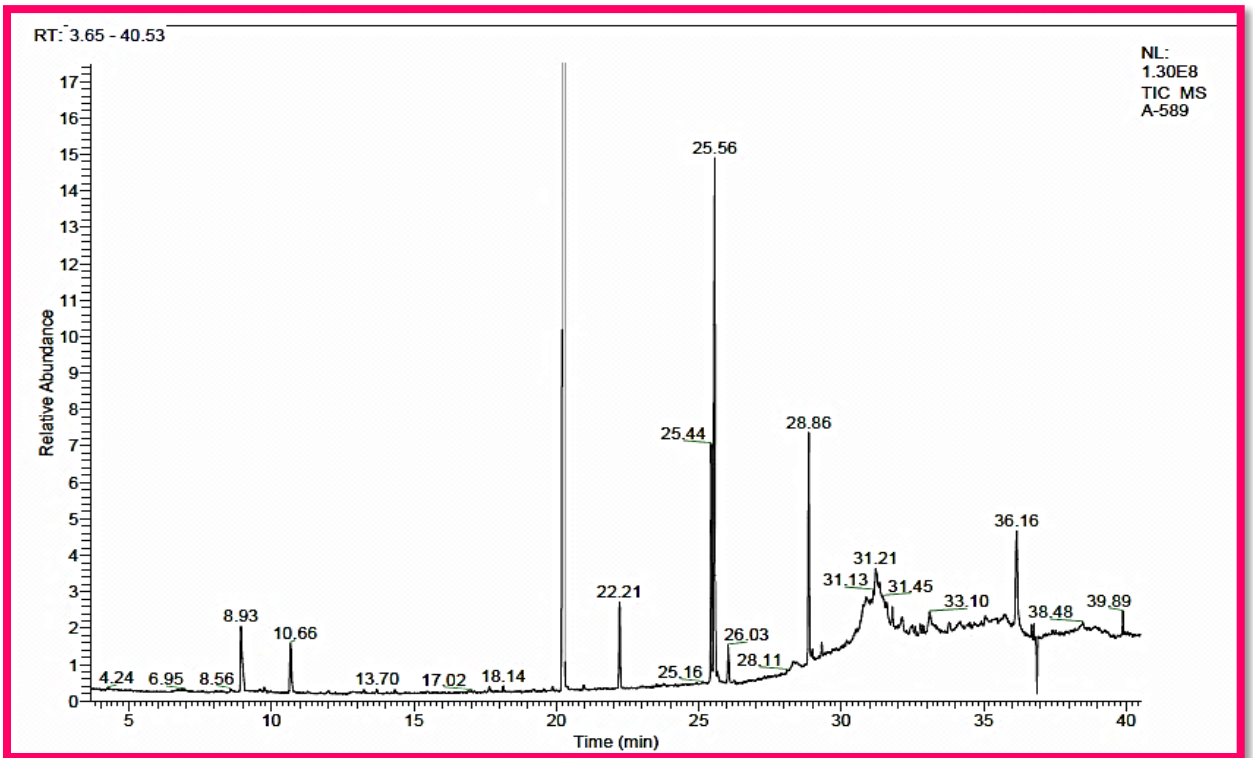
1µl sample injection volume was utilized and the sample used was methanolic extract of red onion seed. The oven temperature was programmed initially at 70°C and then increase to 260°C at 6°C raise per minute. Total run time was 37 minutes. The MS transfer line was maintained at a temperature of 280°C. The source temperature was maintained at 180°C. GC-MS was analyzed using electron impact ionization at 70eV and data was evaluated using Total Ion Count (TIC) for compound identification and quantification. The chromatographic peaks are recorded as a function of time. By measuring the retention time (elapsed time in minutes between the time a sample is injected and the time the chromatographic peak reaches maximum intensity) and comparing this

time with that of a standard of the pure substance, peak are identified. The area under the peak is proportional to the concentration, and so the amounts of the substance are quantitatively determined. The peaks are often very sharp and if so, the peak heights can be compared with a calibration curve prepared in the same manner.

RESULTS AND DISCUSSION

Gas Chromatography- Mass Spectroscopy (GC-MS)

The figure given below presents the details on compounds identified by GC-MS study.



GC-MS CHROMATOGRAM OF METHANOL EXTRACT OF RED ONION SEED VAR.CO5

FIGURE 1

GC-MS analysis of the bioactive constituents of the methanolic extract of red onion seed var. CO5 clearly showed several peaks indicating the presence of several bioactive compounds and their chromatogram is shown in **Figure 1**. Major peaks were determined in GC-MS chromatogram of red onion seed var.CO5 and their corresponding components .On comparison with the mass spectra of the constituents with Wiley9 and NIST library, the phytocompounds present in the extract were characterized. The active principles with their molecular formula, Molecular Weight (MW) are presented in **Table II**

TABLE II PHYTOCHEMICALS IDENTIFIED IN METHANOLIC EXTRACTS OF RED ONION SEED VAR.CO5 BY GC-MS

NAME OF THE COMPOUND	MOLECULAR FORMULA	M. W	COMPOUND NATURE	BIOLOGICAL ACTIVITY
(Carvone)2-Cyclohexen-1-one, 2-methyl-5-(1-methylethenyl	C10H14O	150	Monoterpenoid	• Anti bacterial • Hepatoprotective • Antioxidant • Anti inflammatory
Eugenol,Phenol, 2-methoxy-4-(2-propenyl)	C10H12O2	164	Phenylpropeneallyl chain-substituted guaiacol	• Essentialoilcompound • Flavoring agent • Anti inflammatory • Anticancer
3-Allyl-2-methoxyphenol	C10H12O2	164	Phenylpropanoid isomer of Eugenol	• Essential oil compound. • Flavoring agent • Anti inflammatory • Anti viral • Anti microbial • Anticancer
Hi-oleic (Neoastilbin) safflower oil	C21H22O11	450	Flavanone glycoside	• Food Coating Agent • Emulsifier • Formulation Aid • Texturizer • Dietary Supplement Pharmaceuticals (Diluent, Carrier, Emulsifier, Emollient, Tablet Binder)
5'-androsten-16'-ol	C21H32O3	332	Steroid Pheromone	• Mammalian pheromone • Antidepressant • Anticonvulsant • Anxiolytic
Cyclopentanetridecanoic acid 16 Octadecenoicacid.	C19H36O2	296	Fatty acid, methyl ester	• Monounsaturated fatty acid • Inhibit tumour cell proliferation • Apoptosis inducer • Anti neoplastic agent
Isopropyl tetradecanoate (Isopropyl myristate)	C17H34O2	270	Fatty acid ester (Myristylmyristate)	• Drug delivery medium for liver target drugs • Deodorant • Used in cosmetic and

				topical medicinal preparations where, good absorption into the skin is desired
5-(Hydroxymethyl)-2-1*H*-benzimidazole	C13H12N2O2	228	1*H*-benzimidazole which is substituted by a [4-methoxy-3,5-dimethylpyridin-2-yl)methyl]sulfinyl group	• Antiulcerative • Antioxidant • Cancer preventive • Cosmetic • Nematicide • Hypercholesterolemic • Lubricant
Z-8-Methyl-3-tetradecen-1-ol acetate	C17H32O2	268	Acetate ester	• Cancer preventive
p-Menth-1-en-3-one, semicarbazone	C11H19N3O	209	Oxidiazoles	• Antibacterial • Flavouring ingredient
Hexadecanoic acid	C17H34O2	270	Methyl ester	• Antioxidant • 5 Alpha reductase inhibitor • Pesticide • Nematicide • Lubricant • Hypocholesterolemic • Antiandrogenic
Pentadecanoic acid, 14-methyl	C17H34O2	270	Methyl ester	• Nanoparticle carrier • Cardiac Tonic • Analgesic • Antiasthamatic • Anti-Inflammatory • Antipyretic
cis-Vaccenic acid	C18H34O2	282	Fatty acid intermediate	• Intermediate of CLA
Heptadecanoic acid, 9-methyl-, methyl ester	C19H38O2	298	Methyl stearate	• Saturated fatty acid
Lucenin 2	C27H30O16	610	Phenolic compound	• Anxiolytic activity • Anti cancer
14-Á-H-Pregna(Pregnane)	C21H36	288	Steroidal hormone precursor	• Hepatoprotective • Anti-cancerous • Antiproliferative
Methyl ester of ricinoleic acid	C19H36O3	312	Methyl ester	• Anti-biofilm activity • Antimicrobial
10-Undecenoic	C12H22O2	198	Methyl ester	• Anti-oxidant

acid				• cytotoxic agent • Antifungal
Oleic acid	C38H74O2	562	Eicosyl ester	• Anti-hypercholesterolemic • Omega-9 fatty acid
9-Hexadecenoic acid, eicosyl ester,	C36H70O2	534	Methyl ester	• Inhibit tumor cell proliferation • Induce apoptosis
Flavone 4'-oh,5-oh,7-di-o-glucoside	C27H30O15	594	Flavanoid	• Antiaflatoxin • Antibacterial • Antileukemic • Antimutagenic • Antiproliferant • Fungicide • Hepatoprotective Properties
1-Heptatriacotanol	C37H76O	536	Phenolic compound	• Antihypercholesterolemic • Cardioprotective
ç-Sitosterol	C29H50O	414	Methyl ester	• Antihypercholesterolemic • Anticancer
Rhodopin	C40H58O	554	Carotenoid	• Carotenoid
Docosanoic acid	C23H46O2	354	Food additives	• Methyl ester
Hexa-t-butylselenatrisiletane	C24H54SeSi3	506	Butyl ester	• Antimicrobial • Antitumor • Antiseptic • Preservative • Insecticidal • Antioxidant
2-Nonadecanone 2,4dinitrophenyl hydrazine	C25H42N4O4	462	Glucose derivative	• Indicator of protein oxidative stress
Lanosta-7,9(11)-dien-18-oic acid, ç-lactone	C30H44O5	484	Vitamin B12	• Antitumor • Antimicrobial
Ursodeoxycholic acid	C24H40O4	392	Methyl ester	• Reduced pruritus • Cardio-protective
7,10,13-Eicosatrienoic acid, methyl ester	C21H36O2	320	Homolinolenic acid	• Unsaturated fatty acid
Guanidine, N,N'-diphenyl	C13H13N3	211	Phenolic compound	• Anticancer

cis-11-Eicosenamide	C20H39NO	309	Fatty acid	• Omega fatty acid
13-Docosenamide,	C22H43NO	337	Fatty acid	• Anticancer
(22-Z)-dehydrocholesterol-1-ether	C28H46O	398	Methyl ester	• Anti-hypercholesterolemic
9,19-Cyclolanostan-3-ol, 24,24-epoxymethano-, acetate	C33H54O3	498	Stanol	• Tyrosinase inhibitory activity
Quassin	C22H28O6	388	Bioactive compound	• Remedies for infestations of lice or worms • Anorexia • Dyspepsia • Antilarval
7,10,13-Eicosatrienoic acid, methyl ester	C21H36O2	320	Essential fatty acid	• Essential fatty acid

GC-MS analysis for the bioactive constituents of the methanol extractof Red Onion Seed var.CO5 clearly shows several peaks indicating the presence of numerous compounds.Among them 37 compounds such as (Carvone)2-Cyclohexen-1-one, 2-methyl-5-(1-methylethenyl), Eugenol-Phenol, 2-methoxy-4-(2-propenyl), 3-Allyl-2-methoxyphenol,Hi-oleic safflower oil, 5'-androsten-16'-ol, Cyclopentanetridecanoic acid-16 Octadecenoic acid, Isopropyl tetradecanoate (Isopropyl myristate),Z-8-Methyl-3-tetradecen-1-ol acetate , p-Menth-1-en-3-one, semi carbazone, Hexadecanoic acid, Pentadecanoic acid, 14-methyl,cis-Vaccenic acid, Heptadecanoic acid an 9-methyl, Lucenin 2,14-Á-H-Pregna(Pregnane), Methyl ester of ricinoleic acid,10-Undecenoic acid, Oleic acid,9-Hexadecenoic acid,Flavone4'-oh,5-oh,7-di-o-glucoside, 1-Heptatriacotanol, ç-Sitosterol, Rhodopin , Docosanoic acid , Hexa-t-butylselenatrisiletane ,2-Nonadecanone 2,4 dinitrophenylhydrazine,Lanosta-7,9(11)-dien-18-oic acid, ç-lactone, Ursodeoxycholic acid, 7,10,13-Eicosatrienoic acid, Guanidine,N,N'-diphenyl,cis-11-Eicosenamide,13-Docosenamide,(22-Z) dehydrocholesterol-1-ether, 9,19-Cyclolanostan-3-ol, 24,24-epoxymethano, Quassin and 7,10,13-Eicosatrienoic acid were reported to have biological activities. These phytochemicals serves as secondary metabolites which contribute to the medicinal values of Red onion seed var.CO5.

CONCLUSION

Plants generate phytochemicals to protect them against external threats and environmental agents such as ultraviolet rays and generators of damaging free radicals. The integration of these types of foods into human diet could provide with the protection that the phytochemicals provide for the plant. It also contains some biologically active constituents worthy of further investigations which can also be used in the pharmaceutical industries for producing potent drugs against common

ailments namely inflammation, cancer and hyperlipidemia. Red Onion Seeds var.CO5have a vast diversity of secondary compounds with potential benefits which are still unexplored.

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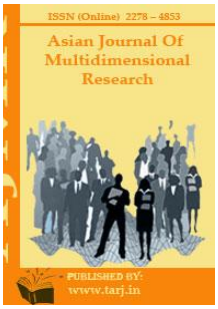

Asian Journal of Multidimensional Research (AJMR)

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STUDY ON EXTRACTION OF ALTERNATE ENERGY FROM MARINE BIOMASS

Dr.A.Lovelin Jerald*; Arogya Georgina Peter; Ranjani.V****

*Associate Professor and Head,
Department of Food Processing and Preservation Technology
School of Engineering
Avinashilingam Institute for Home Science and,
Higher Education for Women
Coimbatore, Tamil Nadu, INDIA

**Student,
Department of Food Processing and Preservation Technology
School of Engineering
Avinashilingam Institute for Home Science and,
Higher Education for Women
Coimbatore, Tamil Nadu, INDIA
Email id: ranjanimandhapati@gmail.com

ABSTRACT

Biomass is one of the better sources of energy. Large scale introduction of biomass energy could contribute to development on several fronts environmentally, socially and economically. The process of trans -esterification of triglyceride oil with monohydric alcohol yields a fuel alternative biodiesel. The burning of enormous amount of fossil fuel has led to the tremendous increase in the CO_2 emission resulting in global warming. Biomass from the marine waste has been focused as a good source of alternative energy; it fixes carbon-dioxide in the atmosphere through photosynthesis. It is inferred that the waste from the marine sources such as the dead marine species, algae grown in CO_2 enriched air can be converted to oily substances which in turn is said to be best alternative source of energy. This approach can contribute to solve major problems of air pollution resulting from carbon-dioxide evolution and future crisis due to the shortage of energy sources.

KEYWORDS: *Biomass, CO_2 Emission, Transesterification, Biodiesel.*

1 INTRODUCTION:

Energy is a quantitative property that is to be transferred to an object in order to perform specific work or to induce heat in an object .energy is a conserved quantity and it is stated that it can be converted into a required form but neither created nor destroyed as said by the law of conservation of energy

Biodiesel is typically made by chemically reacting lipids referring to a vegetable oil or an animal fat with an alcohol producing fatty acid esters. Biodiesel can be used as such or blended with any propositions of petro-diesel. Biodiesel as per review has been used in the railways, aircrafts which used microbially derived biofuel from solar-jetrenewable fuel. It has also been used as a heating fluid in domestic and commercial boilers .Apart from these the major use of biodiesel in the marine pollution is in cleaning the oil spills ,which has been deliberately cleaned by using biodiesel which has a capacity to significantly dissolve crude oil depending upon the amount and the source of fatty acids.

As such biodiesel can also be produced from the waste that has been generated from the marine sources especially marine biomass .Marine biomass mainly algae includes a wide range of organisms from unicellular microalgae such as chlorella to multicellular algal species like the giant kelp serves as a good source for the extraction of energy.

2 REVIEW OF LITERATURE:

2.1 Methods of energy extraction from microalgal biomass: a review proposesthe potential of algal biomass as a source of liquid and gaseous biofuels is a highly topical theme,the process operations for algal biofuel production can be grouped into three areas growth harvesting and energy extraction, with a wide range of combinations of unit operations that can form a micro-algal biofuel production system, but as yet there is no successfully economically viable commercial system producing biofuel .This article briefly reviews the method by which useful energy can be extracted from micro-algal biomass (a) direct combustion, (b)pyrolysis, (c)gasification, (d)liquefaction, (e)hydrogen production by biochemical processes in certain algae, (f)fuel cells, (g)fermentation to bio-ethanol, (h)trans-esterification to biodiesel, (i)anaerobic digestion. Authored by: John. J. Milledge, Sonia heaven,

2.2 Population outburst together with increased motorization has led to an overwhelming increase in the demand for fuel. In the milieu of economical and environmental concern, algae capable of accumulating high starch/cellulose can serve as an excellent alternative to food crops for bioethanol production, a green fuel for sustainable future. Certain species of algae can produce ethanol during dark-anaerobic fermentation and thus serve as a direct source for ethanol production. Of late, oleaginous microalgae generate high starch/cellulose biomass waste after oil extraction, which can be hydrolysed to generate sugary syrup to be used as substrate for ethanol production. Macroalgae are also harnessed as renewable source of biomass intended for ethanol production. Currently there are very few studies on this issue, and intense research is required in future in this area for efficient utilization of algal biomass and their industrial wastes to produce environmentally friendly fuel bioethanol as interpreted in a review article **" Micro And Macroalgal Biomass : A Renewable Source For Bioethanol"** Authored By: Rojan.P, John.G.S, Anisha.K, MadhavanNampoothiri,Ashok Pandey

2.3 A Review on the extraction of lipid from microalgae for biodiesel production" states that Biofuels produced from algal biomass are the most suitable alternative fuels for the future, as

microalgae biomass can accumulate lipids within their cell similar to vegetable oils with a potential to produce 100 times more oil per acre than any other plants. The methods used for the extraction of lipid from microalgae are either mechanical or chemical method. The chemical methods of lipid extraction are Soxhlet extraction, supercritical fluid extraction, accelerated solvent extraction and mechanical methods are oil expeller, microwave assisted extraction, ultrasonic assisted extraction. It is seen that lipid extraction yield from microalgae could be increased by using pre-treatment methods such as ultrasonication and microwave-assisted techniques along with solvent extraction. Authored By: M.Mubarak, A.Shaija, T.V.Suchithra

2.4 Extraction of oil from microalgae for biodiesel production: A review

The rapid increase of CO_2 concentration in the atmosphere combined with depleted supplies of fossil fuels has led to an increased commercial interest in renewable fuels. Due to their high biomass productivity, rapid lipid accumulation, and ability to survive in saline water, microalgae have been identified as promising feedstocks for industrial-scale production of carbon-neutral biodiesel. This study examines the principles involved in lipid extraction from microalgal cells, a crucial downstream processing step in the production of microalgal biodiesel. We analyse the different technological options currently available for laboratory-scale microalgal lipid extraction, with a primary focus on the prospect of organic solvent and supercritical fluid extraction.

Authored By:RonaldHalim,Michael ,K.DanquahPaul AWebley

2.5 A Research Article Biofuel from Algae justifies that Biodiesel is biodegradable, less CO_2 and NO_2 emissions. Continuous use of petroleum sourced fuels is now widely recognized as unsustainable because of depleting supplies and the contribution of these fuels to the accumulation of carbon dioxide in the environment. Algae have emerged as one of the most promising sources for biodiesel production. It can be inferred that algae grown in CO2-enriched air can be converted to oily substances. Such an approach can contribute to solve major problems of air pollution resulting from CO2 evolution and future crisis due to a shortage of energy sources. This studies show that some species of algae can produce up to 60% of their dry weight in the form of oil. Because the cells grow in aqueous suspension, where they have more efficient access to water, CO2 and dissolved nutrients. Algae are capable of producing large amount of biomass and usable oil in either high rate algal ponds or photo bioreactors. This oil can then turn into biodiesel which could be sold for use in automobiles as alternative fuel. Authored By: K. Sumithrabai, Dr. M. Thirumarimurugan, Prof. S. Gopalakrishnan

2.6"Biofuels from algae: challenges and potential" covers up the concept thatAlgae biofuels may provide a viable alternative to fossil fuels; however, this technology must overcome a number of hurdles before it can compete in the fuel market and be broadly deployed. These challenges include strain identification and improvement, both in terms of oil productivity and crop protection, nutrient and resource allocation and use, and the production of co-products to improve the economics of the entire system. Although there is much excitement about the potential of algae biofuels, much work is still required in the field. In this article, we attempt to elucidate the major challenges to economic algal biofuels at scale, and improve the focus of the scientific community to address these challenges and move algal biofuels from promise to reality.

Authored By: Michael Hannon, Javier Gimpel, Miller Tran, Beth Rasala, Stephan Mayfield

2.7 Extraction, transesterification and process control in biodiesel production from *Jatropha*enfolds that Biodiesel has gained worldwide popularity as an alternative energy source due to its renewable, non-toxic, biodegradable and non-flammable properties. It also has low emission profiles and is environmentally beneficial. Biodiesel can be used either in pure form or blended with conventional petrodiesel in automobiles without any major engine modifications. Various non-edible and edible oils can be used for the preparation of biodiesel. With no competition with food uses, the use of non-edible oils as alternative source for engine fuel will be important. Among the non-edible oils, such as *Pongamia*, *Argemone* and *Castor*, *Jatropha curcas* has tremendous potential for biodiesel production. *J. curcas*, growing mainly in tropical and sub-tropical climates across the developing world, is a multipurpose species with many attributes and considerable potentials. In this article, we review the oil extraction and characterization, the role of different catalysts on transesterification, the current state-of-the-art in biodiesel production, the process control and future potential improvement of biodiesel production from *J. curcas*.

Authored By: Novizar Nazir ,Nazaruddin Ramli ,DjumaliMangunwidjaja ,ErlizaHambali ,DwiSetyaningsih ,Sri Yuliani ,Mohd. Ambar Yarmo ,JumatSalimon

2.8 Macroalgae-Derived Biofuel: A Review of Methods of Energy Extraction from Seaweed Biomassdescribes the potential of algal biomass as a source of liquid and gaseous biofuels is a highly topical theme, but as yet there is no successful economically viable commercial system producing biofuel. This article briefly reviews the methods by which useful energy may be extracted from macroalgae biomass including: direct combustion, pyrolysis, gasification, trans-esterification to biodiesel, hydrothermal liquefaction, fermentation to bioethanol, fermentation to biobutanol and anaerobic digestion, and explores technical and engineering difficulties that remain to be resolved, which are broadly classified into wet method and dry method of which the dry method has given an significant over look with beneficial outcome;

3 EXTRACTION OF ENERGY BY DRY METHOD:

3.1 DIRECT COMBUSTION OF MACROALGAE:

Direct combustion is, historically and currently, the main method by which energy from dry biomass resources is realised, providing heat or steam for household and industrial uses or for the production of electricity ,However, in the case of macroalgae, combustion does not appear to have been greatly explored. Dry macroalgae are easy to ignite, but have a low thermal value typical of carbohydrate-rich biomass (14–16 $MJ \cdot kg^{-1}$).The moisture content of biomass can reduce the heat available compared to that from dry biomass by 20% and the direct combustion of biomass is “feasible” only for biomass with a moisture content of less than 50%.

3.2 PYROLYSIS:

An alternative thermolytic technique for the conversion of biomass to fuel is pyrolysis. This may be defined broadly as the thermal decomposition of the organic components of dry biomass by heating in the absence of air. Pyrolysis processes can be classified by temperature and process time as; slow, fast and flash. Slow pyrolysis is characterised by long residence times (from minutes to days for solids) at low reactor temperatures (<400 °C) with very low rates of heating (0.01–2 $°C \cdot s^{-1}$), and results in higher yields of char rather than the liquid or gaseous fuel products. Fast and/or flash pyrolysis covers a range of newer technologies operating with temperatures above 500 °C and short vapour residence times of a few seconds or less, and has potential for the commercial production of biofuel from biomass.

3.3 GASIFICATION:

Gasification is the conversion of organic matter by partial oxidation at high temperature (800–1000 °C) mainly into a combustible gas mixture (syngas). The syngas has a calorific value of 4–6 $MJ \cdot m^{-3}$, and is a mixture of hydrogen (30%–40%), carbon monoxide (20%–30%) methane (10%–15%), ethylene (1%), nitrogen, carbon dioxide and water vapour. The gas can be burnt to produce heat or converted to electricity and heat in combined gas turbine systems.The gasification processes involves a number of stages: initially pyrolysis occurs in a reaction producing char, which is then gasified in the presence of a gasifying agent such as O_2 or H_2O to produce syngas. Importantly, the amount of syngas produced through further gasification of the char is considerably greater than that produced through conventional pyrolysis at 800–900 °C.

EXTRACTION OF ENERGY BY WET METHOD:

Energy extraction methods for wet macroalgae
Hydrothermal treatments;
Fermentation to bioethanol or biobutanol;
Anaerobic digestion.
Authored By: Philip W.Dryer, Patrica Harvey, John J.Milledge, Benjamin Smit

5 Generalised Method for the Extraction of Biodiesel from Marine Biomass:

Algal production and growth
(All the required nutrients are provided along with CO_2 and sunlight)

↓

Selection and harvesting
(Better biofuel contents of algae are selectively harvested by using proper harvesting equipment)

↓

Filtration

↓

Drying
(Sun drying or drying using biogas or other thermal process can be done)

↓

Oil extraction
(Oil is extracted either chemicallyor mechanically by cell disruption process)

↓

Biodiesel production
(Lipid and fatty acid contents are separated)
(Fig 1)

5 RESULTS AND DISCUSSION:

Biodiesel is said to be a biodegradable form of energy with less emissions of CO_2 and NO.

Biodiesel can be chosen as the best form of energy since the continuous use of petroleum sourced fuels is now widely recognised as unsustainable source of energy because of the depleting supplies and the accumulation of carbon-di-oxide in the environment. Biodiesel is said to be the explicit source of alternative energy due to its renewable, non-toxic and non-flammable properties. It also has low emission profiles and is environmentally beneficial. The microalgae is said to be composed of starchy cellulose which can be further utilised as a substrate for bioethanol production in the form of sugar syrup being an alternative to food crops (cane).Microalgae has been intuited as a feedstock for the industrial scale production of carbon-neutral biodiesel due to its promising productivity, rapid lipid accumulation and ability to withstand its growth parameters in the saline water.

6 CONCLUSIONS:

Biodiesel the most advantageous form of energy said to be extracted peculiarly from marine biomass which abundantly consists of lipid compounds and efficiently controls the emission of carbon-di-oxide and nitrogen into the atmosphere, thereby encapsulating the environment. In order to compensate and to withstand the economical viability of the rapidly depleting, non-renewable resources predominantly fossil fuels biodiesel has been recognised as a boon to the industrial stratum. The leftover waste after the extraction of lipids from the biomass has been precisely used as a substrate in the production of bioethanol. Further no residue is backed up after the production process.

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8. Extraction, transesterification and process control in biodiesel production from *Jatropha* Novizar Nazir ,Nazaruddin Ramli ,DjumaliMangunwidjaja ,ErlizaHambali ,DwiSetyaningsih ,Sri Yuliani ,Mohd. Ambar Yarmo ,JumatSalimon

Macroalgae-Derived Biofuel: A Review of Methods of Energy Extraction from Seaweed Biomass Philip W. Dyer [2]and Patricia Harvey [1]John J. Milledge [1,]*, Benjamin Smith

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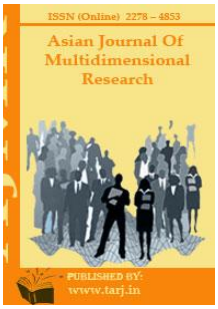

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ACUTE TOXICITY AND INVITRO ANTIOXIDANT ACTIVITY OF FRESH AND COOKED SOLANUMNIGRUM GREEN BERRY EXTRACT

Samja Sabu*; Kalpana C. A.**

*PhD Scholar,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: samsnutrition2018@gmail.com
**Associate Professor,
Department of Food Science and Nutrition
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Solanumnigrum is a herb in the family of Solanacea. The plant contained high nutrients, phytochemicals and has remarkable nutraceutical potential. It is a common plant in hilly areas of Kerala, used for culinary purposes mainly by the tribes. The study aimed to compare the acute toxicity level and invitro antioxidant activity of fresh and cooked Solanumnigrum green berries. The green berries were subjected for different cooking methods and steam cooking was selected as the best nutrient retaining cooking method. The aqueous extracts of fresh and steam cooked green berries were prepared by Soxhlet extraction and invitro antioxidant activity was analyzed by FRAP and DPPH. The IAEC approved ethical clearance to conduct acute toxicity study. Aqueous extracts (Single High dose - 2000 mg/Kg) were supplemented in Sprague dawley female rats to test acute toxicity level according to OECD 423 guidelines and the animals were daily observed for clinical signs of toxicity for 14 days. Fresh Solanumnigrum green berry extract possess better IC_{50} value of 93.9 µg/ml for DPPH and FRAP value of 87.59 µM as compared with steam cooked berries (IC_{50} value of 129.7 µg/ml for DPPH and FRAP value of 99.25 µM). The clinical sign of toxicity over high dose of aqueous extract of both fresh and cooked green berry extract was salivation which subsided within two to three hours after supplementation. The aqueous extracts of Solanumnigrum green berries possess antioxidant activity in DPPH and FRAP methods and not showing remarkable

toxicity over single, high dose supplementation. Hence low dosage of the extract can be used for further experiments.

KEYWORDS: *Solanumnigrum Green Berries, Acute Toxicity, Invitro-Antioxidant Activity*

INTRODUCTION

The mankind was provided with complete store house of herbal remedies to cure various ailments by the nature itself [1]. Due to low side effects, minimal expense and more effectiveness, the interest for herbal medicines is growing now a day. Hence, even the biological active compounds are unknown in a herb, the plant and its extracts are prescribing in a wide manner [2]. *Solanumnigrum* is a herb in the family of Solanacea [3] with common name as black nightshade or Makoi [4]. In ancient Indian medical literature, the *Solanumnigrum* berries are well known for its benefits in diuretics, tuberculosis and inflammation [5].*Solanumnigrum*berryjuice use for treatment of diarrhoea, hydrophobia and opthalmopathy. Berries possess tonic, diuretic and cathartic properties and use for heart diseases. The seeds have beneficial effect to relieve from giddiness and dipsia and useful in inflammations and skin diseases also [6].

The plant is common in hilly areas of Kerala state which is used for culinary purposes mainly by the tribes. The present study is an attempt to analyze *in vitro*antioxidant activity and observe acute toxicity of fresh and cooked *Solanumnigrum* green berries to undertake further studies on its nutraceutical effects.

METHODOLOGY

Methodology of the study was conducted with the following steps

Preparation of Extract for *invitro* Antioxidant activity

The plant*Solanumnigrum*was cultivated and after 4 months of cultivation, the green berries were collected and subjected to different cooking methods such as boiling, pressure cooking, steaming, sautéing and microwave cooking. Nutrient analysis was done for fresh and different cooked green berries and percentage of nutrient retention for each variety of cooking for *Solanumnigrum* green berries was calculated according to USDA True Retention method formula (2007). Among different cooking methods, steaming was selected as the best nutrient retaining cooking method and qualitative estimation of phytochemicals was done for fresh and steam cooked *Solanumnigrum* green berries. The fresh and steam cooked green berries were cabinet dried and at a temperature of 40^0C and stored for further research. The dried fresh and cooked green berries were coarsely powdered and aqueous extract was prepared by soxhlet extraction method and their in vitro antioxidant activity was analyze through DPPH [7] and FRAP[8] methods.

Acute toxicity study forfresh and cooked *Solanumnigrum*green berry extract

The acute toxicity effect of aqueous extract of *Solanumnigrum* green berries was conducted in Sprague dawley (female) rats. Ethical clearance (Certificate Number – AIW.2017:FSN:02) to conduct acute toxicity study was obtained from Institutional Animal Ethical Committee, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore.

The study was carried out according to OECD 423 guidelines for acute toxicity study. Duration of study was 14 days. Six female Sprague Dawley rats of 5-6 weeks age, with an average body weight of 121.5±4.15g selected for the study. The animals were grouped into two and the number of

animals was 3/group (N=3). Single High Dose (HD – 2000mg/Kg) of aqueous extracts of fresh and steam cooked *Solanumnigrum* green berry was administered to the animals through oral gavage tube.

Experimental animals housed under standard conditions of temperature (25 °C), 12 h light/dark cycle, fed with standard pellet diet and water *ad libitum.*The animals were observed twice daily for behavioral changes and clinical signs of toxicity such as CNS depression, CNS stimulant and ANS Activities for a period of 14 days.

RESULT AND DISCUSSION

The result of the study was discussed under the following headings.

DPPH Radical Scavenging Activity

A concentration-dependent DPPH assay wascarried out with the aqueous extracts of fresh and cooked *Solanumnigrum* berries and their percentage of inhibition is shown in Figure 1.

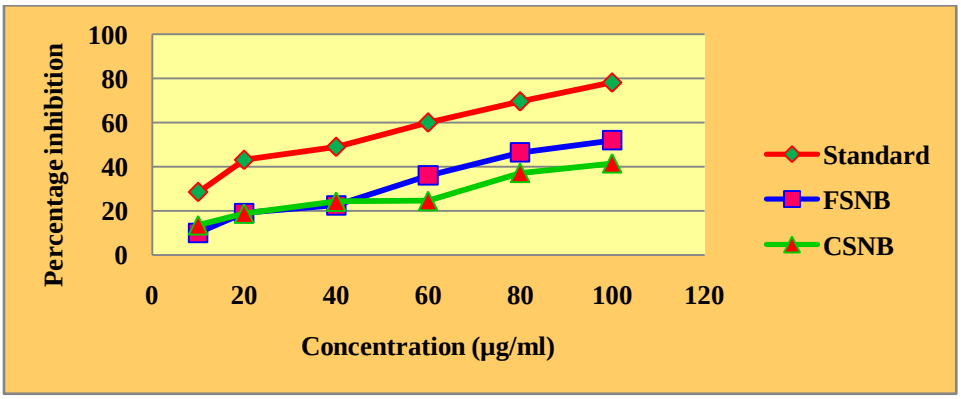

Figure 1 Percentage inhibition of DPPH radical scavenging activity of Fresh and Cooked *Solanumnigrum*Green Berry Extract (Standard - ascorbic acid - control:- 1.320)

The effect of antioxidantson DPPH radical scavenging was thought tobe due to their hydrogen-donating ability [7].DPPH radical scavenging activity of the tested extracts is concentration dependent and lower IC_{50} value reflects higher scavenging ability[9]. The standard, ascorbic acid had an IC_{50}value of 42.84 µg/ml. The fresh *Solanumnigrum*green berry extract showed better scavenging ability (IC_{50} value of 93.9 µg/ml) as compared with steam cooked one (IC_{50} value of 129.7 µg/ml). Thepercentage of inhibition was increased with increasing concentration in the order: Ascorbic acid >Fresh *Solanumnigrum* berries> Cooked *Solanumnigrum* berries.

In vitro antioxidant activityin FRAP

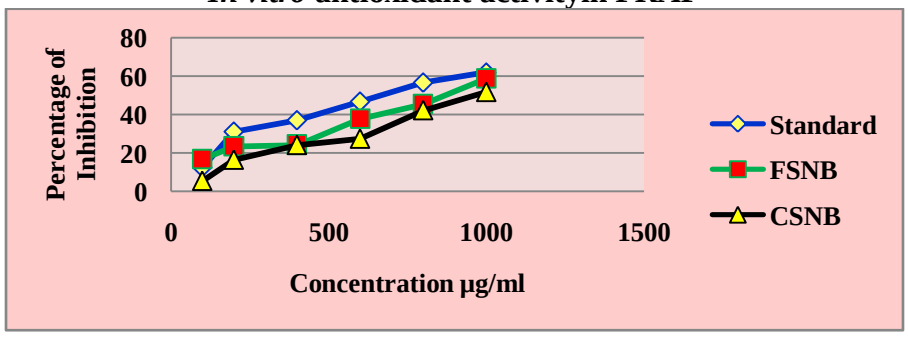

Figure 2 FRAP radical scavenging activity of Fresh and Cooked *Solanumnigrum*Leaf Extract (Standard - ascorbic acid - control :- 1.860)

The aqueous extracts of fresh *Solanumnigrum* green berriesexhibited higher antioxidant potential than that of cooked one. The standard used was ascorbic acid. Increasing order of reducing ability was found as Ascorbic acid > Fresh *Solanumnigrum* green berries> Cooked *Solanumnigrum* green berries.

The FRAP assay is using widely for the evaluation of antioxidant components in dietary polyphenols. Antioxidant activity increases with increase in polyphenol contents. Recent reports show a positive relationship between antioxidant activity and total phenol content which appears as a trend in many plant species [10].

Evaluation of Gross Behavior after Supplementation of Extracts

The Sprague Dawley female rats supplemented with aqueous extracts of fresh and cooked *Solanumnigrum* green berries wereobserved twice daily for behavioral changes and clinical signs of toxicity. The evaluation of Central Nervous System (CNS) Depression activities are given in Table 1.

TABLE 1 OBSERVATION OF CNS DEPRESSION ACTIVITIES

Gross Behavior	Group I (FSNGBE)	Group II (CSNGBE)
Hypoactivity	-	-
Passivity	-	-
Relaxation	-	-
Narcosis	-	-
Ataxia	-	-
FSNGBE –Fresh *Solanumnigrum* green berry extract CSNGBE – Cooked *Solanumnigrum* green berry extract		

The animals supplemented with aqueous extract of fresh and steam cooked *Solanumnigrum* green berry did not shown any CNS depression activities.

Table 2 explains the Central Nervous System (CNS) stimulant activities occur in experimental animals.

TABLE 2 OBSERVATIONS OF CNS STIMULANT ACTIVITIES

Gross Behavior	Group I (FSNGBE)	Group II (CSNGBE)
Hyperactivity	+	-
Irritability	+	+
Stereotypy	-	-
Tremor	-	-
Convulsions	-	-
Stub Tail	+	+
Analgesia	-	-
FSNGBE – Fresh *Solanumnigrum* green berry extract CSNGBE – Cooked *Solanumnigrum* green berry extract		

Experimental animals supplemented with fresh *Solanumnigrum* green berry extract showed CNS stimulant activity such as hyperactivity, irritability and stub tail while the group supplemented with steam cooked *Solanumnigrum* green berry extract showed irritability and stub tail. A range of behaviors including mild elevation in alertness, increased anxietyand nervousnessand convulsions are known as CNS stimulation [11].

Table 3 deals with evaluation of Autonomous Nervous system activities in experimental group after supplementation of extracts.

TABLE 3 OBSERVATIONS OF ANS ACTIVITIES

Gross Behavior	Group I (FGBE)	Group II (CGBE)
Ptosis	-	-
Exophthalmia	-	-
Urination	+	-
Salivation	+	+
Lacrimation	-	-

Autonomous Nervous system activities were observed and only salivation was present for both the group supplemented withfresh and steam cooked *Solanumnigrum* green berry extracts. Urination was present only in group supplemented with fresh *Solanumnigrum* green berry extract. All the above mentioned CNS stimulant and ANS activities were present immediately after the supplementation of extracts which were get subside after 1-2 hours of supplementation.

CONCLUSION

The aqueous extracts of fresh *Solanumnigrum*green berries possess good antioxidant activity in DPPH and FRAP. Both fresh and steam cooked *Solanumnigrum*green berry extract not showing any lethal effect and notable toxicity in experimental animal over single, high dose supplementation. Henceit can be concluded that, the extracts can use for experimental studies related to oxidative stress in low dose.

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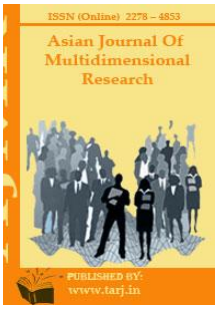

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EMPOWERING RURAL WOMEN TO ACHIEVE FOOD SECURITY THROUGH NUTRITION WELFARE SCHEMES

Dr. G. Baradha*; Dr. G. Sheefna**

***** Former Prof & HOD,
Department of Human Development,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: sheefna@gmail.com

** Assistant Professor,
Department of Home Science Extension Education,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Good quality health is an essential prerequisite for quality of life and the foundation for collective and economic development.The social welfare department is the nodal department in the implementation of the supplementary nutrition programme in the state. In order to develop the children into healthy, literate and creative human beings, the foremost duty is to protect them from childhood hunger, and attract them towards academics. The evident picture obtained from the study is that there have been significant improvements in the overall nutritional and health status of the population in Tamil Nadu but meager functioning of these welfare schemes are not an ending but means of progress. The foremost challenge facing women is to conquer undernourishment because undernourishment critically affects women's participation in the economic system and their productivity. Supplementary nutrition scheme II (sathumavu and noon meal) for the age group 2-5 years, four percent of the respondents each from Krishnarayapuram, Thogaimalai and five percent each at K.Paramathy and Thanthoniwere benefited. Hence it was considered necessary to initiate specific measures for the welfare of women.

KEYWORDS: *Undernourishment, Thogaimalai, Implementation,*

INTRODUCTION

India is a welfare state, committed to the welfare and development of its people and of vulnerable sections in particular. Women welfare was realized that the regeneration of women should be intrinsically bound up with the regeneration of the entire nation. Hence it was considered necessary to initiate specific measures for the welfare of women.

Good quality health is an essential prerequisite for quality of life and the foundation for collective and economic development. The foremost challenge facing women is to conquer undernourishment because undernourishment critically affects women's participation in the economic system and their productivity. It is important to focus on women's nutritional status. According to the 2011 census in Tamil Nadu, the total Scheduled Caste population is 14,438,445 where SC women constitute 7,233,758 of the population. For the well being of these communities the Government of Tamil Nadu has taken several steps in framing and implementing various nutrition related welfare schemes.

The study brings out the awareness level of SC women towards the nutrition related schemes of the two districts namely Karur and Perambalur selected from the state Tamil Nadu. Karur district comprise eight blocks. They are Krishnarayapuram, Kulithalai, Karur, Thogaimalai, Kadavur, Aravakurichi, K. Paramathy and Thanthoni.Perambalur district consist of four blocks namely Perambalur, Veppanthatai, Veppur and Alathur. The respondents selected were 400 SC women from Karur and 400 SC women from Perambalur districts respectively.

A. Nutrition related schemes

For good nutrition a person should eat a well balanced diet, in order to prevent disease and promote good health. For a nation's progress, it is essential that the health and nutrition of women and girls are cared for, hence Government has launched many schemes (Paul, 2010 and Anadhalakshmi and Rajeshwaran, 2003). The nutrition related welfare schemes benefited by the selected SC respondents at Karur and Perambalur were collected under the heads, awareness and sources about nutrition schemes, beneficiaries of Supplementary Nutrition Programme and beneficiaries of noon meal scheme.

i. Awareness and sources about nutrition schemes

The awareness about nutrition related schemes prevailing in the district and the sources from which the respondents acquired the information are projected in Table I.

TABLE I AWARENESS AND SOURCES ABOUT NUTRITION SCHEMES

Districts / Blocks	***Knowledge about nutrition schemes (percentage)***		***Sources (percentage)***				
Karur (n=400)							
Blocks	***Yes***	***No***	***Anganwadi workers***	***Doctors***	***Nurse***	***School teacher***	***Noon meal centre***
Krishnarayapuram	99	1	9	6	3	-	1
Kulithalai	88	12	6	1	-	3	-
Karur	98	2	7	5	1	-	-
Thogaimalai	98	2	10	1	-	1	-
Kadavur	95	5	6	-	1	2	-
Aravakurichi	100	-	8	2	-	-	-

K.Paramathy	90	10	12	-	1	-	-
Thanthoni	90	10	13	1	-	-	-
Average Total	**95**	**5**					
Perambalur(n=400)							
Blocks							
Perambalur	93	7	2	2	2	6	15
Veppanthatai	75	25	2	-	1	1	31
Veppur	96	4	2	6	-	1	10
Alathur	96	4	3	1	1	-	14
Average Total	**90**	**10**					

From the table it can be found that 95 percent of the respondents in all the blocks of Karur district knew about the schemes related to nutrition. The sources of information for the respondents were from anganwadi workers, area nurse, doctors, primary health centre and school teachers. It was observed that 96 percent of the respondents in Alathur and Veppur blocks; 75 and 93 percent of SC Women in Veppanthatai and Perambalur blocks respectively knew about the schemes related to nutrition. The information's were gathered from anganwadi workers, balwadi teachers, doctors, noon meal workers, nurse and school teachers, Chi square test revealed that (χ^2=5.053 p< 0.05) there is a significant relationship between districts and awareness about schemes related to nutrition. The percentage of awareness was higher in Karur (95 percent) than Perambalur (90 percent).

ii. Beneficiaries of supplementary nutrition schemes

The social welfare department is the nodal department in the implementation of the supplementary nutrition programme in the state. Under this scheme, nutritious foods are served to the vulnerablechildren (0-6years) and pregnant women and lactating mothers at anganwadi centre through the anganwadi workers assisted by anganwadi helpers. The beneficiaries of the supplementary nutrition schemes include from 6 months old infant to 45 years old women. The number of beneficiaries and percentile distribution as per the schemes projected in the below given Table II.

TABLE II BENEFICIARIES OF SUPPLEMENTARY NUTRITION SCHEMES BLOCKWISE

Districts / Blocks	***Supplementary nutrition scheme (Percentage)***					
Karur (n=378)	***6 months to 3 years***	***2-5 years***	***Adolescent girls (11-18 years)***	***Pregnant women***	***Lactating mothers***	***15-45 years old women***
Blocks						
Krishnarayapuram	11	4	5	-	-	-
Kulithalai	3	2	2	1	1	-
Karur	4	3	4	1	-	-
Thogaimalai	3	4	4	1	-	-
Kadavur	.5	2	2	-	-	1
Aravakurichi	4	3	3	1	1	-
K.Paramathy	6	5	3	-	1	-

Thanthoni	5	5	3	-	1	1
Perambalur(n=360)						
Blocks						
Perambalur	14	12	9	11	8	-
Veppanthatai	12	10	8	9	6	-
Veppur	27	16	10	16	13	-
Alathur	16	13	8	11	11	-

The scheme I supplementary nutrition (sathumavu) is meant for the children of 6 to 36 months. Only eleven and six percentage of the respondents' families in Krishnarayapuram and K. Paramathy respectively benefited from this scheme for the children of 6 months to 3 years. Supplementary nutrition scheme II (sathumavu and noon meal) for the age group 2-5 years, four percent of the respondents each from Krishnarayapuram, Thogaimalai and five percent each at K.Paramathy and Thanthoniwere benefited. Five percent of the selected SC women in Krishnarayapuram and Karur were the beneficiaries of the nutrition scheme meant for adolescent girls (11-18years). There were a few beneficiaries for the nutrition education scheme for pregnant women, lactating mothers and women of 15-45 years.

Twenty seven, 16, 14, and 12 percent of the families of the SC women in Veppur, Alathur, Perambalur, and Veppanthatai blocks respectively were benefited by the supplementary nutrition scheme for 6 months to 3 years. Regarding the supplementary nutrition scheme for 2-5 years, 16 percent of the respondents in Veppur, 13 percent of them in Alathur and 12 percent of them in Perambalur got benefited. Eight percent of the respondents' families were benefited from the supplementary nutrition scheme for adolescents.

Sixteen percent of pregnant women in Veppur, 11 percent each in Perambalur and Alathur were benefited from the supplementary nutrition scheme. Under schemes for lactating mother, 13 percent in Veppur and 11 Percent in Alathur were benefited. It is very alarming to know that there were no beneficiaries in nutrition schemes in the age group of 15-45 years.

i. Beneficiaries of noon meal scheme

Children who are the future human resources play a vital role in nation building. In order to develop the children into healthy, literate and creative human beings, the foremost duty is to protect them from childhood hunger, and attract them towards academics. Under the noon meal scheme in school, food is given for the children of the age group 6-14 years; the number of beneficiaries in the noon meal scheme is tabulated below.

TABLE III BENEFICIARIES OF NOON MEAL SCHEME BLOCKWISE

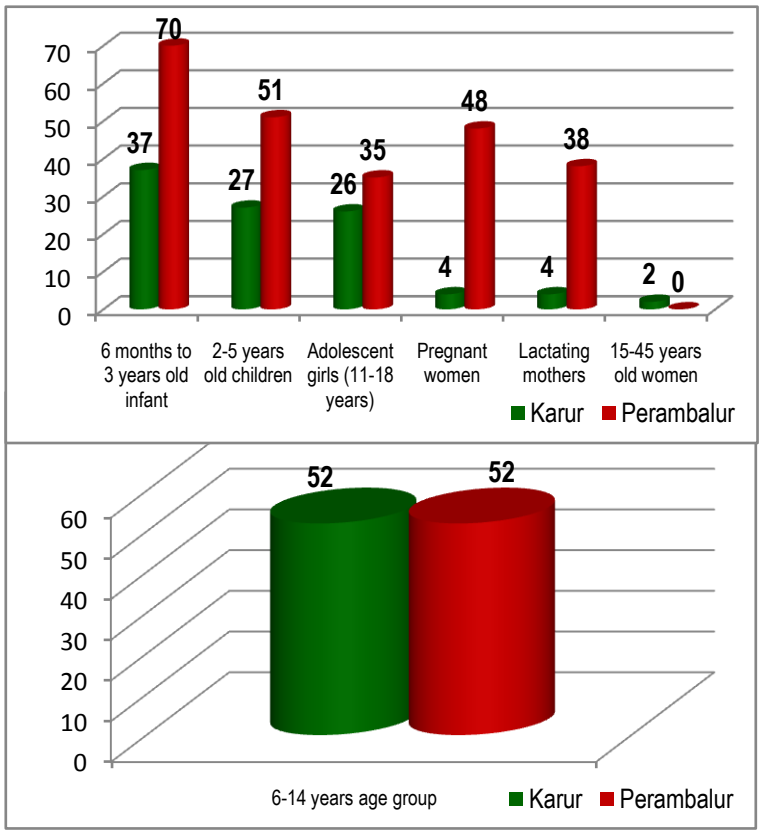
Districts / Blocks	***Noon meal scheme***
Karur (n=378)	***Percentage***
Blocks	
Krishnarayapuram	56
Kulithalai	53
Karur	67

Thogaimalai	43
Kadavur	73
Aravakurichi	45
K.Paramathy	39
Thanthoni	43
Perambalur (n=360)	
Blocks	
Perambalur	41
Veppanthatai	62
Veppur	33
Alathur	81

In Karur district, percentage of the children enrolled for the noon meal block wise shows that at Kadavur 73, Karur 67, Krishnarayapuram 56, and Kulithalai 53 percentage of children of SC community consumed the noon meal in schools. In Perambalur it is satisfactory to find that four fifth of the selected (81 percent) children in Alathur block and 62 percent of them at Veppanthattai block were the beneficiaries under noon meal scheme.

Beneficiaries in nutrition schemes district wise

The beneficiaries of nutrition welfare schemes district wise are shown below in Figure 1.



From the figure, it is evident that in supplementary nutrition scheme, for 6 months to 3 years old infant, 70 percent of infants have benefited from this scheme at Perambalur and at Karur only 37 percent are the beneficiaries. Fifty two percent of the beneficiaries in both Karur and Perambalur districts were benefited from the noon meal scheme.

TABLE IV CHI SQUARE TEST TO FIND THE SIGNIFICANCE IN DIFFERENCE

Nutrition Schemes	*Groups*	*DISTRICT*				*TOTAL*		*Chi-Square*	*Sig.*
		Karur		*Perambalur*		*No.*	*%*		
		No.	*%*	*No.*	*%*				
Supplementary nutrition 6 months to 3 years old infant	*Not Benefited*	240	63.5	109	30.3	349	47.3	25.842	**
	Benefited	138	36.5	25.1	69.7	389	52.7		
Noon meal scheme in schools 6 - 14 years age group	*Not Benefited*	181	47.9	17.4	48.3	35.5	48.1	19.081	**
	Benefited	197	52.1	186	51.7	383	51.9		

**** – Significant at 1% level**

Chi square test shown in the above table reveals that the proportion of beneficiaries significantly differed at one percent level between Karur and Perambalur districts for selected nutrition schemes namely supplementary nutrition for 6 months to 3 years old infants and noon meal schemes in schools for 6-14 years age group.

The evident picture obtained from the study is that there have been significant improvements in the overall nutritional and health status of the population in Tamil Nadu but meager functioning of these welfare schemes are not an ending but means of progress. For the effectiveness of these schemes it is important that these schemes emerge as sustainable units. If the nutritional status is continuous the future generation will also flourish in their life, which in turn will contribute to the progress of our state and nation. Promotion of awareness programs through mass media is important so that the women population will be more familiar with all the Government schemes implemented for the welfare of the rural women.

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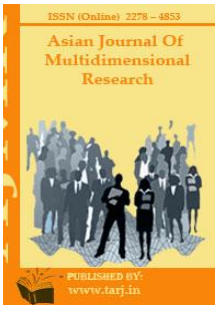

Asian Journal of Multidimensional Research (AJMR)

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STERLING IMPACT OF MALTODEXTRIN ON TEXTURAL PROPERTIES OF JACKFRUIT (ARTOCARPUS HETEROPHYLLUS) BAR USING A SOLAR CABINET DRYER

G. Karishma Yadav*; M.Ramakrishna Rao; Pooja Mandlik*****

*PhD Scholar,
Dept of Food Science and Nutrition,
Avinashilingam Institute of Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

**Director R & D,
Society for Energy,
Environment and Development,
Jubilee Hills, Hyderabad, INDIA
Email id: gkarishma94@gmail.com

***Assistant Professor (ad-hoc),
GITAM (Deemed to be University),
Institute of Science,
Department of Microbiology and FST,
(Estd.u/s 3 of the UGC Act, 1956),
Visakhapatnam, INDIA

ABSTRACT

Advancements in Food and Nutritional Security play a vital role in alleviating poverty and improving the nutrition profile of the masses. Jackfruit is an underutilized tropical fruit from the family Moraceae. The study was aimed at preservation and value addition of this exotic fruit in the form of a fruit bar. An attempt was made to standardize the Jackfruit bar without maltodextrin (M_0), with 2.5% maltodextrin (M_1) and with 5% maltodextrin (M_2). Other ingredients like sugar (25%), citric acid (1.9%), pectin (2.5%), mango pulp (5%), Potassium metabisulphite (0.2%) and water was blended with pulp (60%), in right proportions and processed to obtain a value added, Ready-To-Eat [RTE] jackfruit bar using solar dehydration technology. The proximate analysis of the final product was performed by estimation of Moisture, Acidity, pH and Total Ash and microbial parameters for TBC, E.Coli, Yeast and Mold count was tested. The organoleptic properties (Colour, Appearance, Taste, Texture and Overall Acceptability) were also evaluated by trained panelists. The findings

revealed that the solar-dried Jackfruit bar M_2 had good percentage of Total and reducing sugars and the microbial parameters were within the limits for TBC, E.Coli, yeast and mold. The results of the sensory evaluation showed that the product M_2 was ranked best in terms of colour, appearance, texture, taste and overall acceptability, based on the 9 point Hedonic Scale Rating. It was concluded that the best remarkable results were obtained for sample M_2 in terms of textural aspects and sensory properties than the other samples (M_0) and (M_2), hence is recommended.

KEYWORDS: *Nutritional security, Jackfruit, fruit bar, solar dehydration, sensory evaluation.*

INTRODUCTION

Jackfruit (*Artocarpus heterophyllus L.*) is a species of a tree in the mulberry and Bread fruit family (*Moraceae*). It is an underexploited tropical fruit crop, is native to India and is popularly known as the 'poor man's fruit' in Eastern and Southern parts of India. Few main varieties of Jackfruit include small, fibrous, soft and mushy, with sweet carpels and with a raw oyster like texture and the other variety being crispy and crunchy, but not very sweet (Swami et al. 2012, Siddappa, 1957).

Carotenoids are the pigments responsible for the attractive yellow color of the bulbs (Saxena et al.2009). Jackfruit is found to be a good source of protein, starch and calcium (Burkill 1997). Fresh fruit contains fair amounts of Vitamin A, vitamin C, flavonoid pigments like carotene-β, xanthin, lutein and cryptoxanthin-B. Together these components play a vital role as antioxidants, in vision functions and shield from lung and oral cavity malignancies (SCUC, 2006). Jackfruit is a decent wellspring of antioxidant vitamin-C, giving around 13.7 mg or 23% of RDA, thus creating resistance against infectious agents and rummage unsafe free radicals. It is one of the rare fruits that contain great measures of vitamin B-6 (pyridoxine), niacin, riboflavin, and folic acid. Fresh fruit is a decent wellspring of magnesium, manganese, and iron (Swami et al. 2012 and SCUC, 2006). The matured fruit is fibrous and consists of sugars like glucose, fructose, xylose, rhamnose, arabinose and galactose (Morton, 1987). Jackfruit helps in mitigating the pancreatic afflictions and help in blood purification (Shadab et al. 2015).

However, the natural product is perishable and can't be stored for quite a while as a result of its characteristic compositional and textural attributes. In each year, a lot of jackfruit, specially obtained in the glut season (June-July) goes squander (30 to 34 %) because of absence of appropriate postharvest knowledge amid harvesting, transporting and storage (Gunasena et al. 1996), hence it is essential to process Jackfruit into various value added products. The use of solar drying or natural drying is more preferred for products whose chance of entering the market relies on minimal cost of processing (Alexandre et al. 2011), are better suited for long distance transportation, aids in alleviating food shortages and helps preservation and consumption of seasonal foods with greater ease and relish. However, controlling the processing parameters during drying and performing simulations using accurate kinetic parameters may contribute to the optimization of the process (Khraisheh et al. 2000). This has necessitated the invention of a solar cabinet dryer to supplant the conventional open-air sun drying.

Solar cabinet dryer holds a very promising future for the developing countries economically since it smolders no fuel, doesn't lead to air or water pollution and the materials for its construction are very shoddy and promptly available. It gives a quicker drying rate by raising the temperature to about 10°C – 40°C above the ambient temperature, thus enhancing the quality of the product. It also

prevents the food from dust, insects, rodent and other animals since it is encased in a chamber (Emelue et al. 2015).

Jackfruit bulbs have been widely processed into many value-added products such as fruit rolls, marmalades and ice cream (Narasimham 1990), canned juice (Seow and Shanmugam 1992), candied fruit (Roy and Joshi 1995), fruit leather (Che Man and Sin 1997; Nakasone and Paull 1998), fruit bar (Manimegalai et al. 2001), minimally processed bulbs (Saxena et al. 2009a) and hurdle technology-preserved bulbs (Saxena et al. 2009b). Ripe Jackfruit is used in curries or salads (Narasimham 1990) and is also canned in syrup (Rahman et al. 1995). Freeze-dried, vacuum-fried, and cryogenic handling, are the new preservation techniques for advanced jackfruit-based products. (Roy and Joshi 1995) The objective of this study was preservation, value addition and standardization of underutilized fruit in the form of a bar using conventional Solar dehydration technology and evaluate the acceptability through proximate, microbial and organoleptic analysis of the end product.

METHODOLOGY

Preparation of Jackfruit pulp: Ripe Jackfruit which was fresh and fairly ripe, were procured from the local market. The Jackfruits were vertically cut into portions of four initially. The fruit contains sticky latex, hence a little amount of vegetable oil is applied on to hands and the bulbs are plucked manually and deseeded. The Jackfruit bar of different formulations was prepared using jackfruit pulp, water, sugar, mango pulp, Maltodextrin, pectin and citric acid added to syrup which were added to the double boiled jackfruit pulp and Potassium metabisulphite was added at 75°C - 80°C. The ingredients were carefully added in weighed quantities as per the procedure after repeated trials.

Solar cabinet dehydration of Jackfruit pulp: The pulp was loaded into Stainless steel trays and dehydrated in the solar cabinet dryer model SDM-50 and SDM-200, where the temperature is efficiently maintained around40°C - 60°C. The weight loss of the pulp was recorded every 2h to observe the drying rate. The weight of the Jackfruit pulp was recorded along with the tray using a precision balance having a least count of 0.01g. The moisture content of the end product was maintained to be 11% – 13%. The end product was cut into pieces of 10″×10″ (approx.), rolled and packed in HDPE boxes, shrink wrapped and stored in ambient temperatures (24°C - 26°C), for further analysis.

RESULTS AND DISCUSSION

The data in table 1 and 2 represent the Physico-chemical properties and the sensory evaluation results of the solar dried Jack fruit bars with the variations M_o, M_1 and M_2. The average percentage of moisture in the samples M_o and M_1 is 15.86 when compared to the value of M_2, which is more preferred. The percentage of acidity and total ash, pH values do not show any considerable difference whereas the values of M_2 for percentage of total and reducing sugars showed a slight hike in the value.

The sensory parameters of the study clearly reveal that the product M_2 is more acceptable in terms of colour, flavor, texture, taste and overall acceptability with respect to the 9 point Hedonic Scale Reading.

The microbial parameters of the different jackfruit bar formulations reveal that there is no visible growth of colonies in all the dilutions for E. coli and yeast and mold when compared with the standard reference values which are as follows:

Specification for E.coli - < 10 cfu/gm

Specification for Total plate counts – limits for cfu are 40,000

Specification for Yeast and Mould count <100 cfu/gm

TABLE – 1 PHYSICO CHEMICAL PARAMETERS OF SOLAR DRIED JACK FRUIT BARS

Parameter	Value		
	M_o	M_1	M_2
Moisture content (%)	16.11	15.62	12.89
Acidity (%)	1.193	1.20	1.207
pH	4.34	4.36	4.38
Total ash (%)	0.811	0.813	0.77
Reducing sugars (%)	25.40	26.21	26.60
Total sugars (%)	25.10	25.92	26.96

Graph- 1

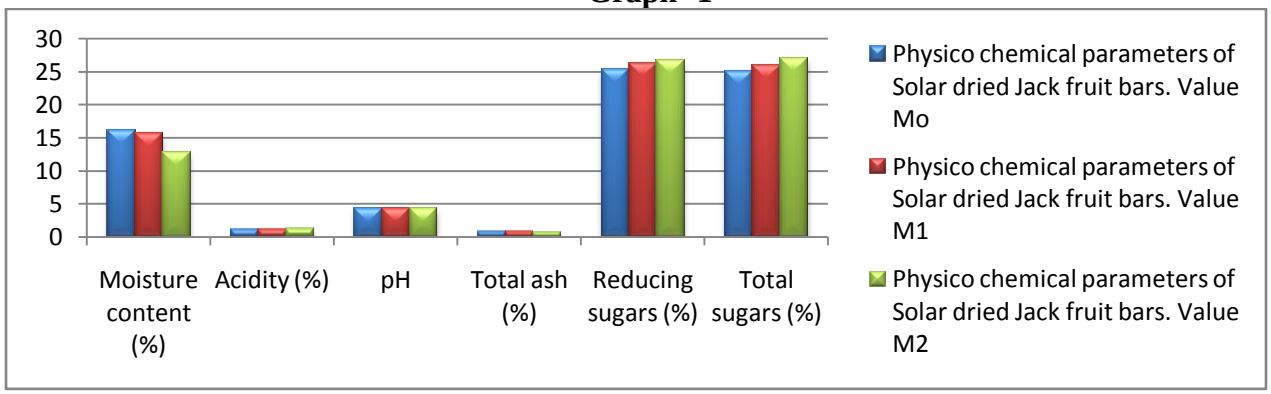
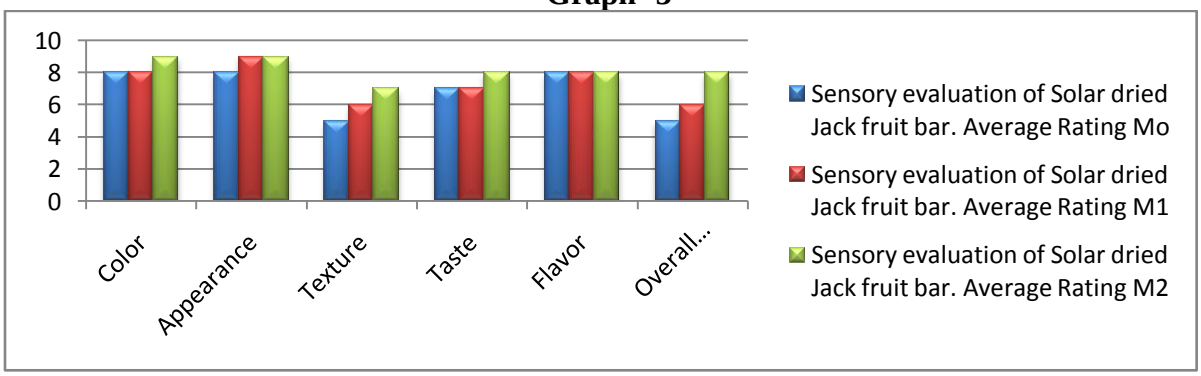


TABLE-2 SENSORY EVALUATION OF SOLAR DRIED JACK FRUIT BARS

Sensory Attributes	Average Rating		
	M_o	M_1	M_2
Color	8	8	9
Appearance	8	9	9
Texture	5	6	7
Taste	7	7	8
Flavor	8	8	8
Overall Acceptability	5	6	8

Graph- 3



Drying data

TABLE-3 AVERAGE DRYING DATA OF THE SOLAR-DRIED JACK FRUIT BARS

Sample	Initial Wt. (Kg)	Final Wt. (Kg)	Yield (%)	Drying Hours (Hr)	Temperature (°C)		Final Moisture (%)
					Cabinet	Ambient	
Solar dried Jack fruit Bar	8.35	7.3	40.23	16	40-60	29-36	12.89%

CONCLUSION

From the above study on improving the textural properties of solar dehydrated Jack fruit bar with Maltodextrin, it was concluded that the best remarkable results were obtained for sample M_2 in terms of textural and sensory aspects. As the results pertaining to the samples M_0, M_1 are not up to desired standards, they are neglected. The findings show that the fruit bar M_2, has adequate moisture content, required amount of acidity levels, slightly weak acidic pH which makes the product acceptable in terms of sensory aspects and microbial parameters, very low Total ash content and also Total and reducing sugars percentage. The findings of the sensory evaluation reveal that the product was more opted for in terms of colour, appearance, texture, taste, flavor and overall acceptability, when evaluated on the basis of 9 point Hedonic scale rating. The microbial parameters were within the limits thus making the product safe and acceptable. Hence it is concluded that Solar dehydrated Jack fruit bar sample M_2 containing 5% mango pulp, 25% sugar and 5% Maltodextrin, is the best method for improving the textural properties of solar dehydrated Jack fruit bar with malto dextrin in aspects like Physico-chemical, Organoleptic and Microbial activity.

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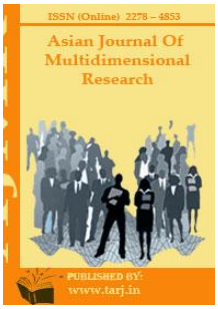

Asian Journal of Multidimensional Research (AJMR)

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VERMICOMPOSTED COIRPITH AS A SOIL SUPPLEMENT TO ENHANCE YIELD PARAMETERS OF CLUSTER BEAN (CYAMOPSIS TETRAGONOLOBA L.)

K. Gnanamani, Vijayalakshmi, A*; Sakthivigneswari, G**

*Professor,
Department of Botany,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: avijayalakshmi85@gmail.com kgnanamani1994@gmail.com

**Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

A pot culture experiment was conducted with cluster bean (Cyamopsis tetragonoloba (L.)) as the test crop to evaluate the efficacy of vermicomposted coirpith. Seven treatments were given viz. C - control, T_1 - vermicomposted coirpith (15g), T_2 - vermicomposted coirpith (16g), T_3 - vermicomposted coirpith (17g), T_4 - vermicomposted coirpith (18g), T_5 - vermicomposted coirpith (19g), T_6 - vermicomposted coirpith (20g). The yield parameters like number of pods/plant, number of seeds/plant, pod length, pod fresh weight, pod dry weight were analyzed on 90^{th} days after sowing. The results of the study clearly indicated that the treatment T_3 significantly promoted all the yield parameters of the test crop as compared to the control treatment.

KEYWORDS: *Cyamopsis Tetragonoloba, C – Control, T – Treatment, G – Gram, Yield Parameters, Days after Sowing.*

1. INTRODUCTION

Knowledge in Organic agriculture has grown rapidly throughout the world in recent years. Organic farming is proving as a remedy to cure ills of modern chemical agriculture. Organic fertilizers have resulted in decomposition of residues, improving physical and chemical properties of soil (Zodape *et al*., 2010).

Organic waste recycling is an efficient and eco-friendly technology to convert wastes into value-added products. Coir pith, an agro waste by-product is collected during the process of coir fibre extraction from coconut husk of the coir industry, constitutes about 70 per cent of the coconut husk and 7.5 million tonnes of coir pith are produced per annum in India. In Tamil Nadu, nearly 0.2 million tonnes of coir pith are available annually (Parasuraman *et al*., 2002). It is a lignocellulosic waste and contains 34.8 per cent of lignin and 28.6 per cent cellulose (Gopal and Gupta, 2001). As it has no economic utility, it is often dumped outside the coir industry in large quantities. Being very low in density, it is blown away by wind when left on roadside, thus causing vehicular obstruction. When it is burnt, it does not burn completely but emits abundant smoke for several days polluting the environment.

Cluster bean (*Cyamopsis tetragonoloba* **(**L)) Taub) commonly known as guar is a cash crop of the family fabaceae. It is an annual legume and the source of guar gum. Cluster bean is a drought tolerant warm season crop grown for its tender fruits for use as vegetables. Fruits are rich in food value and each 100 g contains 10.8 g carbohydrates, 3.2 g protein, 1.4 gm minerals, 316 IU vitamin-A and 47 mg vitamin-C. It is also used as a nutritious fodder for livestock. Mucilaginous seed flour is used for making guar gram (galactomannan) utilized in textile, paper, cosmetic and oil industries throughout the world. Hence in the present investigation, coirpith is biocomposted and used as manure for the growth of *Cyamopsis tetragonoloba.*

2. MATERIALS AND METHODS

Collection of agro- industrial waste

The agro industrial waste coirpith was collected in large amounts from in and around, Coimbatore. It was sundried and stored in gunny bags.

Compost pit preparation

The process of composting was done in 1.5 feet length and 4 square feet width compost pit. It was filled by coirpith waste. It was allowed for decomposition for 30 days.

Experimental tray preparation (*Eudrillus eugeniae* used)

After pre-decomposition pre-digested material was transferred to plastic tray (30x20x20 cm). Fifteen exotic earthworms (*Eudrillus eugeniae*) were inoculated in to each tray. Water was sprayed regularly twice a day to maintain the moisture content. This experimental unit was undisturbed in the shady place for 60 days. After composting the samples were taken.

Potculture Experiment

Treatment applications and cultivation

The pots were filled with 7kg of sandy clay loam soil. The compost was applied to the respective pots and mixed thoroughly. Viable seeds were selected and five seeds were sown in each pots with three replications. After germination three healthy plants were maintained per pot. Plant protection

measures and other cultural practices were followed as per recommendation of Tamil Nadu Agricultural University, Coimbatore.

Yield parameters

On the 90 DAS the plants (cluster beans) were uprooted from the pot and following yield parameters were observed.

1. Number of pods/plant
2. Number of seeds/pod
3. Pod length
4. Pod fresh weight
5. Pod dry weight

Statistical analysis

The data obtained from various yield parameters were subjected to the statistical analysis and based on the results, inference were drawn whenever the treatment differences were significant critical differences were worked out.

3. RESULT AND DISCUSSION

The data presented in table -1 revealed that the number of pods/plant, number of seeds/pod, pod length, pod fresh weight and pod dry weight were increased significantly in the treatment T_3 when compared to other treatments and control on 90 DAS. The significant number of pods per plant (8.0), number of seeds per plant (23.0), pod length (13.9 cm), pod fresh weight (3.16 g) and dry weight content (1.10 g) was achieved in T_3 treatment followed by T_2 treatment (7.0, 20.33, 9.60 cm, 2.88 g and 0.71 g). The lowest value was noted in control treatment (3.0, 8.0, 5.5 cm, 1.77 g and 0.56 g) respectively.

The result is on par with the result of Singh and Chauhan (2009) who also reported that application of vermicompost (4 kg / bed) significantly enhanced the number of pods in *Glycine max*. The present study was positively correlated with the findings of Gupta *et al.* (2013) who observed the maximum number of fruits per plant (6.63) with the application of vermicompost (4 t/ha) and $^1/_2$ NPK (120 : 50: 75) in *Gloriosa superba*. Similar work was done by Sekar *et al.* (2013) who confirmed maximum fruit fresh weight (6.1 g) and dry weight (2.5 g) in chillies due to the application of 50 per cent vermicompost supplement with 50 per cent RDFC (w/w). Similar result was reported by Saraswathy and Prabaharan (2014) who confirmed that application of vermicompost (10.5 t/ha) + RDF (20%) significantly improved the number of fruits per plant (36.57) and fruit weight (71.65 g) in tomato. The similar results was supported by Sakthivigneswari and Vijayalakshmi (2017) who confirmed that application of biocomposted coirpith (Raw coirpith pre digested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* 5 t/h) enhanced the yield parameter at the harvest stage in *Solanum surratens*.

The maximum increase in T_3 treatment might be due to the application of vermicomposted coirpith which increase the solubilisation of plant nutrients helped in the improvement of yield parameters.

CONCLUSION

Disposal of waste material into the environment causes environment pollution, health hazardous to the people and affects the crop productivity. Organic waste is also responsible for pollution of soil and water bodies but if they are recycled properly they served as a good source of plant nutrients. Organic manures improve the soil fertility and biological properties of the soil. Hence, Agro industrial wastes can be recycled and used as a cheaper source of organic nutrients.

TABLE 1 YIELD PARAMETERS OF CLUSTER BEAN INFLUENCED BY VERMICOMPOSTED COIRPITH (90TH DAY)

Treatment	Number of pods/plant	Number of seeds/pods	Pod length	Pod fresh weight	Pod dry weight
Control	3.0 ± 0.42	8.0 ± 0.20	5.5 ± 0.41	1.77 ± 0.02	0.56 ± 0.02
T1	3.0 ± 0.31	11.33 ± 0.31	7.60 ± 0.30	2.01 ± 0.02	0.63 ± 0.05
T2	7.0 ± 0.23	20.33 ± 0.53	9.60 ± 0.27	2.88 ± 0.54	0.71 ± 0.04
T3	8 .0± 0.47	23.0 ± 0.22	13.9± 0.25	3.16 ± 0.58	1.10 ± 0.02
T4	6.0 ± 0.38	18.0 ± 0.43	8.3 ± 0.34	2.23 ± 0.02	0.99 ± 0.03
T5	5.0 ± 0.53	15.0 ± 0.35	7.6 ± 0.22	2.18 ± 0.02	0.81 ± 0.04
T6	4.0 ± 0.32	13.0 ± 0.56	6.5 ± 0.33	1.77 ± 0.59	0.75 ± 0.02
SEd	1.6330	1.6232	0.1633	0.3061	0.1665
CD (P<0.05)	3.5028	3.4819	0.3503	0.6566	0.3571
CD (P<0.01)	4.8615	4.8325	0.4862	0.9113	0.4956

Values are mean ± of three samples in each group

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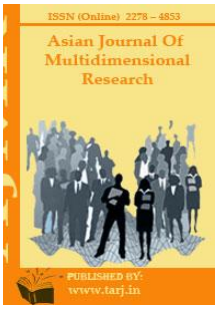

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PUMPKIN SEEDS: A REPOSITORY OF NATURAL STRESS ALLEVIATORS

Amrutha B. Nair*; P.A. Raajeswari**

*Ph.D Research Scholar,
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women
Coimbatore, Tamil Nadu, INDIA
Email id: bnairamrutha93@gmail.com

**Assistant Professor (SG)
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

In recent years, research field is throwing light on oxidative stress and their adverse effects on human body which are manifested as various diseases and disorders. Plants and their metabolites are used as natural antioxidants in pharmaceuticals to combat stress and stress mediated disorders like infertility. Pumpkin (Cucurbita pepo) L. seed has received a considerable attention in meeting the global nutritional demands and is thought to be a potential reservoir of antioxidants. In the present scenario, stress has become the root cause of many health hazards and thus isolating the nutrients and phytochemicals from natural sources have become the need of the hour. The present study was designed to investigate the nutritional composition of pumpkin seeds using standard methods. Pumpkin seeds were washed, cleaned, powdered and were subjected to oil extraction by solvent extraction method using petroleum ether (40°- 60°C). The proximate compositions of the powdered seeds were obtained. The analysis of mineral content such as Na (170 mg / 100g), Zn (14.14±0.02mg/100g), P (47.68±0.04mg/100g), Fe (3.75±0.02mg/100g), Ca (9.78mg/100g) and Mg (67.41±0.05mg/100g) indicated that Cucurbita pepo seeds are a good alternative source of minerals (Mg, Zn, Ca, P and Fe) that could greatly contribute to human nutritional requirements. The present study revealed an interesting and significant data on the magnesium and zinc content of pumpkin (Cucurbita pepo) L. seeds. A meager amount of consumption of pumpkin seed on a regular basis could contribute largely to magnesium and zinc content which can act as potent antioxidants. Information obtained from this research could help to assess the potential of pumpkin seed to be

commercially exploited for nutraceutical application, and incorporated into food formulations to benefit human health.

KEYWORDS: *Oxidative stress, Antioxidants, Pumpkin seed extract, Nutritional composition*

INTRODUCTION

Oxidative stress, a condition arising due to the imbalance of free radical production and antioxidant defenses has been implicated in the pathogenesis of many human diseases encountered today such as atherosclerosis, cancer, cataract, central nervous system disorders, diabetes, inflammatory bowel diseases, liver damage, motor neuron diseases, pulmonary diseases, parkinson's disease, rheumatoid arthritis and infertility. In today's modern world, the risk of diseases due to oxidative stress is promoted by unhealthy life style, exposure of chemicals, pollution, cigarette smoking, drugs, illness, and stress etc[1].

Antioxidants are the crucial defense against oxidative stress induced damage and are very essential for achieving optimum health and well being. Exogenous consumption of antioxidants from various sources like plants, animals and minerals have proved beneficial to human health and are found to be effective in reducing the incidence of free radical induced diseases. In recent years there has been an increased interest in the therapeutic usage of antioxidants in the treatment of diseases associated with oxidative stress.[1]

Pumpkin (*Cucurbita pepo L.*) is cultivated worldwide and is highly popular since it is a highly economical vegetable crop and is grown in both temperate and tropical regions. Depending upon the species, virtually all parts of the plant can be used for food, including leaves, shoots, roots, flowers, seeds, and immature and mature fruits. Pumpkin fruits vary in their size, colour, shape and weight; they have a moderately hard flesh with a thick edible flesh below and a central cavity containing the seeds. The nutritional value of pumpkin seeds is dependent on the strain, species type as well as climatic conditions where it is grown[2]. Researchers have shown that seeds contain nutritionally important bio-compounds besides other phyto-compounds. Moreover, they are more economical and widely distributed and can therefore be easily cultivated and consumed or sold by the population. Pumpkins have a long shelf life of over 6 months without the addition of any chemical if stored in a cool dry place of temperatures between 13–15ºC. In other words, pumpkins are a good food security crop[3].

Oil from pumpkin seeds has been proven to provide multiple health benefits. It is typically highly unsaturated oil with levels ranging between 60% and 90% with oleic and linoleic acids. Low linoleic acid levels and highly unsaturated fatty acids give the oil a high oxidative stability which in turn promotes storage and industrial purposes and low free radical production in human diets. Apart from these, pumpkin seed oil is found to prevent the growth and size reduction of the prostate, slows down the progression of hypertension and reduces the blood cholesterol level. Also it promotes hyperglycemic activity and helps alleviate diabetes. It is a source of vitamin E which aids in preventing female infertility. Pumpkin seeds, generally considered agro-industrial waste, are an extraordinarily rich source of bioactive compounds with interesting nutraceutical properties[4] and are natural stress relievers.

However there is a dearth of scientific evidence for the nutritional composition and antioxidant properties of pumpkin seeds. Hence the present study was designed to investigate the proximate and mineral composition of pumpkin seeds.

OBJECTIVES

- To evaluate the proximate content of Pumpkin (*Cucurbito pepo*) L. seeds
- To analyse the minerals composition of Pumpkin (*Cucurbito pepo*) L. seeds

MATERIALS & METHODS

i) Sample collection and preparation

The pumpkin fruits were washed and cleaned to remove any dirt and filth and then cut to manually separate the seeds from the flesh. Seeds were weighed and dried in an oven at a temperature of 105ºC for a period of 24 hours and then crushed to fineness to pass through a 2 mm sieve using a blender. Powder was subjected to oil extraction by solvent extraction method using petroleum ether (40ºC-60ºC)[5].

ii) Proximate Analysis

Moisture content was determined by the conventional procedure ICOMR[6]. Ash content was determined by following the method of AOAC[7]. Lipid content of *Cucurbita pepo* seed powder was determined by the method of Bligh and Dyer[8]. Total protein content of seed of *Cucurbita pepo* was determined by micro-kjeldahl method Ranganna[9]. Water-soluble protein content of the *Cucurbirta pepo* seed was determined following the method of Lowry *et al*[10]. Total sugar (colorimetrically) and starch content of *Cucurbita pepo* seed were determined by anthrone method as described in Laboratory Manual in Biochemistry Jayaraman[11].

iii) Determination of minerals:

A clean container (dish or beaker) was placed in an oven at 105°C overnight and was allowed to cool in desiccators and weighed, after which the sample was placed into the container and weighed again. The container was placed in an oven at 105°C for 24 hours, after which it was allowed to cool and weighed was taken. The whole process was repeated until the weight became constant. The dried sample was stored in an airtight container and calculated the moisture content in the sample. The sample was grinded in a plant grinder fitted with a suitable screen[12].

RESULTS & DISCUSSION

Proximate Analysis

The proximate analysis of the present investigation (**Table 1)** indicated that the seed has moisture content of 5.00 % which exhibits its storage advantage. The percentage ash of the sample (5.50) gave an idea on the inorganic content of the samples from where the mineral content could be obtained. Sample with high ash contents is expected to have high concentration of various mineral elements, which are thought to hasten metabolic processes and improve growth and development. The crude lipid content of the seed is found to be within the range of 38.00%. This indicates that pumpkin seeds could be considered as an oil seed. The fibre content of the seeds is found to be 1.0 %. Fibre rich foods are known to enlarge the inside walls of the colon thereby easing the elimination of waste metabolites. Also it lowers blood cholesterol level and reduces the risk of various cancers. The protein content of the seed was 27.48% which indicates that the seed can be considered as a source of protein taking into account the level of protein deficiency in the society. The available carbohydrate content of the seed is found to be 28.03%. Hence the sample could not be considered as a rich source of carbohydrate in comparison with some conventional sources like cereals with 72-90 g/100g carbohydrate**.**

Elemental Analysis

The mineral analysis of the present study **(Table 2)** indicates that Potassium is the most abundant element found in the seed (273mg/100g). High amount of potassium in the body was reported to increase iron utilization and can be beneficial to people taking diuretics in controlling hypertension and excessive excretion of potassium through the body fluid.

The concentration of sodium in the sample is found to be 170 mg / 100g; this element is required by the body in order to regulate blood pressure and blood volume. It also helps in regulating the fluid balance of the body.

The calcium content of the sample was 9.78mg/100g. Calcium helps to ease insomnia and regulates the passage of nutrients through cell walls, without calcium the muscles in the body cannot contract correctly, the blood will not clot and the nerves will not carry message.

The concentration of Magnesium in the sample is 67.41±0.05mg/100g. Magnesium has a significant role in the formation of bone and teeth and is closely associated with calcium and phosphorus. Magnesium is very essential for the release of parathyroid hormone and for its action in the backbone, kidney and intestine and for the reactions involved in converting vitamin D to its active form. Magnesium is also important in tissue respiration, especially in oxidative phosphorylation leading to formation of Adenosine triphosphate (ATP). It is involved in normal muscular contraction; calcium stimulates muscles while magnesium relaxes the muscles.

The concentration of Phosphorus in the sample was found to be 47.68±0.04mg/100g, phosphorus is found bound in the blood and cells, while most of the non-skeletal phosphorus is inorganic in the form of nucleic acids, phospholipids, ATP and sugar phosphate. Phosphates play important roles as buffers that prevent fluctuation in the acidity of body fluids because of their ability to combine with additional hydrogen ion.

This work gave Iron content of 3.75±0.02mg/100g. Iron performs multiple functions in the body; it helps in the formation of blood, it also aids in the transfer of oxygen and carbon dioxide from one tissue to another. Iron deficiency results in anaemia which impairs muscles metabolism, iron deficiency in children result in impaired learning ability and behavioral problems.

Pumpkin seed presented fairly high value for Zinc (14.14±0.02mg/100g). Zinc is known for boosting the health of our hair, it is believed to play a role in the proper functioning of some sense organs such as ability to tastes, sense and smell. Zinc plays a vital role in protein and carbohydrate metabolism and also help in mobilizing vitamin A from its storage site in the liver and facilitates the synthesis of DNA and RNA necessary for cell production.

TABLE 1 PROXIMATE CONTENT OF CUCURBITA PEPO LSEEDS

Component analyze	Concentration
Moisture (%WW)	5.00
Ash (%DW)	5.50
Crude lipid (%DW)	38.00
Crude protein (%DW)	27.48
Crude fibre (%DW)	1.00
Available carbohydrate (%DW)	28.03
Energy value (kcal per 100 g)	564

TABLE 2 MINERAL CONTENT OF CUCURBITA PEPO L SEEDS

Mineral	Concentration
Sodium (Na)	170 mg / 100g
Zinc (Zn)	14.14±0.02mg/100g
Phosphorous (P)	47.68±0.04mg/100g
Iron (Fe)	3.75±0.02mg/100g
Calcium (Ca)	9.78mg/100g
Magnesium (Mg)	67.41±0.05mg/100g

CONCLUSION

A meager amount of consumption of pumpkin seed on a regular basis could contribute largely to nutrition and a better health especially due to its high concentrations of potassium, magnesium and zinc which are potent antioxidants. The richness of diet in antioxidants helps in alleviating stress by regulating the action of various stress hormones in the body. Pumpkin seeds are also found to be rich in lipid and protein content which is very essential for achieving immunity power which in turn helps in fighting with diseases. Information obtained from this research could help to assess the potential of pumpkin seed to be commercially exploited for nutraceutical application, and incorporation into food formulations to benefit human health.

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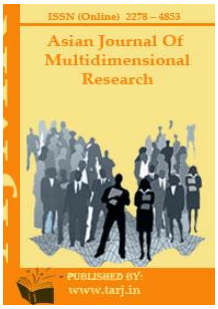

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FORMULATION, QUALITY EVALUATION AND SHELF LIFE STUDY OF SUNFLOWER SEEDS POWDER INCORPORATED THATTA MURUKKU

Gousika. S*; Dr. Angeline Esther Preethi**

* PG Student,
Rathnavel Subramaniam College of Arts and,
Science (Autonomous), Sulur,
Coimbatore, Tamil Nadu, INDIA

**Associate Professor & HOD
Rathnavel Subramaniam College of Arts and Science (Autonomous),
Sulur, Coimbatore, Tamil Nadu, INDIA
Email id: angeline@rvsgroup.com

ABSTRACT

Sunflower is an oilseed crop cultivated worldwide for oil and protein content. Sunflower seeds is one of the best source of vegetables proteins, and known for their nutritional and functional properties. Thattamurukku is one of the traditional South Indian snacks. In the present study sunflower seed powder was incorporated from 10 to 40% instead of rice in the standard Thattamurrukku. The standard and the four sunflower seed incorporated products were subjected to sensory analysis using a score card. The variation that scored the highest in the sensoryanalysis and the standard was subjected to protein and iron content analysis. The two products were kept in polythene covers and stored at room temperature to find out the shelf life. Microbial and sensory analysis was done at regular intervals for a period of 10 days. The cost involved in making the standard and variation was calculated. The selected formulated product was given for selected 30 adolescent girls in an attempt to create awareness about the intake of nutrient dense traditional Indian snack and to find out its acceptance. Variation A with 10% incorporation of sunflower seed obtained the highest score in sensory analysis. The iron content was more than twice as that of the standard and the protein content increased by around 50 %. Both the standard and the selected variation had a shelf life of 10 days. The cost of the formulated product was slightly high than the standard. The product was well accepted by the subjects involved in the popularization study.

KEYWORDS: *Sunflower seeds, Thattamurukku, sunflower seed incorporated products, Microbial and sensory analysis, popularization study.*

INTRODUCTION

Sunflower plant (Helianthus annuus) is a miraculous oil seed crop which is cultivated globally for its seeds. Sunflower seeds, has been found to have a potential role in chronic inflammatory conditions, bacterial and fungal infections, cardiovascular diseases, skin diseases and even cancers. These benefits of sunflower seeds are attributed to the presence of phytosterols, unsaturated fatty acids, proteins, variety of vitamins and minerals (Nandha and Ruchika, 2014).Sunflower seed is considered as a package of healthy unsaturated fats,protein, fibre and other nutrients like Vitamin E, selenium, copper, zinc, folate, iron and phytochemicals (FAO-STAT,2008).Snacks are small portion for a quick meal which can be consumed by all age groups of population to enable them to satisfy hunger between meals(Kanchana et al., 2017). Sunflower seed is now gaining popularity and becoming readily available for use. Sunflower kernels are considered as 'healthy' product. Sunflower kernels have a pleasant flavor and a nutty texture (Hofland 1990). Eating healthy snacks fuels the body with energy, improves the brain power, regulates weight management and boostsup mood (Ashakiran and Deepthi, 2012) A typically South Indian Brahmin savoury is Thattai. The dough prepared from rice flour, black gram, dhal flour, and a little bengal gram dhal, black pepper, chili powder, asafoetida, curry leaves, and butter, is carved into little balls and flattened before frying (Rajesh Rai and Peter Reeves, 2009). So the present study was planned with the objective to incorporate sunflower seed powder at different levels into the traditional snackThattai and to evaluate the quality parameters of the incorporated products and to determine its shelf life.

MATERIALS AND METHODS

Sunflower seeds were collected from the local market. The seeds were soaked in water for 3 to 4 hours. The water was drained and dried at 115 C for 6-8 hrs. The dried seeds were powdered and stored in airtight container. Four variations were prepared by incorporating sunflower seed powder at 10 % (Variation A), 20% (Variation B), 30% (Variation C) and 40% (Variation D) instead of the rice flour and the standard product was also prepared. The standard and the four variations prepared with sunflower seed incorporation were subjected to sensory analysis by a 30member semi trained panel member's using a 5 point hedonic scale. The product that obtained the highest score among the variations was selected for further study along with the standard. The standard and the highest scored product in the variations were analyzed for the protein and iron content to check for the nutrient enhancement. The two selected products were packed in polythene covers and stored at room temperature to determine he shelf life. The products were subjected to microbial analysis on the 1st day, 4th day, and 9thday using streak plate method. The sensory analysis of the stored product was checked on the 1st day, 5th day and 10th day by the same panel members. The cost incurred in making the standard and the variation was calculated. In an attempt to create awareness about the consumption of nutrient dense traditional snack the developed product was popularized among adolescent girls and the acceptability of the product among them was found out.

RESULTS AND DISCUSSION

TABLE I MEAN SENSORY ANALYSIS OF STANDARD AND SUNFLOWER SEED INCORPORATED THATTA MURUKKU

S.NO.	CRITERIA	STANDARD	VARIATION A	VARIATION B	VARIATION C	VARIATION D
1.	Appearance	4.96±0.18	4.43±0.72	4.06±0.90	4.2±0.84	4.06±0.98
2.	Color	4.96±0.18	3.86±1.11	4.00±0.83	4.00±0.83	3.73±1.20
3.	Texture	4.96±0.18	4.06±0.86	3.73±1.08	3.66±1.24	3.83±1.36
4.	Flavor	4.96±0.18	4.23±0.97	4.03±1.06	3.9±1.12	4.06±1.11
5.	Taste	4.96±0.18	4.33±1.02	4.16±0.92	3.96±1.18	3.93±1.13

It is seen from the results of the sensory analysis it seen that Variation A (10% sunflower seed powder) scored the highest among the variations in the all the criteria except color in which variation B obtained the highest mean score. A study conducted by Škrbić and Cvejanov (2011) showed an improvement in the sensory attributes on addition of sunflower seeds in cookies.

TABLE II NUTRIENT ANALYSIS OF THE STANDARD AND SELECTED VARIATION (PER 100G)

S.No	NUTRIENT	STANDARD	SELECTED VARAITION
1	Protein (g)	10.5g	15.9g
2	Iron (mg)	1.5mg	3.59mg

Addition of sunflower seed powder increased protein content from 10.5g to 15.9g. The protein content also showed a significant increase from 1.5 mg in the standard product to 3.59 mg in the selected incorporated product. Many researchers also found anincrease in protein, fibre and micro elements when sunflower seeds are incorporated in their products (Škrbića and Filipčevb 2008; Škrbić and Cvejanov 2011; Srilatha and Krishnakumari 2003).

The microbial analysis of the standard and the selected variation showed that there was no growth of organism in both the samples even at the end of the 9th day analysis.

TABLE III MEAN SENSORY SCORE OF STANDARD AND SELECTED VARIATION DURING STORAGE STUDY

S. No	Criteria	1st day		5th day		10th day	
		Standard	Variation	Standard	Variation	Standard	Variation
1	Appearance	4.96±0.18	4.43±0.72	4.96±0.18	4.06±0.90	4.96±0.18	4.2±0.84
2	Colour	4.96±0.18	3.86±1.10	4.96±0.18	4.00±0.80	4.96±0.18	3.66±01.11
3	Texture	4.96±0.18	4.06±0.86	4.96±0.18	3.73±1.08	4.96±0.18	3.71±1.12
4	Flavour	4.96±0.18	4.23±0.97	4.96±0.18	4.03±1.06	4.96±0.18	3.9±.18
5	Taste	4.96±0.18	4.18±1.08	4.96±0.18	4.16±0.95	4.96±0.18	4.14±0.96

The sensory attributes of the formulated products showed a slight decrease during the storage studyperiod. The cost incurred in preparing 100 g of the product and the sunflower incorporated seed

product was Rs.31 and Rs. 39 respectively. All the 30 samples involved in the populariastion study liked the organoleptic criteria of the sunflower seed incorporated ThattaMurukku.

SUMMARY AND CONCULSION

It is concluded that the Thattamurukku incorporated with 10% of the Sunflower seed powder was highlyaccepted among the different variations. There was a significant increase in the protein and iron content on incorporation of sunflower seeds. The sunflower seed incorporated product had similar shelf life as indicated by the microbial and sensory analysis. The cost of the prepared best product was slightly higher than standard and the product was well accepted by the adolescent girls who participated in the popularization study

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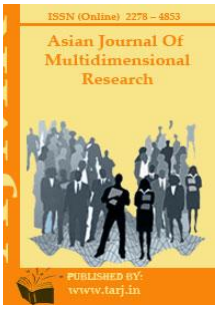

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FOOD CHOICE, FOOD INTAKE AND NUTRITION ADEQUACY AMONG ADOLESCENTS STUDYING IN GOVERNMENT AND PRIVATE PRE-UNIVERSITY COLLEGES

Anupama J B*; Anitha C; Sushma BV *****

*Research Scholar,
Department of Food and Nutrition,
Bharathiar University,
Coimbatore, Tamil Nadu, INDIA
Email id: anupama_suresh2000@yahoo.com

**Assistant Professor,
Department of Studies in Food Science and Nutrition,
Karnataka State Open University,
Muktagangothri, Mysuru, INDIA
Email id: anithaksou@gmail.com.

***Assistant Professor,
Department of Water and Health- Faculty of Life sciences,
Division of Nutrition and Dietetics,
JSS AHER, Mysuru, INDIA

ABSTRACT

Nutrition plays an important role during this stage; nutritional deficiencies can have permanent impact on the cognitive development, resulting in decreased learning ability, poor concentration and impaired academic performance. A pretested food frequency questionnaire checklist was used to record the food choice and frequency of foods consumed daily, weekly, fortnightly, never. Low nutrient intake may result in under-nutrition problems. Research has demonstrated that adolescents' eating patterns are strongly influenced by both the physical and the social environment. Hence data obtained from dietary assessment through 24 – hour recall method done for two working days and two holidays was computed for nutrient intake.Thus the present study was taken with the objective to understand the food choice, food intake and nutrition adequacy among adolescents.

KEYWORDS: *Concentration, Cognitive, Questionnaire, Adulthood, Consumption*

INTRODUCTION

Adolescence is a transitional period between childhood and adulthood, which begins with earliest signs of secondary sexual characteristics and development and ends when a person has achieved adult status[1]. It is considered as a crucial developmental stage associated with a high requirement of nutrients for rapid growth. This stage of life is a period of acceptance for negative health behavior like choice of food, healthy food consumption, skips meals etc.)[2]. Other factors influence the consumption patterns and behaviors are influences of peers, parental modeling, availability of food, food preferences, cost of food, accessibility, personal and cultural beliefs, mass media and body image. Nutrition plays an important role during this stage; nutritional deficiencies can have permanent impact on the cognitive development, resulting in decreased learning ability, poor concentration and impaired academic performance[3]. Studies quote that most the Indian adolescents are found to be anemic out of which 56% of them are girls and 30% are boys resulting in poor resistance to infection, cognitive development and less work productivity[4]. Further researchers noticed that adolescence are not aware of the health effects of junk foods, food quality, nutritive value, chemicals used in food etc, which has ill effects on their health[5]. Documentation by researchers revealed that adolescents received their nutrition knowledge through media –television, which is in sufficient, thus media playing a major role as an information source[6]. Investigating dietary habits and behaviors during the adolescent years offers challenges depending on the multilevel factors that influence the food choice of adolescents[7]. Thus the present study was taken with the objective to understand the food choice, food intake and nutrition adequacy among adolescents.

OBJECTIVE

Adolescents are tomorrow's adults, the quality and quantity of food consumed by adolescents is of concern because their growth and development and future health are linked to their diet. In a 2005, WHO report titled "Issues in Adolescent Health Development" has called for assessing the food consumption and nutrient intake of the adolescence, hence the present study was taken up with the objective:

- To study the food choice and food intake of adolescences from private and government colleges

METHDOLOGY

400 adolescent students (boys-126 and girls-274) from government and private pre-university colleges in Mysuru district were selected randomly for the study. Community based cross sectional study design was adopted. Dietary assessment; one of the techniques used as part of determining nutritional status of an individual. The food habits were assessed by food frequency method and food intake by 24-hour recall method for two working days and two holiday. A pretested food frequency questionnaire checklist was used to record the food choice and frequency of foods consumed daily, weekly, fortnightly, never. Further, 24-hour recall one of the dietary assessment involving structured interview by which the subjects were asked to recall all food and drinks consumed in the previous 24 hours for estimating the food and nutrient intake. The results were subjected to statistical analysis to understand the nutrition security among the adolescences and also to know the nutritional adequacy among the students studying the private and government college.

RESULTS

Dietary diversity of the study subjects was reflected by the food choice and nutrient consumption pattern of energy yielding, body building and protective and regulatory foods. Demographic

condition of children reflects on the quality of health outcomes. Greater proportion of the children belonged to the Hindu religion followed by the Muslims and Christian. Predominantly marked proportion of children were from nuclear families followed by the joint family system

Fig. 1 – Study population from Government Pre-university college with the course

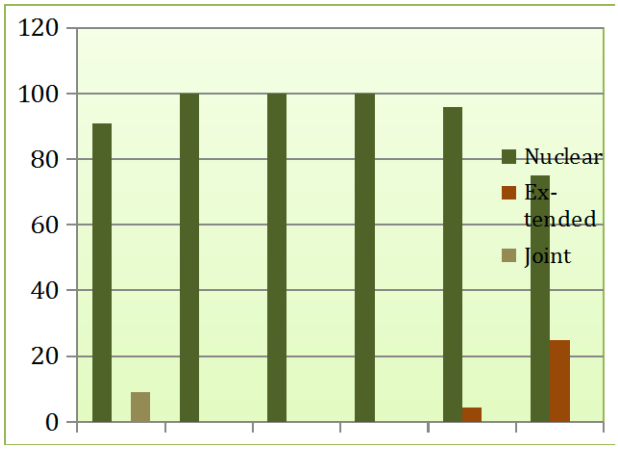

Fig.2-Study population from private pre-university college with the course

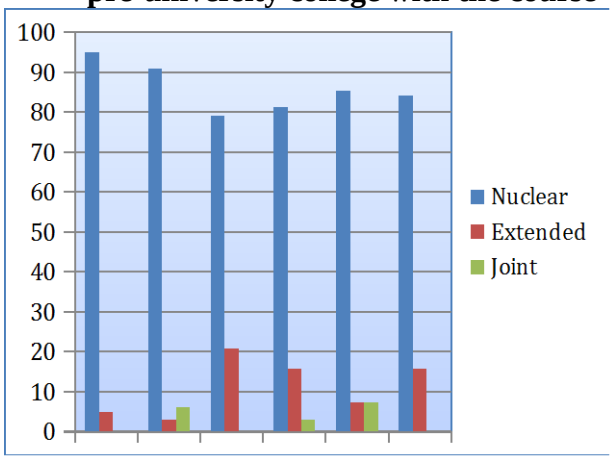

Figure 1 & 2 gives the information about the stream of course taken by the study population in the selected Government Pre -University College. 90 to 100 percent of the students both boys and girls respectively were from science and commerce stream, while less than 80% of the girls were from arts stream. Similarly, in private college majority of students were from science and commerce stream.

TABLE 1- FREQUENCY OF FOOD CONSUMPTION FROM DIFFERENT FOOD GROUPS BY THE GIRLS (%)

Food groups	Private				Government			
	Daily	Alternate days	Once a week	Never	Daily	Alternate days	Once a week	Never
Cereals	100 (rice)	60(wheat)	-	100(ragi)	100(rice)	-	90 (wheat)	59(ragi)
Pulses	61.39	38.61	0.00	0.00	47.06	52.94	0.00	0.00
Roots and Tubers	20.79	64.36	14.85	0.00	11.76	82.35	5.88	0.00
Leafy vegetables	4.95	52.48	42.57	0.00	0.00	70.59	29.41	0.00
Other Vegetables	48.51	47.52	3.96	0.00	23.53	76.47	0.00	0.00
Milk and Products	59.41	25.74	14.85	0.00	58.82	29.41	11.76	0.00
Non Veg	4.95	45.54	16.83	32.67	5.88	29.41	23.53	41.18
Fats and Oils	23.76	29.70	46.53	0.00	0.00	29.41	70.59	0.00
Junk	18.81	41.58	39.60	0.00	11.76	52.94	35.29	0.00

This study has been primarily designed to assess the efficacy of food frequency method in providing insight into the diversity of food consumed by adolescent students from pre-university college of the

study area. The use of food groups as one of the major methods for assessing overall quality of a diet was considered in this study.

Table-1 reveals frequency of food choice and food intake of girls from both private and government colleges. Rice was consumed by 100% subjects from both private and government colleges regularly (i.e. on daily basis). 60% of the students from private college had wheat consumption alternative days, while 90% of the students from government preferred once a week. Ragi a good source of calcium was not a food of choice by the students in both the type of colleges. Pattern of Pulses and legume consumption was similar as daily or alternative days. 64.36% and 82.35 % of both private and government college students respectively wished to have roots and tubers alternative days. 70.59% of the government college students prefer green alternative days, instead of daily, while 52.48% and 42.57 % of students from private college liked to include greens alternative or once a week respectively. Other vegetables were included either alternative days or once a week in both the cases. Similar trend was observed in the consumption of milk and milk products in both private and government college students, however milk as such was not their preference it is mostly though coffee or tea and fairly curds. Private college students expressed use of paneer or cheese through the junk foods. Non vegetarian foods were preferred alternative days (45.54%) or once a week (16.54%) of the students from private college, while 70.59% of students from government college liked it once a week. Majority of the students both from private and Government College had junk food alternative days, around 35% choose to have it once a week, while 11-18% from both the college included it every day. Fruits consumption was occasionally.

TABLE 2- FOOD CHOICE AND FOOD CONSUMPTION PATTERN OF THE BOYS (%)

Food groups	Private				Government			
	Daily	Alternate days	Once a week	Never	Daily	Alternate days	Once a week	Never
Cereals	100(rice)	80 (wheat)	-	-	100(rice)	40 (wheat)	25 (ragi)	-
Pulses	60	40	00	00	63.64	36.36	0.00	00
Roots and Tubers	40	60	00	00	39.39	54.55	6.06	00
Leafy vegetables	00	80	20	00	24.24	36.36	39.39	00
Other Vegetables	60	40	00	00	75.76	21.21	3.03	00
Milk and Products	80	20	00	00	66.67	21.21	12.12	00
Non Veg	00	90	10	00	9.09	45.45	9.09	36.36
Fats and Oils	00	30	70	00	24.24	42.42	33.33	00
Junk	20	60	20	00	12.12	78.79	9.09	00

Table-2 details about the frequency of food choice and food intake of boys from both private and government colleges. Rice was consumed by 100% subjects from both private and government colleges regularly (i.e. on daily basis). 80% and 40% of the students from private college and government college respectively had wheat consumption alternative days, while 20% of the students from government preferred once a week. Boys from government college preferred ragi as good

source of calcium and consumed once a week. Pattern of Pulses and legume consumption was similar as daily or alternative days. 60 % and 54.55% of both private and government college students respectively wished to have roots and tubers alternative days and were not particular in which roots and tubers. 80% of the private college students prefer green alternative days, instead of daily, while 20% include greens once a week. However, all most equal distribution of students was observed preferring greens daily, alternative days and once a week. Other vegetables were included either daily or alternative days. Similar trend was observed in the consumption of milk and milk products in both private and government college students; however milk as such was not their preference it is mostly through coffee or tea and fairly curds. Private college students expressed livingness' for paneer or cheese through the junk foods. Majority (90%) of the boys from private college liked to have non vegetarian foods alternative days, while only 45% of boys from government college liked it alternative days. Majority (60% and 78%) of the students both from private and government college had junk food alternative days, around 20% choose to have it once a week, while 11-20% from both the college included it every day. Fruits consumption was unsatisfactory in the study subjects.

TABLE 3- AVERAGE MEAN NUTRIENT INTAKE OF CHILDREN STUDYING FROM GOVERNMENT AND PRIVATE PRE UNIVERSITY COLLEGE

NUTRIENT	Girls				Boys			
	Government		Private		Government		Private	
	Actual intake	% adequacy	Actual intake	% adequacy	Actual intake	% adequacy	Actual intake	% adequacy
Energy (K cal)	1689±317	69.63	1762±366	71.72	2053 ± 550	67.9	2270.4±174	75.62
Protein (Gms)	37.1±7.9	67.23	39.3±13.7	70.81	42.4±5.2	68.94	47.5±13	77.24
Fat (Gms)	29.3±6.1	82.00	31.9±10.2	91.71	43.8±6.7	86.60	55.9±9.7	110.0
Carbohydrate (Gms)	267.2±60.3	62.41	296.7±54	69.41	360.4± 117.2	68.62	378.6±42.0	71.98
Vitamin C (mg)	45.7±57.7	81.8	49.4±19.4	89.9	47.5±18.1	85.4	52.5±13.0	94.6
Folate (mcg)	119.4±40.5	59.20	140.9±59.5	70.45	137.2± 59	68.60	147.8±14.1	73.92
Iron (mg)	15.67±14	57.6	18.9±15.3	69.92	19.6±2.6	67.29	20.32±1.4	71.71

It was interesting to understand the food intake and nutrient adequacy among the study group. Hence data obtained from dietary assessment through 24 – hour recall method done for two working days and two holidays was computed for nutrient intake. The result was further compared with Recommended Dietary Allowances given for adolescent boys and girls between the age group of 16-18yrs (2016). **Table-3** reports that nutrient consumption was not satisfactory in both girls and boys from different colleges when compared to the RDA. On an average a deficit of 45% in energy intake was observed in girls from both the college. Girls from Government College had a significantly lower intake of protein, fat, folate and iron. This may be due to lower consumption pattern of pulses, vegetables and fruits. Boys from both colleges showed similar consumption pattern, with deficit in

energy and carbohydrates. However, protein intake was up to 77% of RDA. To summarize students from private institution had fairly satisfactory levels of nutrient intake in spite of small deficit when compared to RDA than students from Government College.

CONCLUSION

Adolescents are vulnerable to nutrition-related problems, including malnutrition, micro nutrient malnutrition, obesity and other nutrition-related malnutrition. Low nutrient intake may result in under-nutrition problems. Research has demonstrated that adolescents' eating patterns are strongly influenced by both the physical and the social environment. The study population have varied food choice, however food intake from 24-hour recall method shows that nutrient consumption is not satisfactory, which is below RDA, hence call for concern and need for nutrition and health education and dietary intervention strategies.

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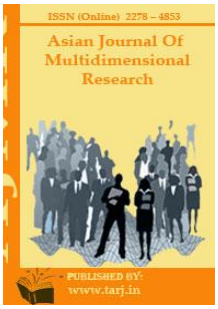

Asian Journal of Multidimensional Research (AJMR)

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FOOD AND NUTRITION SECURITY IN HOUSEHOLDS OF MUSLIM WOMEN IN COIMBATORE CITY

Habeeba.B*; Kalpana.C.A**

*Research Scholar,
Dept. of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: mail4habi@gmail.com

**Associate Professor,
Dept. of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Today the issue of food security has shifted from having enough food to feed everyone to availability, assess and utilization by an individual irrespective of gender, age, ethnicity or socioeconomic status. Food and nutrition insecurity among women has been predominant in India. One such group of women are the Muslim women. The lifestyle of Muslim women is unique and their cultural practices are based on Islamic laws. As the Food and nutrition security is also affected by culture and tradition. Hence the present study aims to find the food and nutrition security status of Muslim women and identify the associated factors. 100 Muslim women between the age of 25 to 45 years were selected from different areas of Coimbatore city by purposive sampling method. The food security was assessed through household income and expenditure pattern, dietary habits, frequency of consumption, food intake and nutrient intake (24 hour recall method) through a well structured interview schedule. The data obtained was statistically analyzed. From the study 51% of the households earned monthly above Rs.20, 000. Expenditure pattern showed 96% to spend <Rs.3000 on food. Frequency of consumption of cereals, pulses and milk was on daily based while vegetables and fruits were consumed on weekly bases. Mean food intake of the women revealed starch, sugars, flesh foods and fats were excess than their requirement, whereas Pulses, green leafy vegetables, roots and tubers, other vegetables, fruits and milk products were deficit. Mean nutrient intake showed excess Energy was +437.81 Kcal, carbohydrates +65.29g and fat +17.79g intake. While all

the other essential nutrients like fibre – 8.43g, calcium -35.53mg and iron – 4.13mg were deficit. Hence we conclude that the Muslim women studied in Coimbatore city were food secure, but nutritionally insecure requiring increased intake in terms of micronutrients and limiting of cereals, animal foods, fats and oils.

KEYWORDS*: Food Security, Muslim Women, Income, Expenditure, Food and Nutrient Intake*

INTRODUCTION

Food security has been an important aspect in the Indian society. After the world food conference in 1972, food and nutritional security focus has shifted from macro scale availability and adequacy to food within a household [1]. Further more research has shown gender gap in intra household food security and women's nutritional status to lag in south Asian countries [2, 3] Food security of a woman has repercussions not only on the women but the entire household. Women take major share in cooking and feeding the family, hence they tend to neglect their own diet and nutritional needs [4]. Further more women undergo physical and biological changes throughout life requiring proper maintenance of health which intern depends on diet and nutrition [5].In 1989 from Nutritional surveys, National Institute of Nutrition and National Nutrition Monitoring Bureau found nutritional status of women in India to be unsatisfactory [6]. Dietary habits are outcomes of complex interrelated social, cultural and economic factors [7]. One such group of women belonging to minority community in India are the Muslim women. The lifestyle of a Muslim woman is unique and their cultural practices are based on four sources of instruction the Holy Quran, the Hadith (life of the prophet), ijma (consensus) and Qiyas (Analogy) [8]. Studies conducted on Indian Muslim women revealed that they were more likely to be overweight or obese with high consumption of calories at one end of the spectrum [9] and studies in certain areas like Cachar district showed prevalence of food insecurity leading to acute malnutrition among Muslim women of reproductive age group [10]. Hence the present study intends to Determine the Food and nutrition Security status of Muslim women in Coimbatore city, Identify the associated factors contributing to the status and Suggest appropriate measures for improvement.

MATERIALS AND METHODS:

The study was conducted in Coimbatore city with the objective to study the Food and nutrition security status of Muslim women belonging to minority community in Coimbatore. The participants of the study were 100 Muslim women of reproductive age group between 25-45 years selected through purposive sampling method from Karumbukadai, Ukadam, Sulur and KK pudur areas with dense Muslim population in Coimbatore city. Subjects were selected based on their willingness to participate in the study. Prior ethical approval was sort. Pregnant and lactating women and women with other health issues were excluded in the study. A well structured interview schedule was designed to elicit general information, income, expenditure pattern, dietary habits and dietary survey. Data was collected through one to one interview. The food security of selected women was assessed through income (capacity to purchase), Expenditure (food), dietary habits, frequency of consumption, food intake and Nutrient intake. Dietary and nutrient intake is an indirect method of assessing nutritional status. Details regarding age, education, marital status, and personal habits were collected. The Dietary survey including questionnaire on frequency of consumption of food and dietary intake by 24 hour recall method for three consecutive days was carried out[13]. Data on the frequency of consumption of food from different food groups was collected with a food frequency

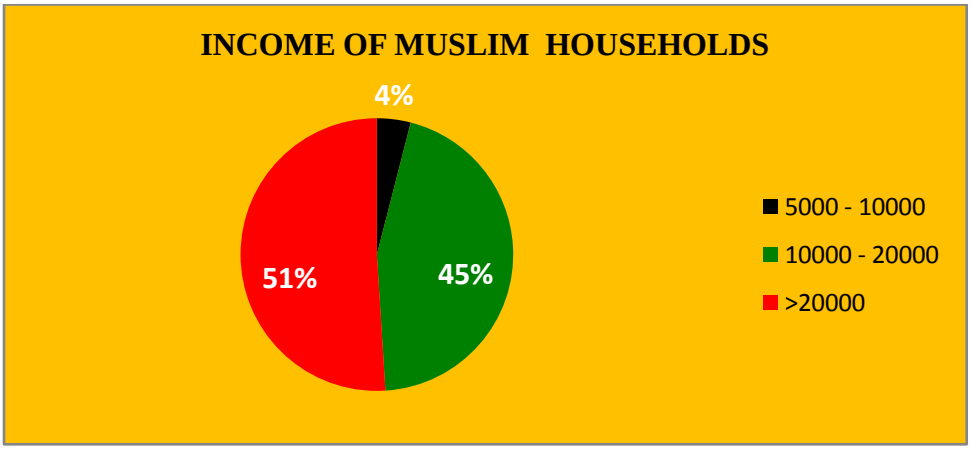
questionnaire. This questionnaire helps to gather information on how often a specific food is eaten. 24 hour recall method was done for 30 selected Muslim women. In the 24 hour recall method standard cups and spoons were used mainly for the respondents to recall. And the micro and macro nutrient intake computed using table of nutritive value for Indian foods. The nutrient adequacy was arrived comparing with recommended dietary allowances for Indians [11]. The data was collected, tabulated, consolidated and statistically analyzed. Mean, standard deviation and percentage were used wherever necessary.

RESULTS AND DISCUSSION:

In poor countries unsatisfactory nutritional status prevails due to insecurity while on other hand in higher income availability of food and drinking promote health and nutrition in the community [12]. Income has an effect on food security of an individual or a household. In the study 47 women were between 25 to 35 years of age and 53 were between 36 to 45 years of age. 80% lived in a nuclear family with 65% of families having 1-4 members. 95% of the women were married.

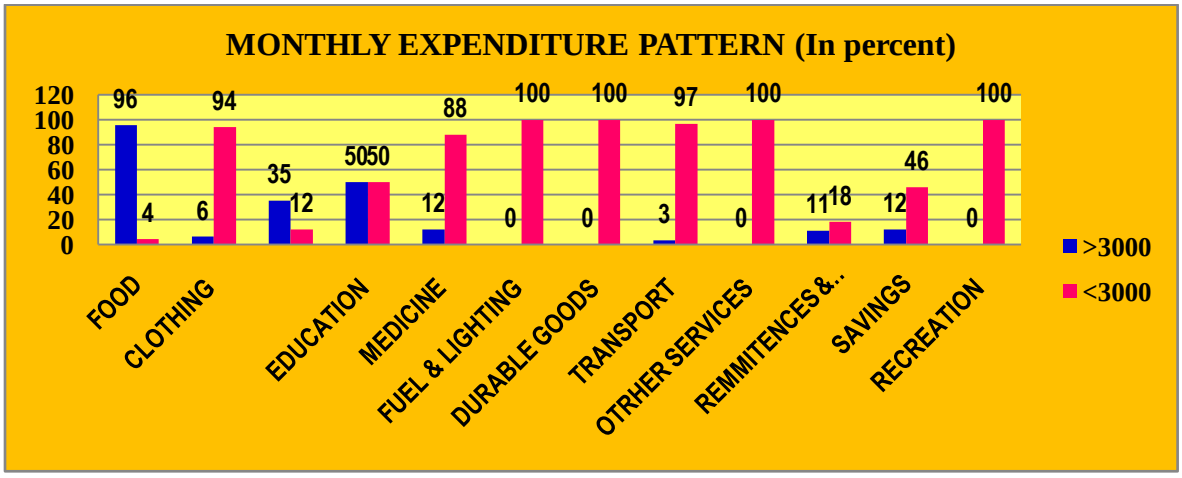
INCOME AND EXPENDITURE:

TABLE I



Among the families studied 51% of the households earned monthly above Rs.20, 000, 45% between Rs. 10000 to 20,000. The remaining 4% had the monthly income within the range of Rs.5000 - 10,000(Table I).

TABLE II



With regards to monthly expenditure pattern 96% of families spend >Rs.3000 on food, while the remaining 4% spent <Rs.3000. Indicating that majority of the families of Muslim women spentp enough on food. Majority of the families spent <Rs. 3000, on clothing medicines, fuel and light, goods, transport, recreation and other services. 35% spent >Rs.3000 on house rent, 50% on education and 11 – 12%medicines, Debt and savings. The decision making patterns showed 67% of the 100 Muslim women studied to make their own decisions in household activities like purchase, preparation and choice of foods (Table II).

DIETARY SURVEY:

Dietary surveys constitute an essential part of any complete study of individuals or groups, providing information on nutrient intake levels, sources of nutrients, food habits, and food preferences[13].Among the 100 Muslim women, 100% of the Muslim Women were non – vegetarian with no vegetarians or ova vegetarians.

TABLE III FOOD CONSUMPTION PATTERN

Food Groups (g/ml)	DAILY		WEEKLY TWICE		WEEKLY ONCE		MONTHLY		NIL		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Cereals	100	100	-	-	-	-	-	-	-	-	100	100
Pulses	80	80	20	20	-	-	-	-	-	-	100	100
Roots and tubers	10	10	45	45	12	12	15	15	18	18	100	100
Green leafy vegetables	5	5	16	16	45	45	6	6	28	28	100	100
Fruits	7	7	36	36	47	47	10	10	-	-	100	100
Animal foods	20	20	57	57	23	23	-	-	-	-	100	100
Milk and mik products	100	100	-	-	-	-	-	-	-	-	100	100

The frequency of conception showed 100% to consume cereals and 80% to consume pulses on daily bases while remaining 20% consumed pulses twice in a week. 45% Roots and tubers and 57% animal food was consumed twice a week, while 45% green leafy vegetables and 47% fruit consumption was on weekly bases. 28% did not consume green leafy vegetables and 18% percentage did not consume roots and tubers. Milk was consumed everyday but more in the form of coffee or tea (Table III).

TABLE IV MEAN FOOD INTAKE OF MUSLIM WOMEN (N = 30)

FOOD STUFFS	ICMR RDA(2010)	ACTUAL INTAKE (g/ml)	DEFICIT or EXCESS(g)
Cereals	**270**	**287**	**+17**
Pulses	**60**	**48**	**-12**
Green leafy vegetables	**100**	**59**	**-41**
Roots and tubers	**200**	**175**	**-25**
Other vegetables	**200**	**169**	**-31**

Fruits	**100**	**58**	**-42**
Milk and milk products	**300**	**276**	**-24**
Animal foods	**60**	**80**	**+20**
Fats and oils	**20**	**38**	**+18**
Sugars	**20**	**32**	**+12**

Table IV depicts the mean food intake of the women which revealed an excess consumption of cereals + 17, + 18 sugars, + 12 fats and oils and +20 animal foods. A deficit in consumption of milk and milk products - 24, roots and tubers -25 was observed. Very low intake of fruits, vegetables and green leafy vegetables -42, -31 and -41 respectively was observed in their diet.

TABLE V MEAN FOOD INTAKE OF MUSLIM WOMEN (N = 30)

NUTRIENTS	ICMR RDA(2010)	ACTUAL INTAKE	EXCESS or DEFICIT
Energy (Kcal)	**1900**	**2337.19**	**+437.81**
CHO (g)	**350**	**415.29**	**+65.29**
Protein (g)	**55**	**68.97**	**+13.97**
Fat (g)	**20**	**42.79**	**+17.79**
Fiber(g)	**30**	**19.57**	**-8.43**
Calcium (mg)	**600**	**564.47**	**-35.53**
Iron (mg)	**21**	**16.87**	**-4.13**

Table V clearly presents the mean nutrient intake in which Energy intake exceeded by +437.81 Kcal above RDA, Intake of carbohydrates (+65.29g), protein (+13.97) and fat (+17.79g) was also higher than RDA . Intake of all the other essential nutrients namely fibre was – 8.43g, calcium - 35.53mg and iron – 4.13mg was deficit among the Muslim women.

CONCLUSION:

Muslim households in Coimbatore city were from moderate income families and they spent enough of food, hence they are food secure. All were non vegetarian and the intake of cereals, animal foods and fats were high among the Muslim women. Findings of the study also revealed that, Muslim women had higher consumption of energy and fat and less intake of calcium, iron and fibre indicating nutrition insecurity alerting for risks of lifestyle associated diseases and deficiencies of micronutrients. The present study recommends improvement in terms of conception of fruits, vegetables and pulses and reducing cereal, oil and fat for health benefit of the Muslim women.

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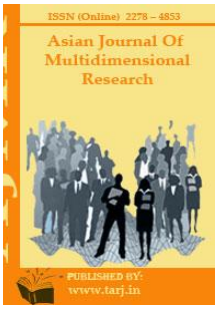

Asian Journal of Multidimensional Research (AJMR)

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ANTIDIABETIC ACTIVITY OF SYNTHESIZED SILVER NANOPARTICLES OF ETHANOLIC EXTRACT OF FRUITS OF TERMINALIA BELLIRICA IN STREPTOZOTOCIN INDUCED DIABETIC RATS

Kaviyarasi.P*; Gayathri Devi.S**

*Research scholar,
Department of Biochemistry,
Biotechnology and Bioinformatics,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

**Professor,
Department of Biochemistry,
Biotechnology and Bioinformatics
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, India
Email id: gayathridevi.adu@gmail.com

ABSTRACT

Medicinal plants have proven to be good source of agents effective in the treatment of diabetes mellitus. The present study focused on the green synthesis of silver nanoparticles (AgNPs) from the ethanolic extracts of fruits of Terminalia bellirica in order to evaluate the antidiabetic activity of the extract. Adult male albino rats, weighing 150 to 200g were used for the study. Invivo antidiabetic activity was assessed in streptozotocin (60mg/kg) induced rats. Control and diabetic rats were treated with AgNPs of ethanolic extract of fruits of Terminalia bellirica for 45 days. On 45 th day, rats were sacrificed and blood samples were stored for the biochemical examination. A significant reduction in blood sugar level was noted in the rats treated with extracts. From the results it can be concluded that the green synthesized silver nanoparticles of ethanolic extracts of fruits of Terminalia bellirica exhibited efficient antidiabetic activity and therefore could be used for the development of potential drug for medicinal applications in the future.

KEYWORDS: *Antidiabetic Activity, Medicinal Plants, Terminalia Bellirica, Silver Nanoparticles*

1.0 INTRODUCTION

Medicinal plant biodiversity is the natural biological capital of the earth. Its conservation and sustainable management area of pivotal importance have been used as natural medicines.Herbal medicinal research has attained an incredible global level in the recent past (Deepa *et al*., 2016) Green synthesis of nanoparticles is an eco-friendly approach which might pave the way for researchers across the globe to explore the potential of different herbs in order to synthesize nanoparticles.*Terminalia bellirica* commonly known as bibhitaki belongs to the family Combretaceae. It is used to protect the liver, reduce high cholesterol, and treat digestive as well as respiratory disorders (Deb *et al*., 2016) Hence, this plant was chosen for the synthesis of silver nanoparticles. Nowadays, nanoparticles are being used in pharmacological studies for their exclusive properties such as small size, more surface area, biocompatibility and enhanced solubility. In view of this, the present investigation aimed to study the antidiabetic activity of the ethanolic extracts of fruits of biosynthesized silver nanoparticles of *Terminalia bellirica* in Streptozotocin - induced rats".

2.0 METHODSAND MATERIALS

COLLECTION OF *Terminalia bellirica*

The fruit of*Terminalia bellirica* was collected from velliyangiri hills, Coimbatore. The fruits were washed thoroughly in tap water, shade dried and pulverized. The powder was weighed, packed in airtight containers and stored at 4ºC until use. 100ml of ethanol was added to 10g of the powdered sample, which was kept in the mild shaker for one day. It was then filtered by Whatmann no.1 filter paper and the filtrate obtained was used for further studies.

SYNTHESIS OF SILVER NANOPARTICLES

Synthesis of silver nanoparticles was carried out by the method explained by Harbone,(1998).Ninety ml of 1mM silver nitrate solution was prepared using deionized water. It was then added to 10ml of ethanolic extract. The mixture of ethanolic extract of fruits of*Terminalia bellirica*with silver nitrate was exposed to sunlight for the duration of 20 minutes.

SEPERATION OF SILVER NANOPARTICLES

The synthesized silver nanoparticles of the ethanolic extract of fruits of *Terminalia bellirica*sample was centrifuged for 20 minutes under refrigerated centrifugation at 13000 rpm and washed 3 times with deionised water. The residue of silver nanoparticles was obtained by freeze drying.

2.1 EXPERIMENTAL DESIGN

Adult male albino Wistar rats (7weeks), weighing 150 to 200 g were used for the present antidiabetic study. The animals were housed in clean polypropylene cages and maintained in a well-ventilated temperature controlled animal house with a constant 12 h light/dark schedule. The animals were fed with standard rat pelleted diet and clean drinking water was made available. All animal experiments were carried out in accordance with the guidelines of Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA). Approval to conduct the animal experiments Proposal number (IAEC/17-18/08) and Approval number (AIW: IAEC.2017: BC: 02) was obtained from the Institutional Animal Ethics Committee.

Rats were divided into five groups of six animals each and were treated on as follows:

Group 1: Control (normal saline)

Group 2: Control+ rats treated with silver nanoparticles of fruits of*T. bellirica* (10mg/kg b.w)

Group 3: STZ - induced rats

Group 4: STZ+ silver nanoparticles of fruits of *T.bellirica* (10mg/kg b.w)

Group 5: STZ+rats treated with Glibenclamide (600µg/kg b.w)

2.2INDUCTION OF DIABETES MELLITUS

The experimental rats were made diabetic by a single intraperitoneal injection of Streptozotocin (60mg/kg) in sterile saline. Three days after streptozotocin injection, rats with blood glucose level>180mg/dl were separated and used for study. Hyperglycemia was confirmed by the elevated levels of blood glucose were determined at 72 h. The animals with blood glucose concentration more than 250mg/dl will be used for the study.

Glucose level in serum was estimated by glucose oxidase/peroxidase method using a commercial kit.10µl of serum was added to 1.0ml of working enzyme reagent, mixed well and incubated at 37°C for 15 minutes. The colour developed was read at 505nm against blank containing distilled water instead of the sample. A standard was also processed similarly. The level of glucose is expressed as mg/dl (Hjelm and Verdier, 1963)

2.2 RESULTS AND DISSCUSSION

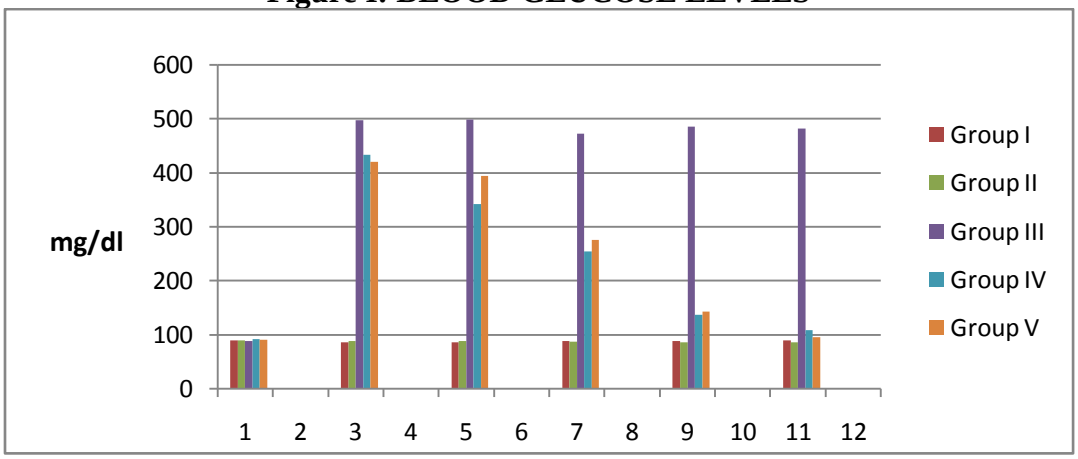
Blood glucose level of the control and diabetic rats were estimated and the results are given in Table I and Figure I.

Table I: BLOOD GLUCOSE LEVELS OF DIABETIC RATS

GROUP	Group I	Group II	Group III	Group IV	Group V
Initial level	89.17±4.549	89.17±3.005	88.33±3.801	90.83±3.005	89.67±3.432
10^{th} day	85.83±2.007	88.2±45.24	496.7±42.4	433.3±48.9	420±57.5
20^{th} day	85.83±2.007	87.7±45.58	498±50.48	341.7±59.35	393.3±58.12
30^{th} day	88.33±3.073	86.3±65.46	472±55.3	253.3±86.82	275±29.41
40^{th} day	88.33±3.073	85.1±50.76	485±60.12	136.7±77.87	141.7±19.56
45^{th} day	89.17±3.27	85.1±19.94	482±64.69	107.5±34.64	95±19.79

Values are expressed as the mean ± S.D. Statistical significance (p) calculated by one way ANOVA followed by dunnett's. ns- not significant $^{**}P< 0.05$ calculated by comparing treated group with control group.

Figure I: BLOOD GLUCOSE LEVELS



Administration of biosynthesized of silver nanoparticles of the ethanolic extracts of fruits of *Terminalia bellirica* was found to be reducing the blood glucose level in the control and the diabetic rats. Maximum reduction in blood glucose was noted on the 20th day.Oral administration of the extracts significantly reduced the blood glucose level in diabetic rats treated with the synthesized silver nanoparticles of the ethanolic extracts of fruits of *Terminalia bellirica*.Control rats treated with the synthesized silver nanoparticles of the ethanolic extracts of fruits of *Terminalia bellirica* did not exhibit any significant change in the blood glucose level. Also the levels were within the normal range.In the diabetic controls,the blood glucose level increased by 20th day after administration of streptozotocin.But administration of the synthesized silver nanoparticles of ethanolic extract of fruits of *Terminalia bellirica* to diabetic rats showed significant ($p<0.05$) reduction from the 20th day onwards. The synthesized silver nanoparticles using the ethanolic extract of fruits of *Terminalia bellirica* caused a significant ($p<0.05$) reduction of the blood glucose level from the 20th day onwards and produced 70 percent reduction in the blood glucose level on the 45 th day.The result indicate that the synthesized silver nanoparticles of the ethanolic extract of fruits of *Terminalia bellirica*was found to reduce the blood glucose level in the streptozotocin induced diabetic rats.The synthesized silver nanoparticles of ethanolic extract of fruits of *Terminalia bellirica* was found to be more effective.This effect was represented in the current study through the elevation of blood glucose and decrease of blood glucose levels in diabetic control rats. The glucose lowering effect of synthesized silver nanoparticles of ethanolic extract of fruits of *Terminalia bellirica* was found to be effective than that of standard drug.

Similar findings were reported by Prabhu *et al*.(2018) that the blood glucose level were found to be significantly decreased in diabetic rats after the administration of *Pouteria sapota* in streptozotocin induced diabetic rats.Anusooriya *et al*. (2014) have reported a significant decrease in the blood glucose level to the diabetic rat after the administration of fruit extract of *Passiflora ligularis*.

CONCLUSION

Hence the outcome of the present study, the antidiabetic activities of the biosynthesized silver nanoparticles of ethanolic extracts of fruits of *Terminalia bellirica*reiterate the fact that the biosynthesized silver nanoparticles of ethanolic extracts of fruits of *Terminalia bellirica* possess strong antidiabetic activity. It can be suggested that the biosynthesized silver nanoparticles of ethanolic extracts of fruits of *Terminalia bellirica* could be used as a novel candidate in herbal preparations to combat the short comings of the available antidiabetic drug.

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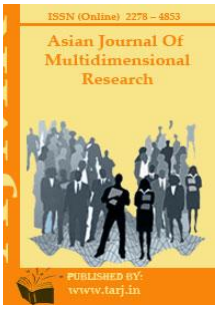

Asian Journal of Multidimensional Research (AJMR)

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DEVELOPMENT OF RTE USING COCONUT FOR NUTRITION SECURITY

Haritha, T*; Thilakavathy, S.**

*PG Scholar,
Department of Food Science and Nutrition,
Avinashilingam Institute for Home science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

**Assistant Professor (SS),
Department of Food Science and Nutrition,
Avinashilingam Institute for Home science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: thilaka.ravichandran@gmail.com

ABSTRACT

Coconut is most widely cultivated tree in the world. Coconut belongs to the family of are caceae. Coconut is highly nutritious because it is rich in fibre, vitamins and minerals. Beyond its nutritional content it provides health benefits. The objective of this study was to develop Ready To Eat mix powders and to evaluate organoleptically followed by shelf life study. . Formulation of RTE coconut mixes namely coconut and onion RTEP, urad dal coconut RTEP, Avalose coconut RTEP, coriander leaves coconut RTEP and egg coconut RTEP was prepared. The developed recipes were subjected to organoleptic evaluation by 30 semi-trained panel members. Shelf life study of RTEP showed that the avalose coconut RTEP had the maximum shelf life of 60 days when compared to other Ready To Eat mixes. Coriander leaves coconut RTEP showed low level of contamination with good keeping quality for 55 days. Egg coconut RTEP got the minimal shelf life because of the highest moisture content.

KEYWORD: *Coconut, Ready to Eat Mix, Shelf Life*

INTRODUCTION

Coconut is a smallholder crop, and millions of rural people depend on it for survival. Its development particularly in postharvest activities could be the base for rural development in the coconut-producing countries. Copra, coconut oil, desiccated coconut (DC), coconut cream, coconut milk, virgin coconut oil, spray-dried coconut milk powder, coconut chips, cream, , coconut jam and young tender coconut are the convenience coconut products.[1]

Coconut is an indispensible ingredient in many of the traditional cuisines of Southeast Asian countries including India[2]. Coconut enters into the diet of the people in many ways; in the form of tender nuts used for their water, mature nuts for cooking and the preparation of sweetmeats, and oil for home consumption[3].

There is a growing demand for the ready-to-eat food category. Changes in lifestyle was considered as major factor in going for packed food purchase as well as demand for convenience and hygienic food products busy life-style and equal participation of women in workforce[4]. The food processing industry is one of the largest industries in India and it is ranked fifth in terms of Production, Consumption, Export and Expected growth. Demand for Ready-to-Eat meals has captured a large amount of the food retail market in India. Thus, the emerging change in consumer's perception, socio-economic-political factors has led to change in consumers purchase intention toward Ready-To-Eat Food Products[5].

Ready-to-eat (RTE) products are food products that are not further treated before consumption in such a way that may significantly reduce the microbial load. There is a wide variety of RTE products ranging from simple salads to complex ethnic dishes[6]. Ready-to-Eat (RTE) foods are described as the foods being ready for immediate consumption at the point of sale[7]. It could be raw, partially or fully cooked, and hot, chilled or frozen. RTE food can be of animal and plant origin including fruits, vegetables and bakery products[8].

In the present study coconut is selected for the development of Ready To Eat mix powders and are evaluated organoleptically. The shelf life study of Ready To Eat mix powders was also carried out. With this background the objectives of the present study entitled **'Development and evaluation of coconut based Ready to Eat mix'** was to

- Development of ready to eat mix powders
- Evaluate the acceptability of the ready to eat mix organoleptically
- Determination of shelf life

Materials and methods

Selection of different varieties of coconut

The coconut for the study was collected from kerala Agricultural University, kasargod in kerala.

Development of ready to eat mix powder (RTEP)

Six ready to eat mix powders (RTEP) were prepared by using coconut namely coconut and onion RTEP, urad dal coconut RTEP, Avalose coconut RTEP, coriander leaves coconut RTEP and egg coconut RTEP. The recipe and the method followed for preparation of the RTEP is as follows:

Coconut and onion Ready To Eat chutney powder

Ingredients

Grated coconut - 100 g

Small onion -50 g

Black pepper corns – 15 g

Ginger, 3 inch piece – 1 no chopped

Garlic – 3 cloves chopped

Curry leaves – 5 spring

Red chilli powder – 15 g

Coriander powder – 10 g

Tamarind – a small lemon sized ball

Salt to taste

Method

Heat a wide pan and add grated coconut and roast until the texture turns dark golden brown in colour by mixing continuously in a medium flame .Add shallots, pepper corns, ginger, garlic and curry leaves roast till the moisture evaporate.

Once it reaches the dark golden brown colour, add red chilli powder, coriander powder and tamarind pieces, salt and stir continuously for about 2-3 minutes in a medium flame. Put all the roasted ingredients together and roast again till dark golden brown. Remove from heat and allow it to cool completely grind into a coarse powder.

Urad dal coconut Ready to Eat powder

Ingredients

Grated coconut - 100 g

Urad dal - 50 g

Dry red chilli - 5 no, halved and deseeded

Asafoetida - 5 g

Oil - 10 ml

Salt to taste

Method

In a kadai add the oil and heat. Once hot, saute all the ingredients separately till the colour changes and good aroma comes allow all the ingredients to cool down.

Grind the urad dal, red chilly, asafoetida, just coarsely powder then finally add the coconut, salt and grind it. Allow to cool completely. Urad dal coconut RTEP is normally eaten with rice and *ghee*.

Mixed vegetable coconut Ready To Eat powder

Ingredients

Coconut -100 g
Grated Beetroot - 25 g
Grated Carrot - 25 g
Red chilli powder - 15 g
Curry leaves - 2 springs
Salt to taste

Method

Peel of the skin of beetroot and carrot and grate them. Sun dried the grated beetroot and carrot for a day till it is free of moisture. After sun drying, roast the carrot and beetroot in a pan till it is roasted and dry. In another pan add grated coconut and roast until the coconut turns dark brown colour. To this add salt, red chilli powder and curry leaves and roast. To this mixture roasted and dried vegetables were added. Grind it and cool.

Mixed vegetable RTEP can be used as side dish for idli and dosa. It is very tasty and healthy accompaniment with an attractive colour. This is a healthy and nutritious side dish for idli or dosa.

Avalose coconut Ready To Eat powder

Ingredients

Grated coconut - 100 g
Raw rice - 50 g
Cardamom - 4 nos
Dried ginger - 1 medium piece
Cumin seeds - 10 g
Sugar - 25 g
Salt - 5 g

Method

Soak rice in water for 4-6 hours and drain the water completely and once dried, grind it into a fine powder. In a bowl, mix together the rice flour, grated coconut, cardamom, dried ginger, cumin seeds and salt. Place a heavy bottomed pan on medium heat. Add in the prepared rice mixture and stir continuously till it turns medium golden in colour on low-medium heat.Remove from heat; keep stirring for some more time to avoid burning to the bottom of the pan. Let it cool completely. Once cooled, add in the sugar and grind it to a coarse powder.

Avalose coconut RTEP is a healthy snack for breakfast and dinner. Avalose podi is a powdered recipe which can be served with sugar or ripe bananas. Apart from other teatime recipes, avalos podi can be stored for long periods in an airtight container. Back when the bakery recipes were not popular, avalose podi was commonly used as an evening snack in Kerala.

Coriander leaves coconut ready to eat powder

Ingredients

Grated Coconut - 100 g

Coriander leaves - 15 springs

Ginger - 1 medium piece

Asafoetida - 5 g

Cumin - 5 g

Chilli powder - 15 g

Salt to taste

Method

Clean the coriander leaves,use only the tender stems Wash the coriander Then spread the leaves and stems on a clean kitchen towel and dry in shade until all the moisture from the leaves is removed. In a pan add grated coconut, and roast until the coconut turns dark brown in colour.Then add dried coriander leaves, ginger, asafoetida, cumin, salt and chilli powder. Once cooled grind it.

Coriander leaves coconut RTEP is the best accompaniment for south Indian dishes like dosa, vada, uttapam.

Egg coconut Ready to Eat powder

Ingredients

Coconut - 100 g

Egg - 3

Ginger - 1 medium piece

Coriander leaves - 4-5 springs

Curry leaves - 5 springs

Red chilli powder - 15 g

Vinegar - 3 ml

Salt to taste

Method

In a pan added grated coconut and roast until the colour turns dark golden brown by mixing continuously in a medium flame.In another pan roast ginger, coriander leaves, curry leaves, red chilli powder. The roasted ingredients are added to the pan containing grated coconut. To this mixture added 2 tablespoon of vinegar and salt to taste.In another pan break the egg and saute the egg till it gets cooked and then add the egg to the above mixture. Remove from heat. Grind into coarse powder.

Shelf life study of Ready To Eat mix powder

The ready to eat mix powder was stored in a container and their shelf life was determined.

Statistical analysis and interpretation of data

The data obtained for sensory attributes of the developed recipes was analyzed statistically and interpreted.

Results and discussion

Table I and figure I presents the mean acceptability scores of Ready to Eat Mix powders

TABLE – I MEAN ACCEPTABILITY SCORE OF READY TO EAT MIX

Organoleptic charecteristics	**I**	**II**	**III**	**IV**	**V**	**VI**
Appearance (Mean±SD)	8.36±0.49	8.00	8.96±0.18	8.60±0.49	8.73±0.44	6.66±0.47
Colour (Mean±SD)	8.53±0.50	8.50±0.50	8.66±0.47	8.26±0.44	8.63±0.49	7.73±0.44
Flavour (Mean±SD)	8.00±0.74	8.56±0.50	7.36±0.49	7.40±0.49	8.00	6.70±0.46
Texture (Mean±SD)	8.36±0.49	8.63±0.49	7.93±0.82	8.56±0.50	8.16±0.46	8.40±0.49
Taste (Mean±SD)	8.86±0.34	8.63±0.49	7.50±0.50	8.70±0.46	7.43±0.50	6.66±0.47
Overall acceptability (Mean±SD)	9.00	8.53±0.50	7.73±0.44	9.00	8.00	7.26±0.44

I-Coconut and onion RTEP, II. Urad dal coconut RTEP, III- Mixed vegetable coconut RTEP, IV- Avalose coconut RTEP, V- Coriander leaves coconut RTEP, VI- Egg coconut RTEP

With regard to the acceptability scores of the different coconut incorporated powders, the appearance of the mixed vegetable coconut RTEP had the maximum score of 8.96±0.18. The appearance of the Egg coconut RTEP had the minimum score of 6.66±0.47. While the mean score obtained for appearance was 8.36±0.49, 8.00, 8.60±0.49, 8.73±0.44 for other powders I, II, IV and V respectively.

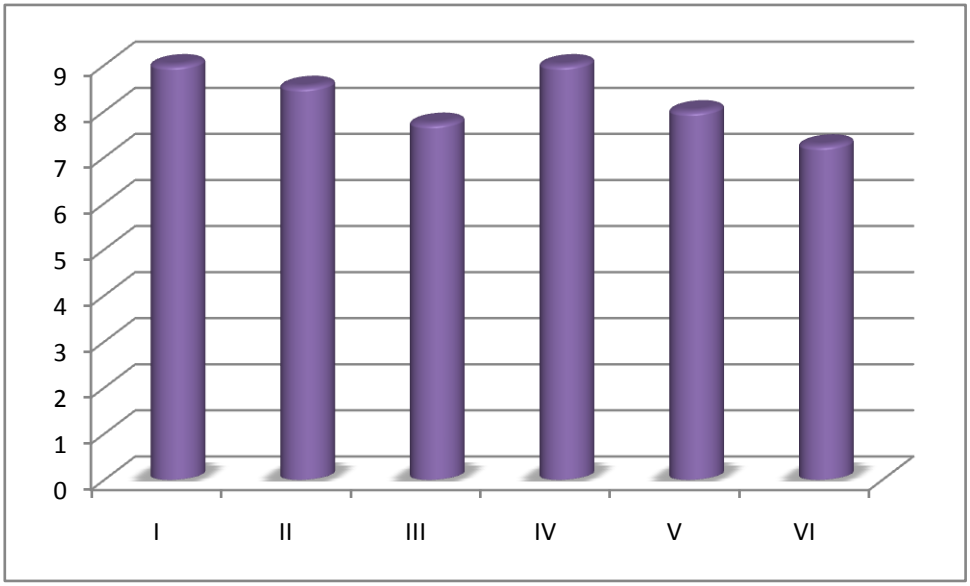
When colour of the RTEP was evaluated, colour of the mixed vegetable coconut RTEP scored the maximum scores of 8.66±0.47 and the minimum scores of 7.73±0.44 was obtained in egg coconut RTEP. The mean scores of other powders I, II, IV, V was 8.53±0.50,8.50±0.50, 8.26±0.44, 8.63±0.49 respectively.

When flavour of the powder was evaluated, urad dal coconut RTEP was highly acceptable with a score of 8.56±0.50. The flavour of I, III, IV, V and VI was 8.00±0.74, 7.36±0.49, 7.40±0.49, 8.00, 6.70±0.46 respectively.

With regard to the texture of I, II, III, IV, V, VI powders it was was 8.36±0.49, 8.63±0.49, 7.93±0.82, 8.56±0.50, 8.16±0.46 and 8.40±0.49 respectively. The maximum score was obtained for urad dal coconut RTEP and the minimum scores were obtained for mixed vegetable coconut RTEP.

The taste of coconut and onion RTEP had the maximum score of 8.86±0.34. The avalose coconut RTEP was also acceptable with a score of 8.70±0.46. The taste of II, III, V and VI was 8.63±0.49, 7.50±0.50, 7.43±0.50 and 6.66±0.47 respectively.

The coconut and onion RTEP and avalose coconut RTEP scored the maximum score of 9.00 for overall acceptability. While the other powders namely II, III, V and VI had the mean scores of 8.53±0.50, 7.73±0.44, 8.00 and 7.26±0.44 respectively.



Overall acceptability of ready to eat mix

Table II presents Shelf life study of ready to eat mix

TABLE – II SHELF LIFE ANALYSIS OF READY TO EAT MIX

RTEP	Initial Date	Final Date	Shelf Life
Coconut and onion RTEP	10.02.2018	12.03.2018	30 days
Urad dal coconut RTEP	10.02. 2018	22.02.2018	40 days
Mixed vegetable coconut RTEP	10.02. 2018	2.03.2018	20 days
Avalose coconut RTEP	10.02.2018	11.04.2015	60 days
Coriander leaves coconut RTEP	10.02. 2018	6.04.2016	55 days
Egg coconut RTEP	10.02. 2018	25.02.2018	15 days

Microbial study was carried out for six Ready To Eat mix Powders namely Coconut and onion RTEP, Urad dal coconut RTEP, Mixed vegetable coconut RTEP, Avalose coconut RTEP, Coriander leaves coconut RTEP and Egg coconut RTEP. Shelf life study was carried out for a period of 60 days at room temperature. The avalose coconut RTEP had the maximum shelf life of 60 days when compared to other Ready To Eat mix. Egg coconut RTEP and mixed vegetable coconut RTEP had less shelf life of 15 and 20 days respectively. Coriander leaves coconut RTEP had shelf life of 55 days. Coconut and onion RTEP and urad dal coconut RTEP had 30 and 40 days of shelf life respectively. From the analysis avalose coconut RTEP had good shelf life than the other Ready To Eat Mix. And it was found that coriander leaves coconut RTEP showed low level of contamination with good keeping quality for 55 days. Egg coconut RTEP got the minimal shelf life because of the highest moisture content.

CONCLUSION

RTEP contain no added preservatives, artificial flavours or colours. The product is in powder form and can be easily carried while travelling. It is oil-free and suitable for people suffering from

diabetes. It is very convenient for elderly people who find it difficult to grind ingredients, or for working professionals who do not have the time to prepare everything from scratch.

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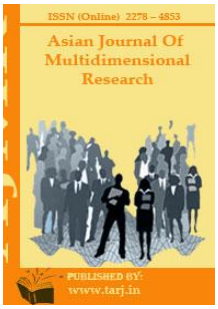

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PHYTOCHEMICAL AND ANTIMICROBIAL ACTIVITY OF EDIBLE MICROGREENS (FENUGREEK AND CORIANDER MICROGREENS)

Logapriya D*; Sylvia Subapriya.M**

*Assistant Professor,
Department of Nutrition and Dietetics,
SSM College of Arts and Science,
Namakal, Tamil Nadu, INDIA

**Professor,
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: sylviadevaprasad@yahoo.co.in

ABSTRACT

Microgreens are a class of edible vegetable, herbs and spices harvested when first leaves have fully expanded and before true leaves emerge. They range in size from one to three inches long including the young stem and leaves. Fenugreek and coriander microgreens were assessed because these spices contain more vitamins and minerals than their matured counterparts, commonly used in cooking in day to day life and also easy to grow. The fresh microgreens were extracted by using two solvents that are, aqueous extract and methanol extract to assess the phytonutrients. The phytochemical analysis was carried out in four extracts. In both microgreens, aqueous extract shows more phytonutrients than methanol extract. The aqueous extracts of Fenugreek and Coriander microgreens contain alkaloids, terpenoids, phenols, saponins, quinine, protein, steroids and tannins. Since the extracts contain bioactive compounds, the antimicrobial activity (antibacterial and antifungal) was assessed in the aqueous extracts of Fenugreek and coriander microgreens. Both microgreen extracts showed the best zone of inhibition against three different bacteria namely, E. coli, S. aureus, P. aeruginosa. They showed less zone of inhibition against fungi such as (A. Niger and T. viride). The zone of inhibition of fenugreek and coriander extracts were, for E. coli -11mm, 10mm; S. aureus- 5mm, 5mm; P. aeruginosa-7mm, 8mm; A.niger -1mm, 2mm and T. viride -2mm, 3mm. Thus fenugreek and coriander microgreens have significant bioactive compounds and antimicrobial activity.

KEYWORDS: *Microgreens, Fenugreek, Coriander, cotyledonary stage, Bio - active compounds, Phytonutrients, phytochemical, Anti – microbial.*

INTRODUCTION

Nowadays 'functional foods' (food enriched with health promoting additives) have gained popularity due to known health promoting or disease preventing properties that can be added to enhance the nutritional quality of regular vegetables. Microgreens are very specific types of vegetables and herbs that are harvested with two fully developed cotyledon leaves with or without the emergence of a rudimentary first pair of true leaves. Due to higher levels of phytochemical compounds found in these early shoots, these plants are considered to belong to a group known as "functional foods".

Microgreens are called as "vegetable confetti," are young, tender greens that are used to enhance the color, texture, or flavor of salads, or to garnish a wide variety of main dishes (Treadwell *et al.*, 2010). They are emerging specialty food products which are gaining popularity and increased attention (Mir *et al.,* 2017). They are quite tender and soft in nature. So they need to grow only in protected structure like green house, net house and shed net. For the growing microgreen wide range of growing media can be used like coir, wood fibre, bark, paper fibre, peat moss, perlite, rock wool, coco-peat, vermiculite, vermicomposting, sphagnum peat, etc. In tropical climate the crop are be ready to harvest at 7-14 days after germination, while it takes long time to harvest the crop *i.e.* 14-28 days in winter temperate season (Kumar *et al.,* 2016).

Phytochemical compounds are found in plants that are not required for normal functioning of the body, but it has a beneficial effect on health and plays an active role in amelioration of diseases. This is due to increased awareness of the limited ability of synthetic pharmaceutical products to control major diseases and the need to discover new molecular structures from the plant kingdom (Thangavel *et al.,* 2015).

Plant derived phytochemical preparations with dual functionalities in preventing lipid oxidation and microbial spoilage have tremendous potential for extending shelf-life of food products with minimal use of synthetic preservative agents (Wong, 2005). Antimicrobial compounds with plant sources have numerous therapeutic potentials; not only are they effective in the treatment of infectious diseases, but also reduce a large number of side-effects that are often associated with antimicrobial Historically, plants have provided sources of antimicrobial compounds to fight infection (Zardini *et al*., 2012).

MATERIALS AND METHODS

Selection of Microgreens

Fenugreek and Coriander microgreens were selected for the present study.

Cultivation of Microgreens

Fenugreek and Coriander seeds were soaked and germinated (only fenugreek), and the seeds were sowed in a plastic container in a suitable environment. The microgreens were harvested when it reach the cotyledonary stage.

Plant extraction

Microgreens were extracted with two solvents (Distilled water and Methanol). Fenugreek and Coriander microgreens were ground in mortar and pestle separately, and added solvents, transfer into

conical flask, and then they were kept in shaking incubator for 24 hours, at 37.5˚C in 50rpm, after filtered using Whatman no.1 filter paper.

Phytochemical Analysis

Test for Alkaloids (Mayer's test): 1ml of the extract was taken in a test tube. A drop of iodine solution was added to the extract, and 1ml of Mayer's reagent was added. The appearance of yellow color indicates the presence of alkaloids (Karna, 2013).

Test for Terpenoids (Salkowski test): 2ml of the extract was taken in a test tube. Equal amount of chloroform was added into the extract. Followed by concentration sulfuric acid (conc.H_2SO_4) was added, and heat it for 5-10mins in water bath. The appearance of gray color indicates the presence of terpenoids (Chitra *et al.,* 2014).

Test for Phenol: 1ml of the extract was taken in a test tube; 2ml of 2% ferric chloride was added. The appearance of blue green or black color indicates the presence of phenol (Soundararajan *et al.*, 2017).

Test for Saponins (Frothing Test): 2ml of the extract was taken in a test tube, and 2-3ml of distilled water was added into the extract. Give continues vigorous shaking. Observe 1cm length of foam indicates the presence of saponins (Karna, 2013).

Test for Flavonoids (Shinoda's test): 2ml of the extract was taken in a test tube. To that added a piece of magnesium ribbon, and con.HCL was added drop by drop. The appearance of pink scarlet color indicates the presence of flavonoid (Rajan and Dharman, 2014).

Test for Quinine: 2ml the extract was taken in the test tube, and 1ml of 2% NAOH was added. The appearance of blue green color indicates the presence of quinine (Soundararajan *et al.*, 2017).

Test for Protein: 1ml of the extract was taken in the test tube, and conc.HNO_3 was added drop by drop. The appearance of yellow color indicates the presence of protein (Soundararajan *et al.*, 2017).

Test for Steroids: 2ml of the extract was taken in the test tube. To that added equal amount of chloroform. Followed by conc.H_2SO_4 was added in the sides of the test tube. The red color ring between chloroform and H_2SO_4 indicates the presence of sterol (Shrivastava, 2017).

Test for Tannin: 1ml of the extract was taken in a test tube, and 2ml of 2% gelatin solution was added mix it well. Formation of curdy white precipitate indicates the presence of tannin (Soundararajan *et al.*, 2017).

Antimicrobial study

The test organisms used in the study (bacterial and fungal strains) were clinical isolates obtained from the CBNR Laboratory, Coimbatore. The clinical isolates were *Escherichia coli, Staphylococcus aureus and Pseudomonas aeruginosa, Aspergillus niger and Tricoderma viride.* Both the antibacterial (Nutrient agar medium) and antimicrobial (malt agar medium) activity was done by well diffusion method. In all the culture medium 50µl of the sample was added, and the plates were kept in 24hours at 37˚C for antibacterial activity, and for the antifungal activity they kept 3-5 days in room temperature.

RESULTS AND DISCUSSION

Phytochemical Analysis

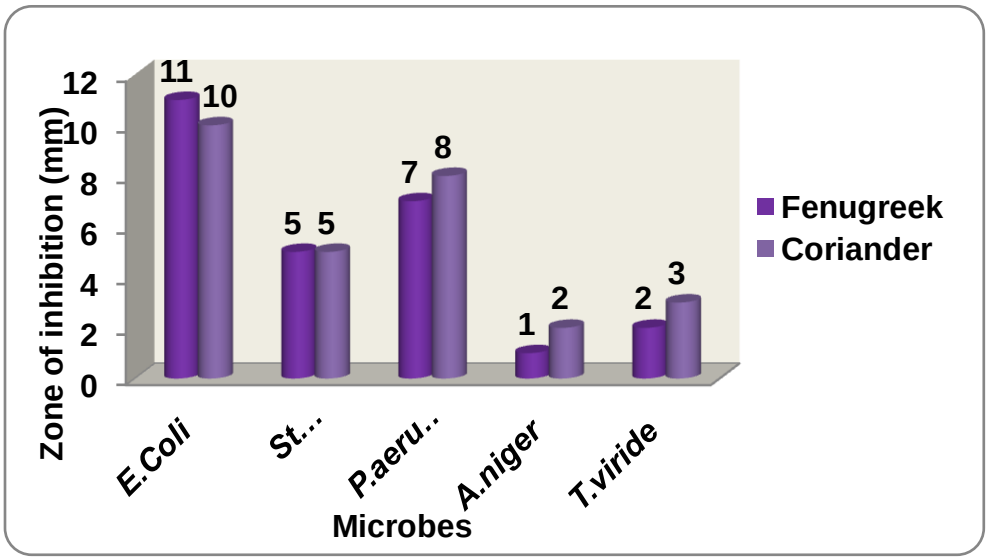
Phytochemical Compounds	Observations			
	Fenugreek Microgreens		Coriander Microgreens	
	Aqueous Extract	Methanol Extract	Aqueous Extract	Methanol Extract
Alkaloids	+	+	+	+
Terpenoids	+	+	-	+
Phenols	+	-	+	+
Saponins	+	-	+	+
Flavonoids	-	-	-	-
Quinine	+	+	+	+
Protein	+	-	+	-
Steroids	-	+	+	+
Tannins	-	+	+	+

Presence +; Absence -

Aqueous extract of fenugreek microgreens contained phytochemical compounds such as alkaloids, terpenoids, phenols, saponins, quinine and protein. Flavonoids, steroids and tannins were found to be absent. In the methanol extract of fenugreek microgreens, alkaloids, terpenoids, quinine, steroids and tannins were present, while Phenols, saponins, flavonoids and protein were absent. Aqueous extract of coriander microgreens contained phytochemical compounds such as alkaloid, phenols, saponins, quinine, protein, steroids and tannins. Absence of terpenoids and flavonoids was observed. In the methanol extract of coriander microgreens only flavonoids and protein were absent. All other phytochemical compounds namely, alkaloids, terpenoids, phenols, saponins, quinine, steroids and tannins were present. The presence of phytochemical compounds was found to be similar in both aqueous and methanol extracts of coriander microgreens.

Similar findings have been reported by Seasotiya *et al.*, (2014) who reported the presence of phytochemical compounds in the methanol extract of fenugreek seed such as phenols, tannins, saponins and alkaloids. Mahmood and Yahya, (2017) report the presence of phytochemical compounds such as alkaloids, steroids, protein, phenols, tannins, terpenoids and saponins in aqueous extract of fenugreek seeds. Thangavel *et al.*, (2015) screened that phytochemicals of various extracts of *Coriandrum sativum*, the study shows the presence of alkaloids, protein, tannin, phenol and saponins in aqueous and methanol extracts. Shrivastava, (2017) reported that in both methanol and aqueous extracts of *Coriandrum sativum* leaves, terpenoids and steroids were present, while tannins, saponins, flavonoids and alkaloid were absent. This could be probably because his study was conducted on mature leaves of *Coriandrum sativum*.

Antimicrobial Activity



ANTIMICROBIAL ACTIVITY OF MICROGREENS (mm)

Fenugreek microgreens showed zone of inhibition against *Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, Aspergillus Niger and Tricoderma viride* were 11mm, 5mm,7mm,1mm and 2mm respectively, and the Coriander microgreens showed 10mm, 5mm, 8mm,2mm and 3mm respectively.

Chitra *et al.*, (2014) studied and reported that antibacterial activity of fenugreek seed extracts against *Escherichia coli* is 20-24mm with different concentration. The study by Kumari *et al.*, (2016) reveals that distilled water, methanol, acetone and ethanol extract of *Trigonella foenum-gracum* seeds were reported the best zone of inhibition against *Escherichia coli, staphylococcus aureus, Bacillus subtilis, and Salmonella typhi* (10mm, 11mm, 13mm and 10mm) respectively and against *Aspergillus niger, Candida parapsilosis, Trichophyton rubrum* and *Candida albican*s with inhibition zones of 11mm, 13mm, 10mm and 11mm respectively.

CONCLUSION

Fenugreek and Coriander microgreens contained phytochemical compounds such as alkaloids, phenols, saponins, quinine and proteins in aqueous extracts and alkaloids, terpenoids, quinine, steroids and tannins in methanol extract, and also both microgreens shows best antimicrobial activity against different bacterial and fungal culture such as *Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, Aspergillus Niger and Tricoderma viride*.

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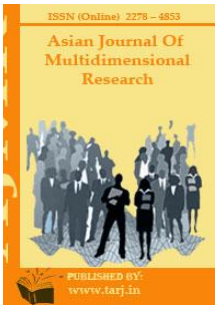

Asian Journal of Multidimensional Research (AJMR)

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FORMULATION AND STANDARDISATION OF SWEET POTATO FLOUR INCORPORATED MURUKKU

Mrs. K. Yasodhadevi*; Ms. Nandhana Unnikrishnan**

*Assistant Professor,
Department of Foods and Nutrition,
Rathnavel Subramaniam College of Arts and Science,
Sulur, Tamil Nadu, INDIA

**II M.Sc Foods and Nutrition,
Rathnavel Subramaniam College of Arts and Science,
Sulur, Tamil Nadu, INDIA
Email id: nandhanaunnikrishnan96@gmail.com

ABSTRACT

Aim: *The study aims to develop sweet potato flour incorporated murukku and its quality analysis.*
Objectives: *To formulate and standardize sweet potato flour incorporated murukku, to analyse the nutrient content of sweet potato incorporated murukku, to evaluate the shelf life of sweet potato flour incorporated murukku, to analyse the nutrient content of sweet potato flour incorporated murukku and to popularize the formulated new product among adolescent girls.*
Methods and Materials: *The murukku was prepared by incorporating sweet potato flour at various proportions like 10%, 20%, 30% and 40% in samples A, B, C and D respectively along with a standard. The prepared samples along with the standard were subjected to sensory evaluation to find the best product. The standard and the best product were analyzed for its nutrient content and shelf life. Cost analysis and popularization were also done.*
Results and Discussion: *Sample D with 40% sweet potato flour was selected as best product as it got the highest score for the criteria appearance, colour, texture, flavour, and taste. When compared to standard, sample D was rich in fiber and vitamin A. The standard and the best product were stored in air tight polythene bag and there was no change in sensory and microbial quality till 10 days. Popularization of the best product was done for a total of 30 participants and most of the adolescent girls accepted the product. The cost analysis showed that sample D is low cost than the standard.* ***Conclusion:*** *From the study, it was concluded that, the sweet potato flour incorporated murukku was accepted organoleptically. The prepared product is nutritious when compared to the standard product. The prepared product is accepted till 10th day with no microbial deterioration.*

KEYWORDS: *Sweet Potato Flour, Murukku*

INTRODUCTION

Intense global competition, rapid technology change and shifting patterns of world market opportunities compel companies to continually invest in NPD; if not for profit, then f or survival, and this is considered to be the key to success (Cooper & Kleinschmidt, 1988, 1991, 1995; Schmidt, 1995).

Sweet potato, Ipomoea batatas is one of the main root and tuber crops commonly grown in the tropical and subtropical parts of the world. It was described as the seventh most important food crop in the world (Bhattiprolu S, 2000; Okorie, S.U and Onyeneke, E.N. 2012). Sweet potato (Ipomoea batatas (L.) Lam.), known as a patata, is well known long-term species in a warm and hot climate zone and an annual plant (spring) in temperate zone. This species has moist and delicate tubers with a sweetish taste, pleasant and aromatic smell. It has also a high nutritional value – about 50% higher than the potato. Therefore, it plays an important role in the diet of the world's population (Ofori et al., 2005). The main nutritional material in sweet potato's tubers is carbohydrates (starches and simple sugars), protein, fat and fatsoluble vitamins. Moreover, cultivars with a yellow flesh also contain significant amounts of carotenes (Allen et al., 2012).

People nowadays love to consume snack foods because of the light and quick meal that can be consumed anywhere and anytime compared to main meal. Besides by living in a very hectic lifestyle also lead many people consume snack foods in a way to prevent them from hunger (Sarangam.S, Chakraborty.P and G. Chandrasheker, 2015). (Albayrak et. al., 2010) studied the traditional foods and assessed interaction between local and global foods in Turkey. Traditional foods are play an important role in local identity, consumer behavior, the transfer of cultural heritage for future generations, and the interaction of this heritage with the rest of the world. Murukku is one of the Indian traditional savory snacks produced from rice flour with combination of chickpea flour or black gram flour, natural flavorings and spices. It is being prepared in spiral, coil or ribbon form (Sarangam.S, Chakraborty.P and G. Chandrasheker, 2015).

Keeping this above information in view, the present study was undertaken basically to utilize sweet potato flour by incorporating it in murukku with a combination of rice flour and urad dhal flour, a highly preferred and most popular deep fried snack of India and also to develop a nutrient snack with sweet potato flour.

The objectives of the study are to formulate and standardize sweet potato flour incorporated murukku, to analyse the nutrient content of sweet potato incorporated murukku, to evaluate the shelf life of sweet potato flour incorporated murukku, to analyse the nutrient content of sweet potato flour incorporated murukku and to popularize the formulated new product among adolescent girls

METHODS AND MATERIALS

Murukku is a savory, crunchy Indian snack. The new product namely sweet potato flour incorporated murukku was developed by using ingredient rice flour and urad dhal flour in variation of sweet potato flour. Four samples like A, B, C, and D were prepared by incorporation of sweet potato flour at a variation of 10%, 20%, 30%, and 40% respectively. Along with this, a standard murukku was also prepared without sweet potato flour. A score card was prepared on the basis of criteria such as appearance, color, flavor, texture and taste was given to the panel members for the selection of most acceptable proportion. The evaluation was done by 30 semi–trained panel members from the Department of Foods and Nutrition in Rathnavel Subramaniam College of Arts and

Science, Sulur, Coimbatore. The product that scored the highest in sensory analysis along with standard was taken for further study. The standard and selected sweet potato flour incorporated murukku was packed in an air tight polythene bag and stored in room temperature and analyzed for a period of 10 days. The microbial analysis was carried out on the 1st day, 5th and and 9th day and sensory analysis was done after the microbial analysis by the same panel members on 1st, 6th and 10thdays to find the shelf life of the product. The cost estimation was done on the basis of ingredients used in the new product. It was also done to compare the price of the standard product and the formulated product. The popularization was done among 30 adolescence girls by the help of a questionnaire.

RESULTS AND DISCUSSION

Sensory Analysis of Standard and Formulated Products

Cooking helps to improve the microbiological and organoleptic qualities of food, increase digestibility and nutrients bioavailability, destroy toxins, microbes and anti-nutritional factors in food (Erdman J.W.J and A.G.P Schneider, 1994). Sensory evaluation of the standard and formulated murukku showed that, sample D got the highest score for all the criteria like appearance, colour, flavor, tecture and taste when compared to the other variations. Hence, Sample D with 40% sweet potato flour was selected for further study. Sensory score of the standard and selected murukku is given in table – I.

TABLE I MEAN SCORES OF STANDARD AND FORMULATED PRODUCTS

Criteria	**Standard**	Sample A	**Sample B**	**Sample C**	**Sample D**
Appearance	4.9±0.24	4.5±0.7	4.6±0.7	4.4±0.8	4.7±0.6
Colour	4.7±0.58	4.4±0.87	4.5±0.84	4.5±0.8	4.6±0.64
Texture	4.8±0.4	4.5±0.8	4.5±0.7	4.5±0.7	4.6±0.64
Flavour	4.7±0.58	4.4±0.75	4.5±0.84	4.4±0.9	4.6±0.75
Taste	4.8±0.33	4.5±0.7	4.6±0.9	4.5±0.8	4.7±0.6

From the above Table I it is cleared that among the prepared products, Sample D had the highest mean score in all the criteria when compared to other samples like sample A, B and C. It is observed that, 40% incorporation of sweet potato flour in standard recipe improved the organoleptic qualities.

Nutrient Analysis of Standard and Selected Product

Sweet potatoes are rich source of energy, antioxidants and vitamins (especially C) as well as carotenoids (Wakjira, D. Adugna and G. Berecha. 2011; Woolfe, J. A. 1992). They are also an excellent source of fibre and minerals, which are important in reducing blood cholesterol and aid digestion (Effah-Manu L; Oduro I and Addo A. 2013; Chukwu, O., Nwadike, N. and Nwachukwu N. G. 2012). Table – II shows the nutrient content of stand and selected product.

TABLE II NUTRIENT CONTENT OF STANDARD AND SELECTED PRODUCT

Nutrient	**Standard (100:0)**	**Sample D (40:60)**
Fiber (g)	1.02	2
Vitamin A (IU)	7	1150

From the above table it was concluded that the fiber content of the standard (1.02g) and sample D (2g) is more or less nearer. The vitamin A content of sample D was 1150 IU and standard was 7 IU. Thus, the addition of sweet potato flour improves the nutritional value of the product.

Shelf Life Study of Standard and Selected Product

Shelf life is a critical factor in food industry. It is the time during which the food product will remain safe, be certain to retain desired sensory, chemical, physical and microbiological characteristics and comply with any label declaration of nutritional data, when stored under the recommended conditions (Institute of Food Science and Technology, 1993).

(i) Microbial Analysis of Standard and Selected Product

Microbial analysis clearly showed that, there was no microbial growth in both standard and sample D for a period of 10days when stored in air tight polythene bag.

(ii) Sensory Analysis of Standard and Selected Product

TABLE IV SENSORY ANALYSIS OF STANDARD AND SELECTED PRODUCT DURING SHELF LIFE STUDY

Day	Standard	Sample D
Day 1	4.73±0.58	4.8±0.33
Day6	4.73±0.58	4.73±0.58
Day 10	4.76±0.43	4.7±0.4

From the above table it is clear that, the sensory quality of the product kept in air tight polythene bag was accepted upto 10 days by the panel members.

Cost Analysis and Popularization

The results revealed that the cost of 100g of sweet potato flour incorporated murukku (Sample D) was Rs. 45/-; whereas the cost of standard murukku was Rs.55/. Hence, the cost of the selected product is less, when compared with standard.

During the popularization of the selected product, all the participants accepted the sweet potato incorporated murukku based upon its sensory attributes and they were ready to buy the product if it is available in the market.

CONCLUSION

From the study, it is concluded that murukku with 40% sweet potato flour was selected as best product. The prepared product is high in Vitamin A and fiber when compared to the standard product. The prepared product is acceptable till 10^{th} day without any changes in sensory quality and no microbial deterioration if it is stored in air tight polythene bag. The cost of the selected product was comparably less than the standard product. In the popularization study the entre participants accepted the product based upon the sensory attributes.

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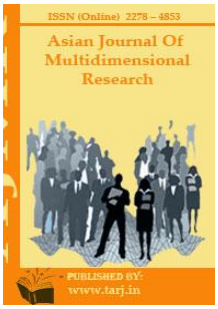

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PRELIMINARY STUDIES ON CORIANDRUM SATIVUM - ALZHEIMER'S DISEASE

Nandhini.B*; Deepika. A; Anitha Subash*****

*Research Scholars,
Department of Biochemistry,
Biotechnology and Bioinformatics,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

**Research Scholars,
Department of Biochemistry,
Biotechnology and Bioinformatics,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

***Professor,
Department of Biochemistry,
Biotechnology and Bioinformatics,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: dranithasubash@gmail.com

ABSTRACT

Medicinal plants are considered as rich resource of ingredients that can be used in the synthesis and development of certain drugs. Antioxidants may be of great benefit in improving the onset of degenerative diseases. The present study was aimed at investigating the antioxidant potential of Coriandrum sativum- the enzymic and non-enzymic antioxidants and in vitro free radical scavenging activity (DPPH, ABTS and hydrogen peroxide) activity. The results showed that the shoots and roots of Coriandrum sativumwere found to have significant activities of all enzymic and non-enzymatic antioxidants. Preliminary phytochemical screening revealed the presence of glycosides, flavonoids, terpenoids, steroids and tannins. In vitrofree radical scavenging activity was found to be dose dependent. The DPPH scavenging activity of the petroleum ether extract of the seeds and the methanolic extract the shoots of Coriandrum sativum, showed better scavenging activity among the

six extracts. ABTS scavenging activity of ethyl acetate extract of seeds and aqueous extract of shoots showed maximum scavenging activity, H2O2 scavenging activity of aqueous extract of seeds and the methanolic extract of shoots showed higher scavenging activity than the other extracts. Thus it can be concluded that both the shoots and roots of Coriandrum sativum could be a good source of antioxidants. Further studies may be carried out with this medicinal plant to find out its effect on Alzheimer's disease.

KEYWORDS: *Coriandrum Sativum, Phytochemicals, Free Radical Scavenging, Enzymic Antioxidants, Non-Enzymic Antioxidants*

INTRODUCTION

Herbal medicine is the oldest medicine. It was the main type of treatment in many early civilizations and still the most widely practiced form of medicine in the world today (Al-Snafi, 2016).Several herbal medications in various medicinal systems are used for the treatment of illnesses. Medicinal plants are used to relieve pain and illness because of the presence of several bioactive compounds. Conventional medications are available as a source of new pharmaceutical, healthiness maintenance product and alternative medicine. Plant constituents are used directly as therapeutic agents and as starting materials for the synthesis of drugs (Verma, 2016; Edrah, 2017). The active compounds are naturally occurring chemicals or phytochemicals that are present in plants (Nyamai *et al.*, 2016). The important bioactive constituents are alkaloids, tannins, flavonoids and phenolic compound. The preliminary phytochemical screening of plants is the need of the hour in order to discover and develop novel therapeutic agents with improved efficacy. (Yadav *et al.*, 2014; Nandagoapalan *et al.*, 2016)

Reactive oxygen species (ROS) that are produced as a result of cellular metabolism are highly toxic and are involved in the etiology of many chronic diseases due to oxidative damage to lipids, nucleic acids and proteins. Although an internal system of antioxidant exists in our body to get rid of excessive free radicals, exogenous antioxidants are recommended (Akhtar *et al.*, 2016). Antioxidants either synthetic or natural are potent scavengers of free radicals and have beneficial effects on human health and disease prevention (Malick *et al.*, 2016). Free radicals are atomic or molecular structures with unpaired electrons. Free radicals have an important role in food, pharmacological, biological processes and in a variety of pathophysiological conditions. Free radicals are capable of oxidizing biomolecules that contain amino acids, proteins, carbohydrates, lipids, and nucleic acids (Koksal *et al.*, 2017).ROS is the type of free radical containing all highly reactive, oxygen-containing molecules. Types of ROS include the hydroxyl radical, the super oxide anion radical, hydrogen peroxide, singlet oxygen, nitric oxide radical, hypochlorite radical, and various lipid peroxides. These react with lipid protein causing a cellular damage (Harsha and Anilakumar, 2014).

In the present work, an attempt was initiated with the objective of analysing the phytochemical constituents, antioxidants and free radical scavenging activity in the shoot and seed extracts of *Coriandrum sativum.*

MATERIALS AND METHODS

Collection of plant samples

Shoots and seeds of *Coriandrum sativum* (coriander) were collected from a local market near Karamadai, Coimbatore District. The collected samples were cleaned and dried in the shade at room temperature. They were then powdered and used for further investigation.

Preparation of plant extract

Extracts from powdered shoots and seeds of coriander were prepared in different solvents of increasing polarity - chloroform, petroleum ether, ethyl acetate, ethanol, methanol and water (Madhu *et al., 2016*; Santhi and Sengottuvel, 2016)

Phytochemical screening of the shoot and seed extracts of *Coriandrumsativum*

Preliminary phytochemical analysis of crude powder of the samples was carried out. Phenols, flavonoids, alkaloids and glycosides were estimated by the methods given inRaaman 2006, Terpenoids, and steroids were estimated by the method described in Siddiqi and Ali 1997 and tannins by the procedure given in Iyenger 1995.

Determination of enzymic antioxidants and non-enzymic antioxidants

Estimation of the enzymic antioxidants and non-enzymic antioxidants were carried out according to described methods in Table I

TABLE I

Enzymic antioxidant activity	**Non- Enzymic antioxidant activity**
Catalase (Luck, 1974)	Ascrobic acid (Roe and Kuether 1973)
Polyphenol Oxidase (Esterbauer *et al.* 1977)	α-tocopherol (Rosenberg, 1992)
Superoxide dismutase (Misra and Fridovich, 1972)	Flavonoids (Cameron *et al.,* 1943)
Glutathione peroxidase (Rotruck *et al.*1973)	Polyphenols (Malick and Singh, 1980)
Glutathione-S-transferase (Habig *et al.* 1974)	Reduced glutathione (Moran1972)

Antioxidant assays

The determination of DPPH scavenging activity of the plant extracts was done by using the method described previously(Meso*et al.,* 2001), ABTS free radical scavenging were determined and the procedure is given (Shirwaikar *et al.,* 2006) and the hydrogen peroxide (H_2O_2) scavenging activityof the plant extract was performed asdescribed by previously reported method Ruch*et al.,* 2006.

RESULTS AND DISCUSSION

Phytochemical Analysis

The results of the phytochemical screening of secondary metabolites in different extracts of seeds and shoots of *Coriandrum sativum*are shown in Table II. It is clear that presence of glycosides, terpenoids andsteroids and absence of saponin, tannin, flavonoid and alkaloids were observed inchloroform extract of seeds. In the shoots of chloroform extract only terpenoids and steroids were present. In the ethanolic extract of seeds only phenols and tannins were present. In the methanolic extracts of seeds except alkaloids all others were present and in shoot flavonoids, glycosides and terpenoids were present. Except glycosides and terpenoids all other compounds are present in ethyl acetate extract of seeds and in shoots only phenols flavonoids, tannins and terpenoids were present. In the aqueous extract, phytocompounds such as flavonoids and glycosides are present in seeds and in shoots glycosides, terpenoids and steroids were present. The petroleum ether extract of seeds gives positive result only for steroids. Similar results were obtained as (Minakshi*et al.*,2016) who reported that *Mentha piperita* showed positive results for saponins, tannins, flavonoids, terpenoids, glycosides, alkaloids, carbohydrates and steroids. (Mushtaq*et al.*,2014) study reveals the different extracts of *Eremuru shimalaicus shows* positive result for tannins, saponins, terpenoids, flavonoids, phenolics, and cardiac glycosides.

TABLE II: PHYTOCHEMICAL SCREENING OF SEEDS AND SHOOTS OF CORIANDRUM SATIVUM

Phytochemical Parameters	Petroleum Ether		Chloroform		Ethanol		Methanol		Ethyl Acetate		Aqueous	
	SD	ST	SD	ST	SD	ST	SD	ST	SD	ST	SD	ST
Alkaloids	-	-	-	-	-	-	-	-	-	-	-	-
Phenols	-	-	-	-	+	-	+	+	+	+	-	-
Flavonoids	-	-	-	-	-	-	+	+	+	+	+	-
Tannins	-	-	-	-	+	-	+	-	+	+	-	-
Glycosides	-	-	+	-	-	-	+	+	-	-	+	+
Terpenoids	-	-	+	+	-	-	+	+	+	+	-	+
Steroids	+	-	+	+	-	-	+	-	+	-	-	+
Saponin	-	-	-	-	-	-	+	-	+	-	-	-

+: Presence - : Absence SD: Seeds ST: Shoots

Enzymic antioxidant activity of seeds and shoots of*Coriandrum sativum*

Enzymic antioxidants were assessed in the seeds and shoots of *Coriandrum sativum*. Table III decipits the levels of enzymic antioxidants in seeds and shoots of *Coriandrum sativum.*

TABLEIII LEVELS OF ENZYMIC ANTIOXIDANTS IN SEEDS AND SHOOTS OF CORIANDRUM SATIVUM

S.No	Enzymic Antioxidants U/g	Samples	
		Seeds	Shoots
1	Catalase	0.86 ±0.02	1.18 ± 0.07
2	Peroxidase	0.83 ±0.02	0.95 ±0.01
3	Polyphenol oxidase	1.6±0.01	1.09± 0.01
4	Superoxide Dismutase	0.76 ±0.02	1.04 ±0.07
5	Glutathione S Transferase	1.95±0.07	2.025 ± 0.06

The triplicate value is expressed in Mean ± standard deviation

From Table III, it can be observed that shoots show maximum level and the seeds show the lowest level of catalase. The levels of peroxidase were low in seeds and moderate value was observed in shoots. The activity of polyphenol oxidase was found to be maximum in shoots (1.09± 0.01) and lowest value was found in seeds (1.6 ± 0.01). Glutathione-S-transferase was found to be maximum in shoot (2.03 ±0.06) compared to seeds (1.95 ±0.06). Superoxide dismutase had least activity compared to other samples. Shoots showed better activity than the seeds of *Coriandrum sativum.*

The above result is supported by the work of (Alici and Arabaci, 2016) who revealed that *Rumex obtusifolius* L. significantly shows higher SOD activity than other enzymes.

Non-Enzymic antioxidants activity of in seeds and shoots of*Coriandrum sativum*

Non enzymic antioxidants were assessed in seeds and shoots of *Coriandrum sativum*. Table IV shows significantly highest value of ascorbic acid, reduced glutathione, α-tocopherol, flavanoids and total polyphenol in shoots. Seeds were found to exhibit the lowest ranges of various non enzymaic antioxidants comparing to shoots are ascorbic acid 3.03±0.03 (mg/g), α-tocopherol (2.06 ± 1.5mg/g) and total polyphenol (0.81±0.03), Reduced glutathione(1.08 ±0.07) ,α-tocopherol (1.95 ± 0.02), flavanoids (0.98 ±0.02).

TABLE IV LEVELS OF NON-ENZYMIC ANTIOXIDANTS IN SEEDS AND SHOOTS OF CORIANDRUM SATIVUM

S.No	Non- enzymic antioxidant	Samples	
		Seeds	Shoots
1	Ascorbic acid (mg/g)	3.03±0.03	4.03±0.03
2	α- Tocopherols(mg/g)	2.06 ± 1.5	1.95 ± 0.02
3	Flavonoids (mg/g)	0.98 ±0.02	0.98 ± 0.02
4	Polyphenols (mg/g)	0.81±0.03	0.94±0.01
5	Reduced Glutathione (ng/g)	1.08±0.07	2.04 ±0.08

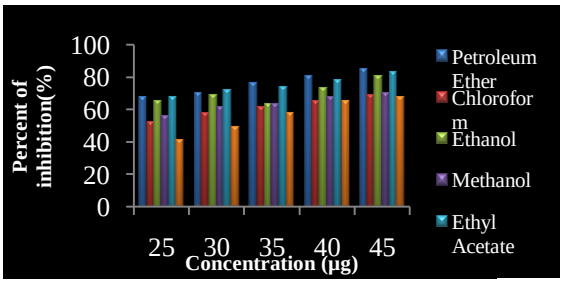
The triplicate value is expressed in mean ± standard deviation

Similar result were obtained as the result of Vijayakumari*et al.*,(2013) that *Rotula aquatic* roots shows highest value of ascorbic acid, α-tocopherol and total polyphenols. Leaf was found to exhibit the lowest ranges of various non-enzymatic antioxidants *viz.*, ascorbic acid, α-tocopherol and total polyphenol. The level of ascorbic acid, α-tocopherol and polyphenol were found to be moderate in stems compared to roots.

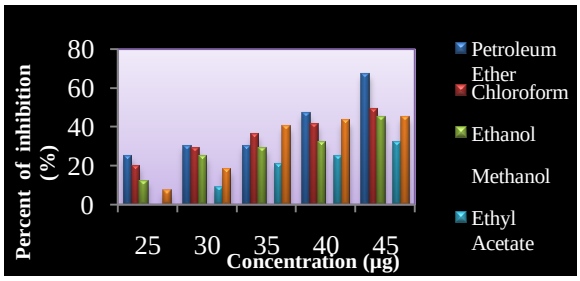
DPPH radical scavenging activity of seeds and shoots of *Coriandrum sativum*

DPPH scavenging activity of seeds of *Coriandrum sativum* and percent of inhibition in shown in Figure I DPPH radical scavenging activity of both seeds and shoots of *Coriandrum sativum* petroleum ether extract possessed excellent antioxidant capacity as compared to other extracts

Figure 1



a) DPPH radical scavenging activity of seeds of *Coriandrumsativum*



b) DPPH radical scavenging activity of shoot of *Coriandrum sativum*

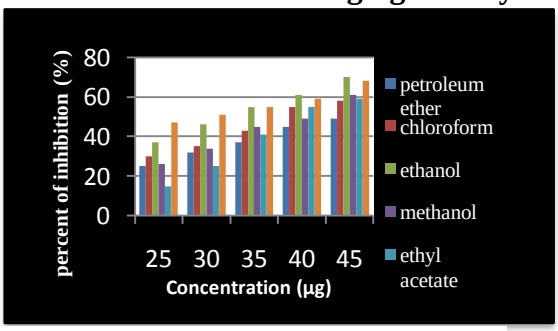
Chittam *et al.*, (2016) investigated that the extract of *Chlorophytum tuberosum* tested against DPPH stable radicals scavenging activity of ethanolic extract possessed excellent antioxidant capacity as compared to aqueous extract. Similar results were expressed by Geetha *et al.*, (2013) who stated that the ethanolic extract of *Aesculus hippocastanum* showed 92.72% inhibition of DPPH scavenging activity.

ABTS scavenging activity of seeds and shoots of *Coriandrum sativum*

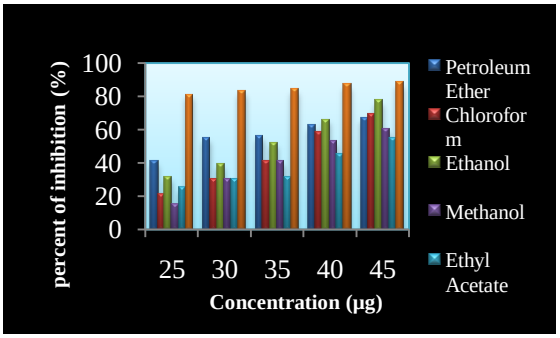
Percent of inhibition of ABTS scavenging activity of seeds of *Coriandrum sativum* is shown in Figure 2a.it is understood that ethyl acetate extract has a capability to scavenge the ABTS free radical, at higher concentration and the percent of inhibition was found to be 88%, comparing to other extracts. ABTS scavenging activity of shoots of *Coriandrum sativum* and percent of inhibition is presented in Figure 2b. It is clearly understood that aqueous extract has a capability to scavenge the ABTS free radical, compared to other extracts.

Another study by Gupta *et al.*,(2016) stated that the percentage of inhibition against different concentrations of both extracts of *Glycyrrhizaglabra* is determined as 575 ±26.694 in alcoholic extract, 683.9 ±49.220 in aqueous extract of *Glycyrrhizaglabra*.

Figure – 2
ABTS scavenging activity of seeds of *Coriandrum sativum*



a) **ABTS radical scavenging activity of seeds of *Coriandrum sativum***

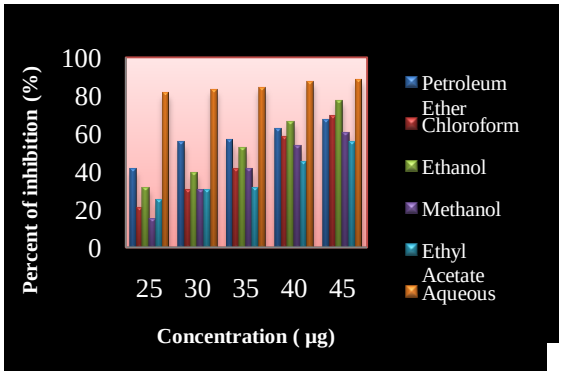


b) **ABTS radical scavenging activity of shoots of *Coriandrum sativum***

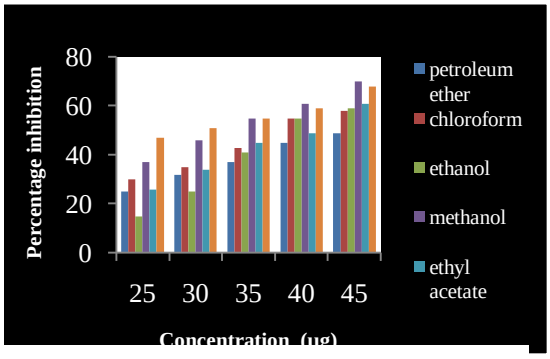
H_2O_2 scavenging activity of seeds and shoots of *Coriandrum sativum*

The percent of inhibition of hydrogen peroxide scavenging activity of seeds are shown in Figure 3a. Aqueous extract of seed showed higher hydrogen peroxide scavenging activity. From Figure 3b, it can be seen that the aqueous extract of shoots showed higher percent of inhibition of hydrogen peroxide. The results are on parr with that of Ngonda, 2013 who stated that hydrogen peroxide scavenging activity of methanolic extract of Trichodes *mazeylanicumm* showed good scavenging capability compared to the standard compound.

Figure – 3
H_2O_2 scavenging activity of seeds of *Coriandrum sativum*



a) **H_2O_2 radical scavenging activity of seeds of *Coriandrum sativum***



b) **H_2O_2 radical scavenging activity of shoots of *Coriandrum sativum***

CONCLUSION

The preliminary phytochemical screening of shoot and seed extractsof *Coriandrum sativum*revealed the presence of glycosides, flavonoids, terpenoids, steroids and tannins. These active principles could be responsible for the antioxidant properties. Levels of enzymic and non-enzymic antioxidants were calibrated in seeds and shoots, where shoot showed higher activity than seeds. Both the seeds and shoots exhibited moderate to significant antioxidant activity and the capability to

scavenge free radicles. Thus the results of the present study proposethe possibilities of using *Coriandrum sativum* for pharmacological preparation for the managementof Alzheimer's.Therefore, further studies may be carried out to find out if antioxidants could decrease the risk of Alzheimer's disease.

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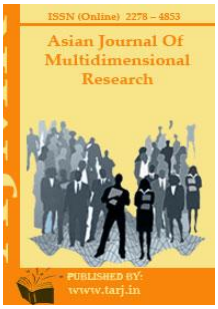

Asian Journal of Multidimensional Research (AJMR)

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NUTRITIONAL STATUS OF CHILDREN AGED 6–8 YEARS OLD OF FISHER FOLKS RESIDING IN THE AREAS OF COASTAL RURAL KAKINADA OF EAST GODAVARI DISTRICT, ANDHRA PRADESH.

Rajya Lakshmi Devi Yenumula*; Dr. S. Thilakavathy**

*PhD Research Scholar,
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: yenumula.rajee@gmail.com

**Assistant Professor (SS).
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

The study aimed to analyze the nutritional status of children aged 72 - 108 months (6–8 years old) of fisherfolks belonging to the fishermen community of East Godavari District, Andhra Pradesh, in eight villages namely, Chollangi, Nemam, Vakalapudi, Valasapaka, Uppada, Mulapeta, Ponnada and Konapaapapet. In general, the data collection techniques used in this research is field observation, lived experiences, interview, and secondary data collection (Triangulation approach). Field observations and interviews are conducted by direct discussions with parents, school teachers and children in the study area who have a good understanding about the situation and the social issues surroundings the coastal environment by using a list of pre-selected questions. Data about age of child, sex, household size, income and expenditure of fishermen was collected. The study reveals that 0.8% boys and 11.5% girls have severe stunted growth and 13.8% boys and 5.8% girls showed moderate stunting. The overall prevalence of severe underweight (Weight for age< Median -3SD) is seen among 0.7% girls. The number of underweight children of the fisherfolk (Weight for age< Median -2SD) are about 15.2% in which 3.2% were boys and 12% are girls. The BMI for age is normal for all children except for 0.2% children (boys) who were over nourished.

KEYWORDS: *Nutritional status, Young children, Schoolchildren, Fisher folk*s

INTRODUCTION:

Fisher folks consistently top as the poorest sector in Andhra Pradesh, based on the report of *CMFRI, National Marine Fisheries Census, 2010*. Aside from the uncertainty of income among fishing communities, factors such as land ownership, debt, access to health, education and financial capital, as well as political and geographical marginalization also contribute to why poverty thrives in this sector[1]. Moreover, fisher folks often live in places that have particularly high risk of extreme events; flooding, cyclones and tsunamis often visit coastal and floodplain fisheries, while inland fisheries can be significantly affected by droughts and floods. These disasters leave severe damages on infrastructures as well as productive assets such as boat, landing sites, post-harvesting facilities and road among fishing-dependent people[2]. These consequently decrease their harvesting capacity and access to markets, affecting both local livelihood and the overall economy[3]. These kinds of disasters had also brought severe asset damages among fishing communities in the District of East Godavari of Andhra Pradesh state. In India, 60.57% of the fishermen families were under BPL category as per CMFRI (2010) reports. Whereas, situation of fisheries is worst and all fishing families in coastal Andhra Pradesh are under BPL except some employees and mechanized boat owners[4]. In Andhra Pradesh, 97.3% of marine families were under BPL category as per CMFRI (2010) reports. Out of 1, 63,427 marine fishing families in coastal Andhra Pradesh, 1,59,101 families are under BPL[5].

OBJECTIVES OF THE STUDY:

To,

- Assess the nutritional status of school going children (6-8 years) of fisher folk community of coastal rural Kakinada.
- Assess the socio- economic status of the fisher folk children.

METHODOLOGY:

The study aimed to analyze the nutritional status of children aged 72 - 108 months (6–8 years old) of fisherfolks belonging to the fishermen community of East Godavari District, Andhra Pradesh, in eight villages namely, Chollangi, Nemam, Vakalapudi, Valasapaka, Uppada, Mulapeta, Ponnada and Konapaapapet. In general, the data collection techniques used in this research is field observation, lived experiences, interview, and secondary data collection (Triangulation approach). Field observations and interviews are conducted by direct discussions with parents, school teachers and children in the study area who have a good understanding about the situation and the social issues surroundings the coastal environment by using a list of pre-selected questions. Data about age of child, sex, household size, income and expenditure of fishermen was collected.

Results

1. Background Information on Children

Table I presents data about the selected children's family background regarding the type of family.

TABLE I FAMILY BACKGROUND OF CHILDREN

Types of family	Age (in years)				Total (N=1000)	
	6-7		7-8			
	No.	%	No.	%	No.	%
Joint	307	62.6	342	67	649	64.9
Nuclear	183	37.4	168	33	351	35.1
Total	490	100	510	100	1000	100

Of the 6-7 year old children, 62.6 per cent lived in joint families and 37.4 per cent in nuclear families. In the 7-8 year age group, 67 per cent lived in joint families and 33 per cent in nuclear families. On the whole, 64.6 per cent of the children were from joint and 35.2 percent were from nuclear families. Thus it is evident that in fishermen community, joint family system is predominant. The average size of the joint family is 13 and nuclear family is 8.

Gender of the children

Data in table II depicts the number of children selected in each gender.

TABLE II GENDER OF THE CHILDREN

Gender of the children	Age (in years)				Total (N=1000)	
	6-7		7-8			
		%	No.	%	No.	%
Boys	253	51.6	294	57.6	547	54.7
Girls	237	48.4	216	42.4	453	45.3
Total	490	100	510	100	1000	100

Boys: Girls ratio: There were 253 boys and 237 girls in the age group of 6-7 years and 294 boys and 216 girls in the age group of 7-8 years in the study, i.e., 51.6 per cent boys and 48.4per cent girls in 6-7 years age group, 57.6 per cent were boys and 42.4per cent were girls in 7-8 years age group.

Monthly Income

Data in table III depicts the monthly income of thefisher folks' families of the selected children

Table III
Monthly income of the family

Monthly Income	Age in years					(N= 1000)
(INR)	6-7 YEARS		7-8 YEARS		MEAN	
	NO.	%	NO.	%	NO.	%
<2000 - 2000	7	1.4	18	3.5	25	2.45
2001 -5000	445	90.8	467	91.6	912	91.2
5001- 10000	38	7.8	25	4.9	63	6.35
Total	490	100	510	100	1000	100

The Planning Commission of India calculates the poverty line every year adjusting for inflation. The poverty line in recent years is as Rs. 368 per head in rural India and Rs. 558 per head in Urban India. All children in the age group of 6-8 years were from BPL (Below poverty line) families, except 6.3 per cent of children who belonged to Low Income Group families with monthly income of Rs.5001 to 10,000. On the whole, 93.65 per cent of the children belonged to BPL (Below poverty line) families and only 6.3 per cent were from LIG.In the present study,given in tables III, however, the average monthly income of the family is Rs.4165/-.It was shocking to note that all the families spent a major part of their income on alcohol, smoking and tobacco. In the families of 6-7year old children, only 10.8 per cent of the income was spent on food and families of 7-8year age group spent only 11.4 per cent of their income on food.

Expenditure Pattern of the Fisherfolk families

Table IV presents data about the monthly expenditure pattern.

Table IV
Expenditure Pattern of the families

Details of Expenditure	(INR)	%	(INR)	%	(INR)	%
Food	450	10.8	480	11.4	465	11.2
Paan/Betel Nut/Tobacco Alcoholic Drinks	1850	44.6	1900	45.5	1875	45
Clothing	450	10.9	450	10.8	450	10.8
Purchase of household items /Repair work	150	3.6	100	2.4	125	3
Transport	250	6	250	6	250	6
House Rent /boat rent	820	19.8	820	19.6	820	19.7
Debts	180	4.3	180	4.3	180	4.3
Total	4150	100	4180	00	4165	100

An unbelievable expenditure, i.e., 44.6 per cent of income of 6-7years age group, 45.5 per cent of 7-8years age group was spent on paan, betel nut, smoking, tobacco and alcoholic drinks(toddy) and both the parents in the families were addicted to these habits. On the whole, 11.2percent, 45percent, 10.8percent, 3percent, 6 percent,19.7and 4.3 percent of income was spent on various heads of expenditure namely, food, pan/betel nut/ alcoholic drinks, clothing, maintenance of household /repair work, transport, house/boat rent and debts respectively (Table IV).

C. Nutritional Anthropometry of Children

The mean anthropometric measurements such as height and weight of the children are presented according to ageand gender and compared to the WHO standards[6] in TablesV and VI below.

Mean Height of Children

The mean height of children is given in Table V.

Table V

Mean Height of Children N= 1000

Ag (years)	Standard		Height (cm)		t – test	
	WHO(2006)				mean ht vs WHO	
	Boys	Girls	Boys (n= 547)	Girls(n= 453)	Boys	Girls
6+	117.15	116.5	101.8 ± 1.68	101.55 ± 1.80	-122.9	-101.0
7+	124.3	123.6	111.57 ± 2.30	105.37 ± 1.60	-77.68	-149.9
8+	130.1	129.2	121.01 ± 2.39	118.38 ± 2.44	-49.29	-50.94

Height for Age

HAZ	less than -3SD	-3sd to -2sd	-2sd to -1sd
Total	123	196	51
Boys	8	138	51
Girls	115	58	0

The mean height of all the boys and girls in the present study was less than both the WHO standard values for height in the respective age groups. The height of boys and girls was compared statistically with WHO standards since these were more recent and it was observed that most of boys and girls were significantly shorter than their WHO counterparts. **T**he study reveals that 0.8% boys and 11.5% boys and 5.8% girls showed moderate stunting 5.1% boys are normal. The overall prevalence of severe underweight (Weight for age< Median -3SD) is seen among 0.7% girls.

Mean Weight of Children

The mean weights of children are given in Table VI.

Table VI

Mean Weight Of Children

Age (years)	Standard Weight (Kg) WHO(2006)		N= 1000		t -test mean wt vs WHO	
	Boys	Girls	Boys (n= 547)	Girls(n= 453)	Boys	Girls
6+	20.5	20.45	18.13 ±1.55	15.02 ± 0.93	- 21.54	-71.44
7+	22.7	22.3	19.54 ± 1.00	16.83 ± 0.71	- 44.50	-101.2
8+	25.2	25.0	21.76 ± 0.98	19.80 ± 1.02	-45.26	- 65.0

Weight for Age

WAZ	less than -3SD	-3sd to -2sd	-2sd to -1sd	>-1SD
Total	7	152	183	28
Boys	0	32	137	28
Girls	7	120	46	0

The mean weights of children were much lighter than both their standard counterparts (WHO and ICMR).Thus the weight of boys and girls in all the age groups were significantly less than the respective standard values.The number of underweight children of the fisherfolk (Weight for age< Median -2SD) are about 15.2% in which 21% were boys and 79% are girls. The BMI for age is normal for all children except for 0.2%children (boys) who were overnourished. On the whole prevalence of stunting, wasting and underweight was higher among girls than among boys. Looking into the prevalence of malnutrition among children of fisherfolk in the coastal areas of rural Kakinada, East Godavari District, Andhra Pradesh, it can be observed that there is a low prevalence of overweight and high prevalence of underweight, stunting and wasting children. This scenario can be attributed to limited access of children to high-calorie snacks and fast food which are hardly affordable. Thus, there are only few who are identified to overweight.

CONCLUSION

The present study showed that malnutrition is highly prevalent among children of Fisherfolk. Colds and cough, diarrhoea, skin infections and asthma, sore eyes and various intestinal parasites are the common illness among children living in coastal rural areas. These kinds of illnesses affect the growth and nutritional status of children. Perhaps, the nutritional status of children was compromised due to their poor health caused by their living environment.Household socioeconomic status remains to be crucial determinant of nutritional status of children. Thus, with fishermen being the poorest sector in the country, the prevalence of undernutrition among fisherfolks may be due to their low economic capacity that limits their access to food and nutrition. However, while poverty is a strong determinant of undernutrition among young children, it may not be true for schoolchildren. The study suggests that poverty is predictive factor to the poor nutrition among young children but not to the nutritional outcomes among schoolchildren.

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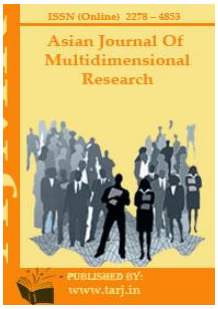

Asian Journal of Multidimensional Research (AJMR)

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PROCESSING AND STORAGE STUDIES OF DRIED MORINGA PODS UNDER TRAY DRYER

Sudagar, I.P*; P.Aruna**

*Assistant Professor (Food Process Engg.),
(Horticulture), TNAU,
Coimbatore, Tamil Nadu, INDIA
**Assistant Professor
(Horticulture), TNAU,
Coimbatore, Tamil Nadu, INDIA
Email id: ipstnau@gmail.com

ABSTRACT

Drumstick (Moringa oleifera Lam) is an important vegetable rich in nutrients and minerals. It belongs to the family Moringaceae. The shelf life of fresh moringa pods ranged between 3-5 days. Lower shelf life have led to heavy post harvest losses during peak season. Fresh moringa pods (Annual Moringa type CV PKM-1) handpicked from Horticultural College and Research Institute, TNAU, Periyakulam, Tamil Nadu were used for the study. Pretreatment was given by dipping in boiling water with magnesium oxide (0.1%) for 15 seconds. Moringa pods were cut into chewable size of 5.0cm length and used in tray dryer. Chewable size moringa pods at a moisture content of 751.35 ± 5.00 per cent (db) was spread as thin layer and deep bed layer dried at 40 and 50 ºC. Dried samples were packaged using polypropylene and multilayer packaging materials under vacuum and as normal air packaging condition and were stored at ambient (Normal Temperature Pressure (NTP) and at cold storage condition for three months. Dried, packaged and stored moringa pods of 5.0 cm length, dried as thin layer at 50 ºC in a tray dryer, packaged in multilayer packaging material, sealed under vacuum and stored at cold storage condition recorded minimum water activity value of 0.452 on 90th day of storage.

KEYWORD: *Moringa, Tray dryer, water activity, different storage, packing method, packaging material, shelf life.*

INTRODUCTION:

Moringa (pod) is a very popular vegetable in South Indian cuisine and valued for its distinct flavour and its nutritional values and significant quantities of vitamin C, calcium, iron, etc., and a good balance of all the essential amino acids. Water activity is widely recognised as an indicator of food stability because; it may correlate with microbial growth and with the rate of chemical reactions such as browning and oxidation, enzymatic reactions and structural or textural changes. (Sablani 2006, Graciela W.Padua, 2011)

MATERIALS AND METHODS

Fresh moringa pods (Annual Moringa type cv PKM-1) handpicked from HC&RI, TNAU, Periyakulam, Tamil Nadu were used for the study. Fresh moringa pods were washed in running tap water and pretreatment was given by dipping moringa pods in boiling water (96^{o}C) with magnesium oxide (0.1%) for 15 seconds. As the moringa pod is too long to use as such, it was cut into of 5.0 cm in length (ready to cook size) and then used to conduct experiment. Drying reduces moisture content thereby it reduces water activity of the produce to a level at which deterioration does not occur for a definite period of storage. Chewable size moringa pods were dried in tray dryer. Chewable size moringa pod samples (5.0 cm) were spread as thin layer (density 11.14 kg / m^2) and deep bed (density 22.25 kg / m^2) on perforated aluminium trays and placed inside the tray drier and dried until constant weight (equilibrium moisture content) was reached. Chewable size moringa pods were dried at two different temperatures at 40 and 50°C in a tray dryer at a moisture content of 751.35 ± 5.00 per cent (db) was spread in 24 trays at a hot air flow rate of 97.2 m^3 / h. Cross flow cabinet tray dryer mainly consisted of heating coils, blower, drying chamber, air inlet and outlet openings and thermostat. Samples filled trays were placed on the tray. Thermostat was set to maintain the required temperature inside the drying chamber. Drying was stopped when the sample attained equilibrium moisture content. After drying, moringa pods were packaged in Multilayer (ML) pouch (120 microns) and Polypropylene (PP) pouch (100 microns) following the vacuum packaging and normal air packaging methods and samples were stored in cold storage, (7±1°C and 80±5 per cent relative humidity), at room condition (temperature 28±2°C and relative humidity 60±5 per cent) storage conditions for three months.

Water activity meter (M/s Aqua Lab, USA) was used to measure (atmospheric temperature 28 ± 2°C) and average value water activity was recorded in the present study. During three months of storage period, studies on changes in water activity was carried out at monthly intervals and recorded and statistically analyzed using software IRRISTAT 3/93 version for four factorial complete randomized design and reported.

RESULTS AND DISCUSSION

Moringa pods were cut into 5.0 cm length and dried as thin layer and deep bed in a tray dryer at 40 and 50^{0}C. Dried samples were packaged using polypropylene and multilayer packaging materials under vacuum condition and as normal air packaging and stored at ambient condition [Normal Temperature Pressure (NTP),] and at cold storage for three months. Dried, packaged and stored samples, dried as thin layer at 50^{0}C in a tray dryer recorded minimum increase in water activity value with increase in storage period irrespective of packaging materials used, packaging methods followed and storage conditions adopted and shown in Fig.

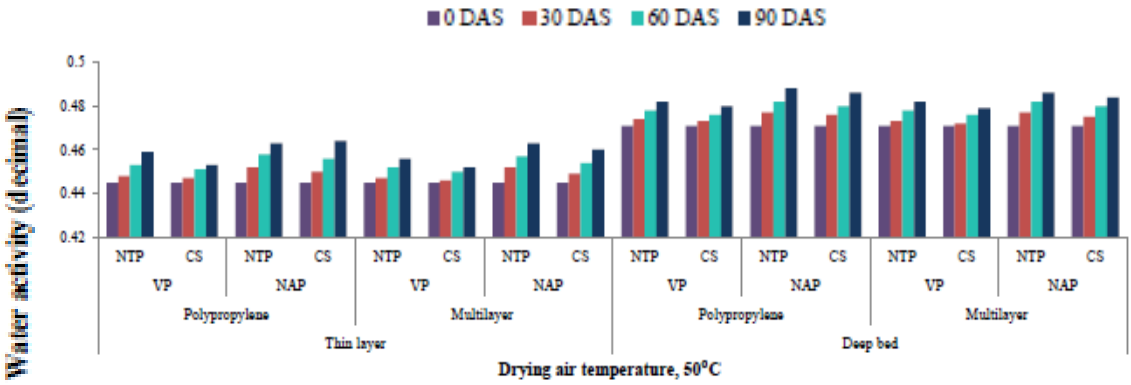

Fig. Effects of drying air temperatures, bed thicknesses, packaging materials, methods of packaging, storage conditions and days of storage on water activity value of 5.0 cm length moringa pods dried at 50^{0}C in a tray dryer

Dried, packaged and stored samples, dried as thin layer at 50^{0}C in a tray dryer recorded minimum increase in water activity value with increase in storage period irrespective of packaging materials used, packaging methods followed and storage conditions adopted. Among two packaging materials and two different packaging methods used, two storage conditions adopted multilayer packaging material, vacuum packaging and cold storage having good barrier properties recorded minimum increase in water activity value as compared to polypropylene material, normal air packaging and NTP storage respectively. Samples, recorded a water activity value of 0.445 on the day of start of storage recorded a minimum increase in water activity value in the treatment of moringa pods, packaged under vacuum, stored at cold storage using multilayer film and recorded a value of 0.452 on 90th day of storage. Samples of moringa pods dried as above, packaged in polypropylene as normal air packaging and stored at NTP recorded a maximum water activity value of 0.463 after 90 days of storage. All the other treatments recorded values in between them.

CONCLUSION

Kaleemullah and Kailappan (2006) also reported an increased water activity value in dried and packaged chillies during storage. The increased water activity values observed in dried, packaged and stored moringa pods in the present study are inline with published results. Moringa pods of 5.0 cm length, dried as thin layer at 50^{0}C in a tray dryer, packaged in multi layer packaging material, sealed under vacuum and stored at cold storage condition recorded minimum water activity value after first, second and third month of storage, respectively and this treatment is highly suitable for export purpose.

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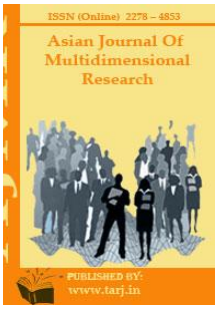

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TRADITIONAL HERB HELICTERES ISORA ARBITRATED NANO COMPOSITE SYNTHESIS AND ITS ANTI-CANCER POTENCY AGAINST BREAST CANCER CELL LINES

Smina C.S*; P.Lalitha; K.S Sasi Reka*****

*Research Scholar,
Department of Chemistry
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

**Associate Professor,
Department of Chemistry
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: goldenlalitha@gmail.com

***Research Scholar
Department of Chemistry
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Helicteres isora from family Malvaceae is a traditional medicinal herb which is used for various ailments and is commonly known as East Indian screw tree. H.isora is used in the treatment of diarrhoea and constipation of new born baby. In south India there is a traditional practice of administering H.isora dried fruit and seed parts along with honey and mothers breast milk to the new born infants. It also exhibits antidiabetic, antibacterial, anti-diarrheal and anticancer properties. The present study aims at synthesis of Helicteres isora mediated nano composite by simple sonication method. Gold nano particles and reduced graphene oxide have been prepared initially by microwave and sonication method respectively and the time of formation of H.isora mediated gold nano particles and reduced graphene oxide (RGO) were noted. Varied compositions by varying the amount of gold, graphene oxide and plant extracts were utilized for the synthesis of nano composite. The biosynthesized H.isora nano composite were characterized by Ultraviolet–

visible Spectroscopy and Fourier Transform Infrared Spectroscopy. The surface topography and elemental analysis (EDX) of synthesized nano composite were confirmed using Field Emission-Scanning Electron Microscopy. The biosynthesized nano-composite was then taken up for anti-cancer studies against MCF-7 human breast cancer cell lines and was found to possess IC_{50} value 75±1.5.

KEYWORDS: *Helicteres isora, Gold nano particles, reduced graphene oxide, MCF-7 cell lines*

INTRODUCTION

The nano-composite materials have emerged as suitable alternatives to overcome limitations of micro-composites and monolithics. Meanwhile preparation challenges to the control of elemental composition and stoichiometry in the nano cluster phase. They offer better mechanical, thermal and tribological properties over the micro composites and was found that nanosized particles increase strength, ductility and toughness [1–5]. A scientific shift has been observed towards the use of carbon based materials in different composites to improve their mechanical and electrical properties [6].The spread of various infectious diseases and the increase in incidence of drug resistance among pathogens have made the search for new antimicrobials inevitable, similarly is the cancer disease [7].

Helicteres isora is a medicinal plant which is used in several diseases and is commonly known as valampiri idampiri, East Indian screw tree, Marodphali, Marorphali, Enthani *etc.* due to its screw like appearance of fruit. *H.isora* is used in the treatment of diarrhoea and constipation in new born babies. In south India there is a traditional practice of administering *H.isora* dried fruit and seed parts along with honey and mothers breast milk to the new born infants after 28 days of birth. In the research, antioxidant, hypolipidaemic, antibacterial, cardiac antioxidant, brain-antioxidation potency, anticancer activity, anti-diarrheal activity and wormicidal activity with this plant are reported [9]. Earlier study describes the biosynthesis and bio stabilization of silver nano particles by *Helicteres isora* aqueous fruit extract and their dose-dependent antibacterial activities against four XDR P. aeruginosa [8]. Reports also reveal that acetone fruit extract of *H.isora* exhibited better cytotoxicity against human lung cancer cells (NCI-H460) [10]. Tribals of Wyanad, Palakkad and Malappuram , Kerala, use *H. isora* plant extracts for its anticancer properties [10,11].

The unique physicochemical properties of gold nano particles and reduced graphene oxide and their nano composite formation have led to potential applications in anti-cancer activity. The aim of the present work is to synthesize *H.isora* facilitated gold-graphene-nano composite (G/RGO-Comp) by adopting simple sonication procedure and to evaluate the anti-cancer efficacy against MCF-7 human breast cancer cell lines.

MATERIALS AND METHODS

Preparation of *Helicteres isora* extract

Immersed 4 g of cleaned and dried seed and fruit parts of *Helicteres isora* in 40 ml of doubly distilled water and kept under steam bath for 40 min at 80°C. The mixture was cooled to room temperature and filtered through Whatmann filter paper 41. The filtered *Helicteres isora* extract was stored in refrigerator at 4°Cfor further studies.

Synthesis of the targeted gold nanoparticles, reduced graphene oxide and nano composite

The gold nano particles were prepared by adding commercial gold chloride solution(3mM) to one portion of *H.isora* extract of definite concentration by microwave assisted method of synthesis and

the reaction mixture designated as MIX-A . The other portion of extract was treated with graphene oxide and undergone sonication process for 3 h until the colour changes from green to black (designated as MIX-B). These MIX- A and MIX-B treated together yielded MIX-C, a tinted pinkish black coloured nano composite.

Characterization

The UV-Visible absorbance spectrum of gold nano particles, reduced graphene oxide and nano composite were recorded using Bio-spec Nano (220-600 nm), SHIMADZU CORPORATION (230V) instrument. Doubly distilled water was taken as the blank. FT- IR analysis was carried out using instrument model FTIR SHIMADZU Corporation 2808, Japan .Surface morphology of GNPs, RGO,G/RGO -Compo was confirmed by FE-SEM through SE imaging, BSE imaging, In-beam SE imaging and EDX analysis (Oxford X-max 150) using MIRA3 FE-SEM system, TESCAN, CZECH REPUBLIC.

Anti-cancer activity against human breast cancer cell lines

Cancer cell Treatment procedure and Methodology Adopted

Cell culture: The breast cancer cell lines were purchased from the National Center for Cell Sciences (NCCS), Pune, India. The cancer cells were maintained in Dulbecco's modified eagles medium (DMEM) supplemented with 2mM l-glutamine and balanced salt solution (BSS) adjusted to contain 1.5 g/L Na2CO3, 0.1 mM nonessential amino acids, 1 mM sodium pyruvate, 2 mM l-glutamine, 1.5 g/L glucose, 10 mM (4-(2-hydroxyethyl)-1-piperazineethane sulfonic acid) (HEPES) and 10% fetal bovine serum (GIBCO, USA). Penicillin and streptomycin (100 IU/100µg) were adjusted to 1mL/L. The cells were maintained at 37^{o}C with 5% CO_2 in a humidified CO_2 incubator.

Evaluation of cytotoxicity

The inhibitory concentration (IC_{50}) value was evaluated using an MTT [3-(4,5- dimethylthiazol-2-yl)-2, 5-diphenyltetrazolium bromide] assay. Percentage of viability = OD value of experimental sample/OD value of experimental control ×100

Results and Discussion

Bio synthesis of *H.isora* nano composite

The biosynthesized *H.isora* nano composite under sonication method was confirmed by the change in colour formation from pale yellow to black (Fig 1.b and 1.c).

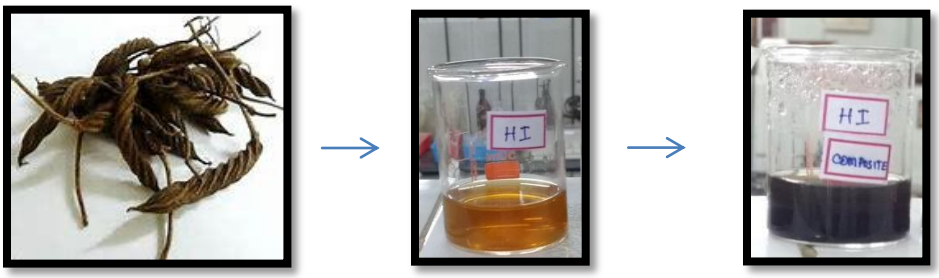


Fig 1.a Fig 1.b Fig 1.c

TABLE 1: TIME OF FORMATION OF NANO PARTICLES

S.No	Sample code	Method	Composition	Time of formation of nano particles
1	HIGNPs	Microwave	$5_{extract}:1_{gold}$	4**(sec)**
2	HIRGO	Sonication	$5_{extract}:1_{graphene\ oxide}$	3h
3	G/RGO- nano comp	Sonication	$5_{Gold\ nano}:5_{RGO}$	2h

Characterization

The color of gold ion changes to pale pink by the addition of selected sample extracts, indicating the conversion of Au (III) to Au (0). Absorption peak at 545–550 nm showed the formation of HIGNPs. The absorption peaks for reduced graphene oxide were observed at 268nm for HIRGO. Nano composite, (G/RGO-nano comp) has formed an absorption peak at 298nm as shown in (Fig 2.a, 2.b and 2.c).

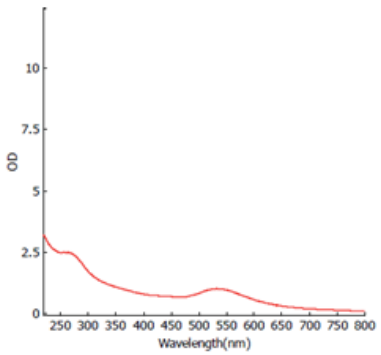


Fig 2.a

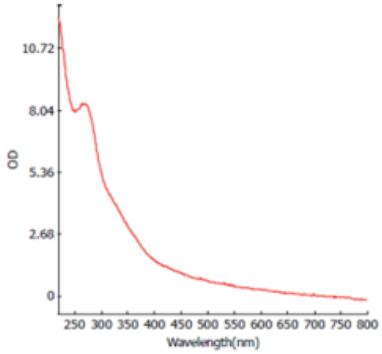


Fig 2.b

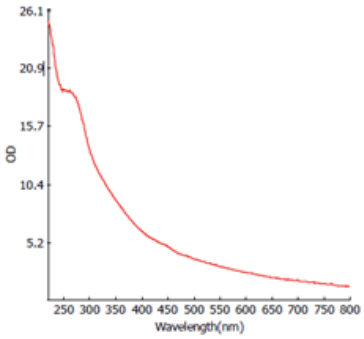


Fig 2.c

UV- visible images of HIGNPs, HIRGO and G/RGO-Nano comp

HIGNPs showed strong bands at 3338.78; 1635.64 and 594.08 cm^{-1} respectively. Similarly HIRGO showed strong bands at 3336.85; 1639.49; 644.22 cm^{-1} and nano composite at 3726.47; 3336.85; 2310.72; 1639.49 and 601.79 cm^{-1} (Fig 3) respectively.

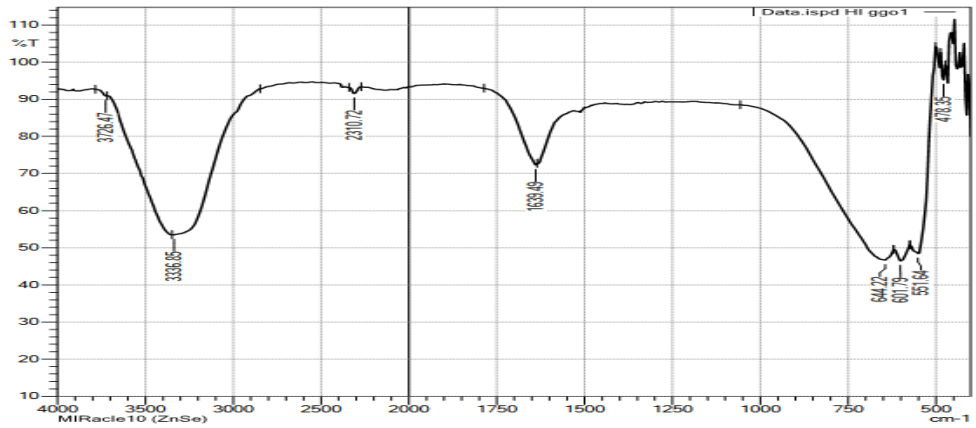


Fig 3 FT-IR Images of nano composite.

Field Emission Scanning Electron microscopy

The figure shows crumbled and flaky images of nano composite. The Edax and elemental mapping showed the presence of non-metal carbon and metal gold in the prepared H.isora nano composite as shown in (Fig 4.a, 4.b, 4.c and 4.d).

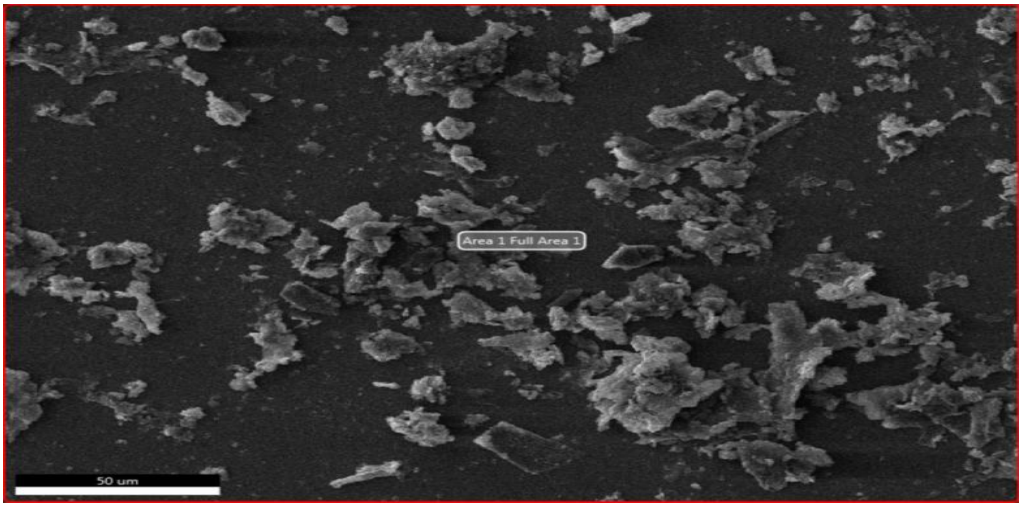


Fig 4.a FE-SEM images of nano composite

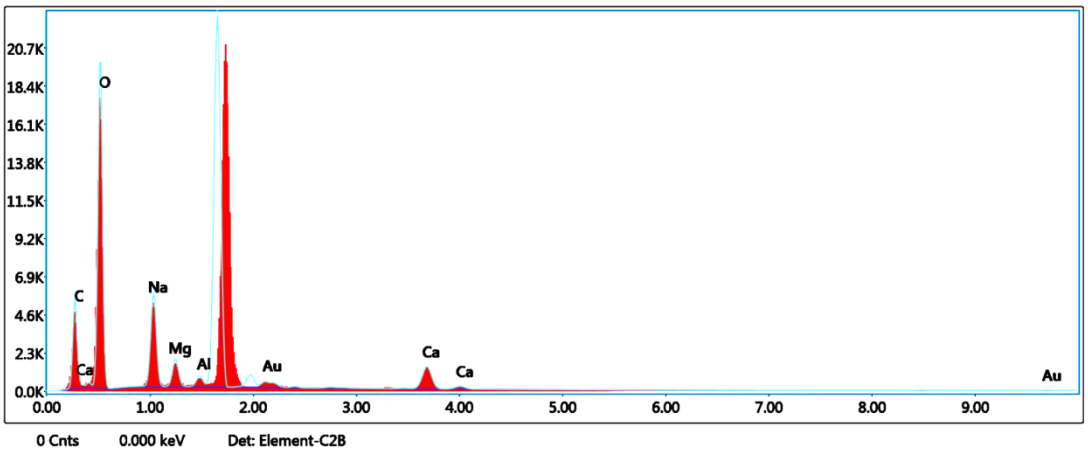


Fig 4.b EDAX analysis of *H.Isora* nano composite

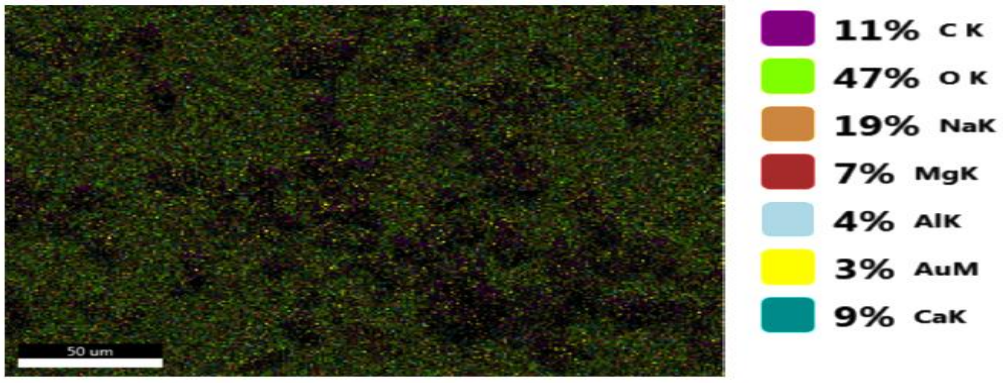


Fig 4.c Elemental mapping of biosynthisised nano compsite

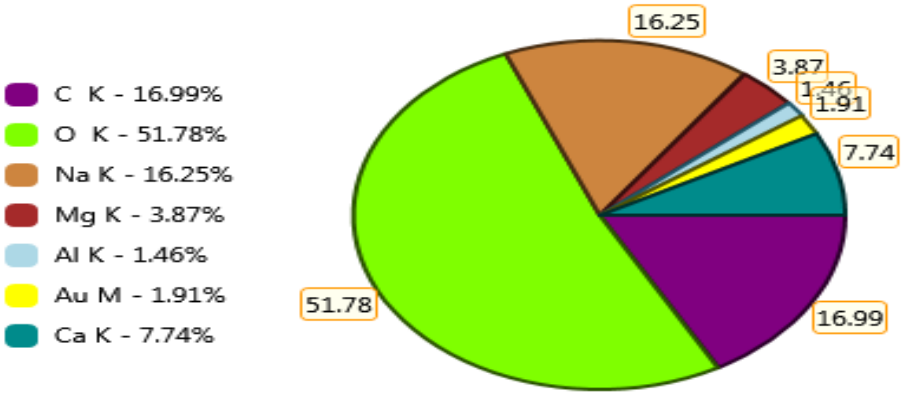


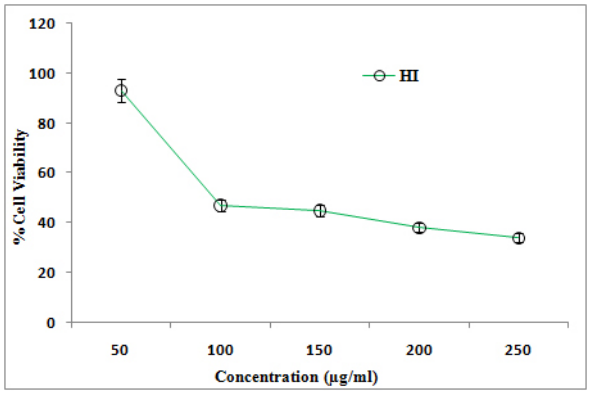
Fig 4.d Elemental Analysis of nano compsite

Anti-cancer activity- MTT assay

All the *in vitro* experiments were done in triplicate. The statistical software SPSS version 17.0 was used for the analysis. *P* value <0.01 was considered significant. The standard used was Doxorubicin. Percentage cell viability assay was carried out for the biosynthesized nano composite (G/RGO- nano comp) against MCF-7 cell lines. MTT assay was carried out at concentrations 50, 100, 150,200 and 250µg/mL for 24 h exposure time (Fig 5.a). The viable cell decreases as the concentration of the nano composite increases .This confirms the cytotoxicity of the synthesized nano composite. The IC_{50} value of synthesized nano composite was found to be 75±1.5 which proved to be excellent as compared to the standard.

TABLE 2: CYTOTOXIC ACTIVITY OF COMPLEXES (µG/ML)

Compound name	MCF-7
HI	75±1.5
DOX	14 ±1.0



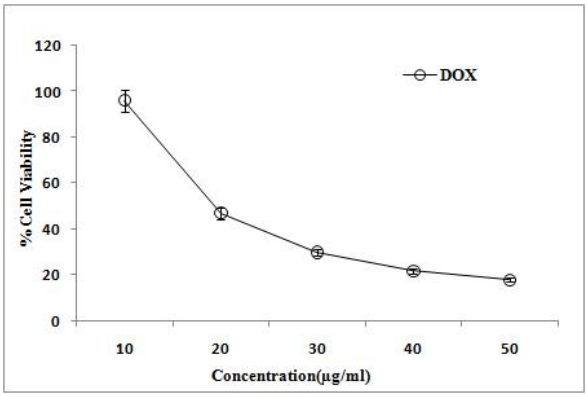


Fig 5.a HI – composite IC 50=75±1.57F Fig 5.b DOXORUBICIN IC $_{50}$=14 ±1.0

CONCLUSION

Helicteres isora dried fruit and seed aqueous extracts formed *Helicteres isora* nano composite by combining *H.isora* nano gold and *H.isora* RGO under sonication method. The UV–Visible

absorption spectral analysis of synthesized nano composite showed Surface Plasmon Resonance (SPR band) at 298 nm range indicating the formation of composite. SEM images analyzed indicate crumpled, flaky structures. Good anti-cancer activity was attained for the biosynthesized *Helicteres isora* nano composite against MCF-7 cell lines.

Conflict of interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

Acknowledgement

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SPECIAL ISSUE

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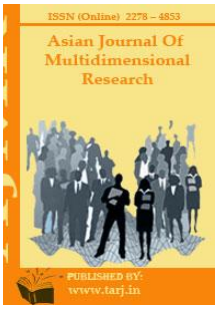

Asian Journal of Multidimensional Research (AJMR)

(Double Blind Refereed & Reviewed International Journal)

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MICROBIAL QUALITY OF TRADITIONAL FOODS SOLD BY STREET VENDORS IN MADURANTAKAM AND PUDUCHERRY

S.TamizhThendral*; Dr. S. Alamelu Mangai**

*M.Phil (FSMD) Scholar,
PG & Research Department of Home Science
Bharathidasan Govt. College for Women,
(Autonomous) Puducherry, INDIA

**Assistant Professor.
PG & Research Department of Home Science
Bharathidasan Govt. College for Women,
(Autonomous) Puducherry, INDIA
Email id: mangaifsmd19@gmail.com

ABSTRACT

Microbial contamination of ready-to-eat foods and beverages sold by street vendors and hawkers has become a global health problem. The present study was undertaken to study the most popular traditional foods and fast moving item sold in street foods near hospital, market place and bus stands and was subjected for microbial analysis. Two traditional foods such as idli with sambar and bajji were chosen based on selection criteria and due to lesser cost and clients consideration as safe food. Using standard procedures the presence of E.Coli and Salmonella was identified. A higher mean count of 1. 17 ± 0.21 E.Coli and 2.59 ± 0.02 Salmonella APC (Aerobic Plate Count) was noted in 24th hour in Madurantakam food samples due to unhygienic practice of food handling and improper storage. The food handling practices in most cases were below the standards and food safety guidelines and are inconsistent. Vendors were not completely ignorant of basic hygienic practices, but consumers also probably do not demand safe food. The street food vendors are ubiquitous and are regarded as potential conduits of food poisoning and infection. Street food vending is growing with increasing urban population. It also plays a role in food security of poor and mobile population as street foods are source of inexpensive, convenient and delicious foods. Hence these foods need improvement in terms of variety and nutrient harmony.

KEYWORDS: *Microbial contamination, ready-to-eat foods and beverages, traditional foods, E.Coli and Salmonella, unhygienic practice, Street food vending.*

1. INTRODUCTION

Street food trading solves major social and economic problems in developing countries through the provision of ready-made meals at relatively inexpensive prices and employment for teeming rural and urban populace along its value chain (Alimi, 2016). Microbial contamination of ready-to-eat foods sold by street vendors and hawkers has become a major health problem (Tambekar et al, 2011). Regular monitoring of the quality of street foods must be practiced to avoid any food borne illness in future. In addition, health education to improve the awareness of food vendors on food safety and hygiene practice is essential (Aktar, 2016). Hence the present study was carried out with broad objective of analyzing the microbial quality of the selected traditional street foods operating near hospital and bus stand.

2. METHODOLOGY

Two areas such as Madurantakam and Puducherry were selected for the conduct of study based on the convenience sampling technique. The investigator being resident of Madurantakam and due to the familiarity of the place had chosen the area for study and Puducherry was selected as the investigator pursued higher education.

2.1 Sampling of street foods

Idli with sambar and bajii the two traditional foods main dish and snack respectively were chosen as these being the most popular traditional foods and fast moving items and were cost effective and clients felt it as safe food because of cooking method adopted in preparation of idli. Two food samples each from hospitals and bus stand respectively was chosen from Madurantakam and Puducherry. All samples from total eight locations were collected from selected street food vendors who sold traditional foods in all three meals and who were found to follow unhygienic practices and holding the cart near sewage/ toilet area. 100 grams of each food purchased from the selected eight vendors were taken separately using a clean spoon and were transferred in a zip lock cover and labeled, whereby sample 1, 3 denotes idli with sambar ; and sample 2, 4 denotes traditional snack bajii sold near hospital and bus stand respectively from Madurantakam. And similarly 5,7 denotes idli with sambar; and samples labeled 6,8 denotes snack bajji sold near JIPMER, and bus stand respectively from Puducherry.

The samples were kept chilled using a thermacol cool box placed with ice till taken to 'Pondicherry Center of Biological Sciences' Laboratory for analysis of Salmonella and E coli and the samples were analyzed the next day.

2.2 *Microbial analysis*

The detection of complete range of pathogenic microorganism is impractical in routine examination of food. In order to assess the microbiological safety of food borne pathogens, indicator organisms are used which indicate the presence of pathogens of intestinal origin as a result of direct or indirect fecal contamination and they are also used to assess food hygiene (FAO,WHO 2002). The test samples (1g/1ml) were serially diluted in phosphate buffered saline (PBS) and Agar (EMB Agar) Himedia M503-500G and Salmonella Shigella Agar (SS Agar) Plate Himedia M108-500G. The test plates were incubated for 24th hour at 37°C in triplicates. *E.coli* appears as green metallic sheen and *Salmonella* spices appears as colorless colonies with black centers as shown as in the Plate 1 to 2. The Aerobic plate count test which is used to determine the total number of viable bacteria was done using FAO (1992) procedures.

PLATE 1: Isolation of *E.coli* in food samples in 12th & 24thhour

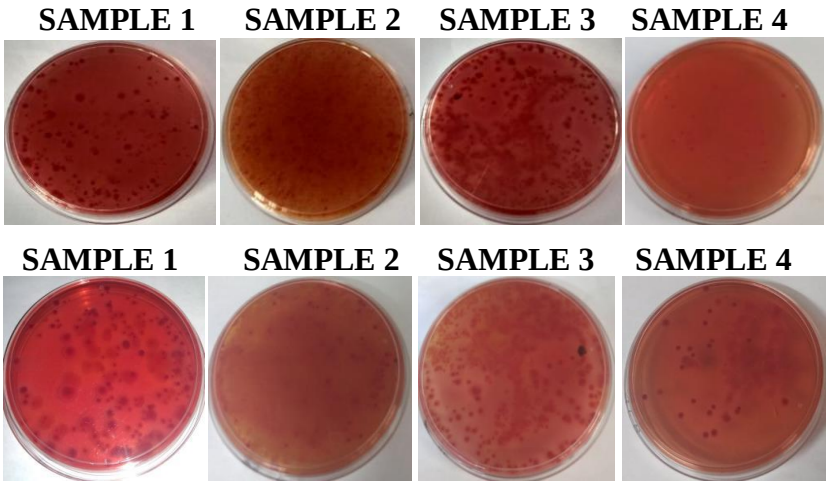
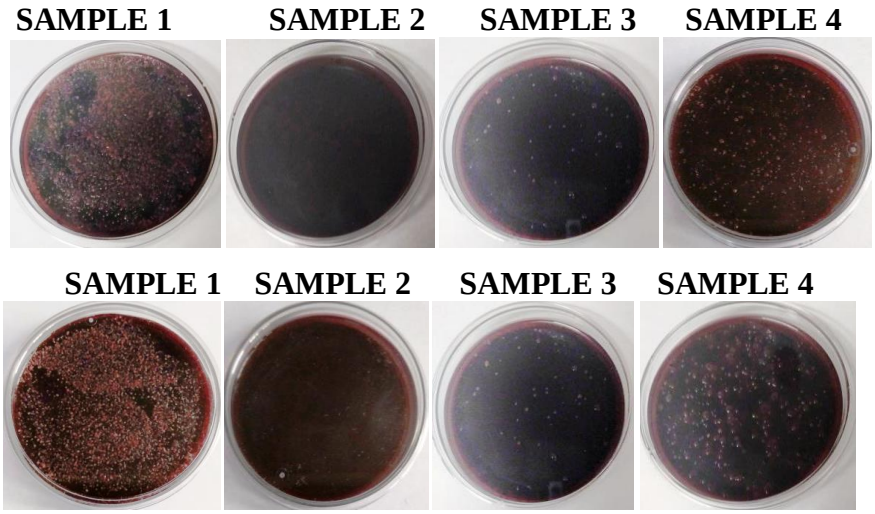


Plate 2: Isolation of *Salmonella* in food samples in 12th & 24th hour



3. RESULTS AND DISCUSSION

Two traditional foods idli with sambar and baji each selected for identification of contamination were from vendors near main Government hospital and bus stand of Madurantakam and near JIPMER hospital and main bus stand of Puducherry.

3.1 **Microbial analysis**

The table 1and 2 shows the mean microbial count of *E.coli* and *Salmonella* respectively of the samples from Madurantakam.

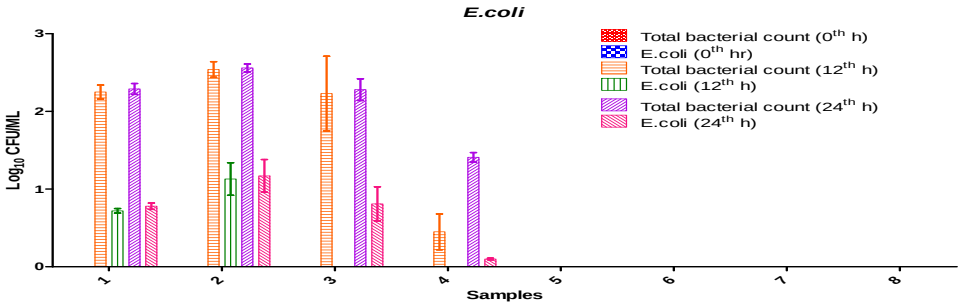
3.1.1 Microbial count of E.coli

The count of E.coli identified in selected food samples at 12 th and 24 th hour is given the table 1 and Figure 1.

TABLE 1: MEAN COUNT OF E.COLI FROM SELECTED FOOD SAMPLE

Sample	12th hour		24th hour	
	APC	E.coli	APC	E.coli
Sample1	2.25±0.09	0.72±0.03	2.29±0.07	0.78±0.04
Sample2	2.54±0.10	1.13±0.21	2.56±0.05	1.17±0.21
Sample3	2.23±0.48	0±0.0	2.28±0.14	0.81±0.22
Sample4	0.45±0.23	0±0.0	1.41±0.06	0.10±0.01

Figure 1: Microbial count of *E.coli* from selected food sample



The higher mean count of *E.coli* was 1.13 ±0.21 and 1.17± 0.21 in 12th and 24th hours respectively in sample 2 in Madurantakam. And sample 4 showed absence of *E.coli* in 12th hour and in 24th hour (0.10±0.01) bacterial counts slightly increased. It shows that the bajji served as a traditional snack near hospital of Madurantakam is prepared and served following unhygienic practice of food handling and improper storage, as the presence of large number of *E.coli* was high in these foods.

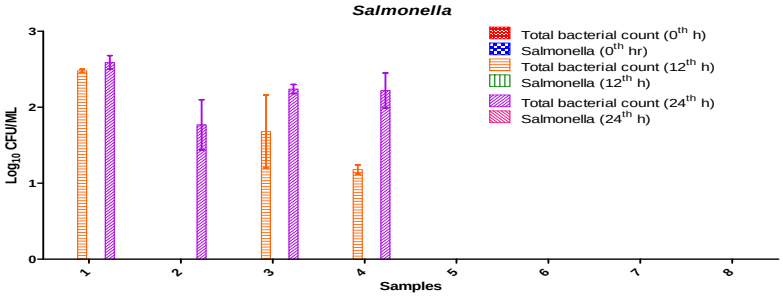
3.1.2. Microbial count of Salmonella

The table 2 and figure 2 gives the microbial count of *Salmonella* at 12 th hours and 24 th hour of incubation of the selected samples.

TABLE 2: MICROBIAL COUNT OF *SALMONELLA* FROM SELECTED FOOD SAMPLES

Sample	12th hour		24th hour	
	APC	Salmonella	APC	Salmonella
Sample1	2.48±0.02	0±0.0	2.59±0.09	0±0.0
Sample2	0±0.0	0±0.0	1.77±0.33	0±0.0
Sample3	1.68±0.48	0±0.0	2.24±0.06	0±0.0
Sample4	1.18±0.06	0±0.0	2.22±0.23	0±0.0

Figure 2: Microbial count of *Salmonella* from selected food sample



The *salmonella* APC (Aerobic Plate Count) in 12th hour was 2.48+_ 0.02 and 2.59+_0.02 in 24th hour showing high count in sample 1 than other samples (i.e) traditional breakfast served near hospital of Madurantakam. The microbiological count high in food indicates inadequate cleaning during preparation, use of contaminated water for cooking, personal hygiene and also the unhygienic storage of these food items during service.

In Puducherry since there was awareness among vendors and the Swatch Bharat Mission was followed it is happy to report that none of the food samples selected near hospital and bus stand reported for presence of *E coli* and *Salmonella* irrespective of their location of vending on closed sewage slab and hence the count of microbes is not represented in tables.

4. CONCLUSION

In conclusion, the street food vendors are ubiquitous and are regarded as potential conduits of food poisoning and infection. But the street food vendors face challenges and struggles in order to maintain their livelihood and also suffer from morbidity. As the food handling practices in most cases were below the standards and food safety guidelines and are inconsistent, the microbial analysis revealed high contamination levels in Madurantakatam. Vendors were not completely ignorant of basic hygienic practices, but consumers also probably do not demand safe food. Street food vending is growing with increasing urban population. It also plays a role in food security of poor and mobile population as street foods are source of inexpensive, convenient and delicious foods. Hence these foods need improvement in terms of variety and nutrient harmony.

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SPECIAL ISSUE

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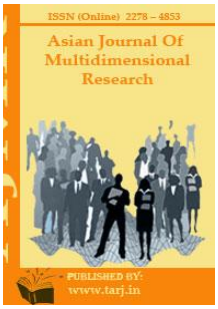

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EFFECT OF BETELLEAF EXTRACT ON OXIDATIVE STRESS INDUCED APOPTOSIS IN SACCHAROMYCES CEREVISIAE

Suleka*; Azhagumeena, C.; Padma, P.R. *****

*M.A.,
Department of Biochemistry,
Biotechnology and Bioinformatics,
Avinashilingam Institute for Home Science and
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

**Department of Biochemistry,
Biotechnology and Bioinformatics,
Avinashilingam Institute for Home Science and
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

***Department of Biochemistry,
Biotechnology and Bioinformatics,
Avinashilingam Institute for Home Science and
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: jvcazhagubio@gmail.com

ABSTRACT

Molecular changes acquired by cancer cells may disturb the apoptotic network. Any agent that can induce apoptosis in cancer cells, at the same time protecting the non-cancerous cells, will be a valuable anticancer drug. The plant kingdom represents an enormous reservoir of biologically active compounds with various chemical structures and protective/disease preventive properties. Piper betle (betel leaves) is one of the important plants in the Asiatic region, which ranks second only to coffee and tea in terms of daily consumption. Several reports have been published on the effects of the plant extract and chemical constituents on different biological activities, including anticancer effect in vitro and in vivo. The present study was formulated to evaluate the anti-apoptotic effect of Piper betle leaf extracts on oxidatively stressed Saccharomyces cerevisiae cells, as a representative of eukaryotic non-cancerous cells. The yeast cells were treated with the aqueous and methanol extracts of Piper betle leaves and the effect of leaf extracts in counteracting the

oxidative stress induced apoptosis was studied by checking viability (MTT assay), cytotoxicity (SRB assay), assessing morphological changes (Giemsa) and nuclear changes (PI, EtBr and DAPI). Our results showed that the leaf extracts of Piper betle exerts a protective effect against H_2O_2 induced oxidative damage in S. cerevisiae cells, indicating their protection towards normal cells in the human body.

KEYWORDS: *Piper betle; viability; cytotoxicity; assessing morphological changes; nuclear changes; oxidative damage.*

INTRODUCTION

Apoptosis is a highly regulated natural process that can remove unwanted, redundant, or damaged cells from multicellular organisms in an orderly, non-inflammatory way. It is characterized by activation of effect or caspases and cleavage of proteins that are essential for cell viability, resulting in DNA fragmentation, chromatin condensation, cell shrinkage, and membrane blabbing (Call *et al*., 2008). Conventional chemotherapy and radiotherapy can induce apoptosis as a secondary consequence of inflicting cell damage. However, more direct and selective strategies to manipulate the apoptotic process in cancer cells are emerging as potential therapeutic tools. Genetic and biochemical understanding of the cellular signaling mechanisms that control apoptosis has increased substantially during the last decade. These advances provide a strong scientific framework for developing several types of targeted proapoptotic anticancer therapies (Ashkenazi *et al*., 2008).

Current cancer treatments include surgical intervention, radiation and chemotherapeutic drugs, which often also kill healthy cells and cause toxicity to the patients (Peer *et al.*, 2007). Thus there is an urgent need for novel therapeutic agents. Natural products are rich source for developing novel anticancer agents (Wang *et al*., 2008). The plant selected for the present study *P. betle* is a perennial creeper cultivated for leaf (Ahuja and Ahuja, 2011). Studies indicated *P. betle* exhibit biological capabilities of detoxification, antioxidant and antimutagenic activities that suggested the chemopreventive activity of *P. betle* against various ailments (Shun *et al*., 2007). It also acts as a stimulant, a breath freshner, a carminative, a cardiac tonic, an astringent and an antiseptic (Ali *et al*., 2010).

The budding yeast *S. cerevisiae* is a powerful model system for the study of basic eukaryotic biology and it has been used as a screening tool for the identification of bioactive small molecules. Many cellular processes are highly conserved between yeast and mammalian cells and observations in yeast often have translated into the discovery of similar process in humans (Gassner *et al*., 2007). *S. cerevisiae* strains have been successfully used to analyze mechanisms of cytotoxicity for a variety of anticancer drugs (Stepanov *et al*., 2008).In the present study we attempted to study the protective effects of *P. betle* leaf extracts against oxidative stress induced by H_2O_2 on yeast cells. The study was formulated with the following objectives 1. To study the effects of *P. betle* leaf extracts on oxidative damage to DNA. 2. To visualize the effects of leaf extract on morphological changes occurring during apoptotic cell death induced by oxidative assault. 3. To analyze the cellular and nuclear events associated with apoptotic cell death.

MATERIALS AND METHODS

Preparation of betel leaf extract

1 g of leaf was ground with 1ml of distilled water in a mortar and pestle. The extracts were centrifuged at 2000 rpm for 10 min and the supernatant was used for the experiments. The extract was prepared fresh on each day of the experiment.

Methanolic extract

1 g of the sample was ground with 10 ml of methanol in a mortar and pestle. The extract was centrifuged at 2000 rpm for 15 min. The supernatant transferred to a beaker was evaporated at 60^{o}C. Air dried the solvent and the residue was dissolved in minimal volume of DMSO.

Treatment Groups

The treatment groups set up for the present study were as follows

1. Untreated (Negative control)
2. H_2O_2 treated (Positive control)
3. Aqueous extract of *P. betle*
4. Methanolic extract of *P. betle*
5. H_2O_2+ Aqueous extract of *P. betle*
6. H_2O_2+ Methanolic extract of *P. betle*

$H_2O_2$was taken at a concentration of 200 µM and the plant extract at a concentration of 400 mg/ml.

Parameters Analyzed

Assay for viability

The viability of the cells in the presence and absence of H_2O_2, with or without leaf extracts was estimated by MTT assay as proposed by Igarashi and Miyazawa (2001).

Cytotoxicity assay

The extent of apoptosis in the cells was studied by Sulphorhodamine B assay as proposed by Skehen *et al*., (1990).

Morphological changes

The morphological characteristics of yeast cells after treatment were observed using phase contrast contrast microscope (Nikon, Japan). Giemsa stain was used for the better visualization of the cells as described by Chih *et al*., 2001.

Nuclear changes

The nuclear changes such as chromatin condensation and fragmentation were investigated in yeast cells by ethidium bromide staining as propidium iodide staining as explained by Sarkar *et al*. (2000) and DAPI staining as proposed by Rashmi *et al*. (2003).

RESULTS AND DISCUSSION

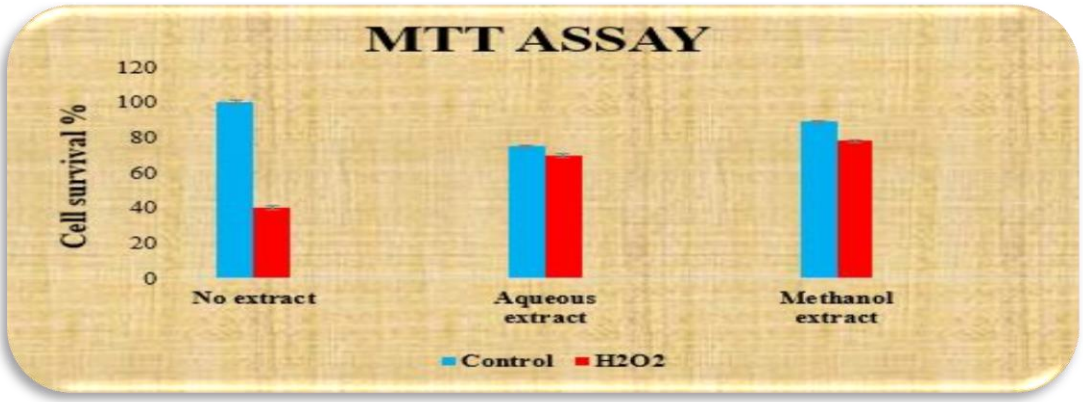
VIABILITY ASSAY

MTT assay

MTT assay was performed in the cells to assess the ability of leaf extract to prevent the cytotoxic event induced by H_2O_2 and the results are depicted in Figure 1. The results showed that the cytotoxic effect induced by H_2O_2 exerts a significant decrease (57%) in cell survival. Co-treatment with leaf extract of *P. betle* and H_2O_2 enhanced cell survival. Moreover, *P. betle* leaf extract was shown to exert a protective effect against H_2O_2 induced cytotoxicity. The methanol extract improved the cell viability more significantly compared to aqueous extract. Anticarcinogenic activity of ethanolic extract of *Piper sarmentosum*, was determined in HepG2 and non-malignant Chang's liver cell lines using MTT assay, showed that the methanolic extracts possessed anticarcinogenic properties in HepG2 cells, while in the non-malignant Chang's liver cell line there was no activity (Ariffin *et al*., 2009). The cytotoxic properties of total methanol extract *Scutellaria litwinowii* and its fractions, investigated on different cancer cell line like AGS, HeLa, MCF-7 and PC12 using MTT assay showed that methylene chloride fraction possessed more toxicity (Tayarani-Najaran*et al*., 2011). From the observations made in our study it is clear that leaf extracts of *P. betle* protected the yeast cells from oxidative injury.

Figure 2

Effect of *P. betle* leaf extracts on the viability of *S. cerevisiae* cells subjected to oxidative stress (MTT assay)

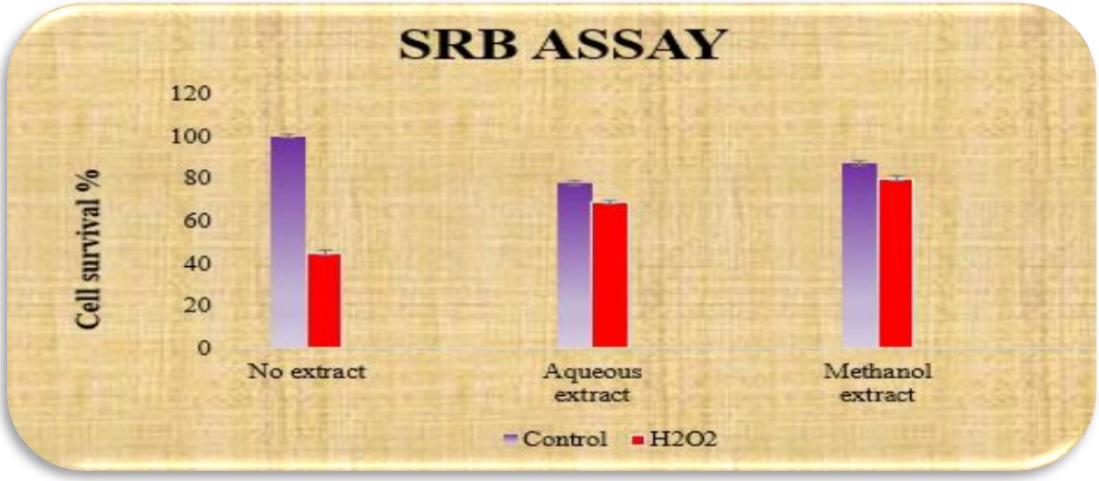


CYTOTOXICITY ASSAY

SRB assay

SRB assay was used to evaluate the cytotoxicity of the cells treated with or without H2O2 and in the presence or absence of *P. betle*leaf extract. The results are depicted in Figure 2. These results indicated that on treatment with H_2O_2, cell viability was significantly reduced from 100% to 48%. The co-treatment of the leaf extract with H_2O_2 increased the viability of the cells when compared to H_2O_2 alone treated group. These results indicated that the leaf extracts exert protective effect against H2O2 induced cytotoxicity, where the methanolic extract had more significant effect when compared to that of aqueous extract.

Figure 2
Effect of *P. betle* leaf extracts on the viability of *S. cerevisiae* cells subjected to oxidative stress (SRB assay)



The methanolic extract of *Semecarpus anacardium* nuts were tested for its cytotoxicity against HeLa and Vero cell lines and was proved that, it has significant cytotoxicity on HeLa cell lines and no significant effect on Vero cell line (Patel *et al*., 2009). Treatment with resveratrol and sulforaphane inhibited the cell proliferation and migration in U251 glioma cells, induced apoptotic cell death through the suppression of prosurvivalAkt and induction of proapoptotic caspase-3 signalling pathways (Jiang *et al*., 2010). Similarty our results showed that the leaf extracts of *P. betle* improved the viability of *S. cerevisiae* cells subjected to oxidative stress imposed by H_2O_2implicating its safety to normal cells.

MORPHOLOGICAL CHANGES

Giemsa staining

The leaf extracts of *P. betle* drastically reduced the number of apoptotic cells in oxidative stress induced cells and thus have a protective effect against H_2O_2induced oxidative stress. The results are given in the Table 1 and is illustrated in Figure 3 and Plate 1. The anticarcinogenic effect of ethanolic extract of Piper sarmentosum could induce apoptosis in HepG2 cells, as proved by May-Grunwald Giemsa staining, AO/EtBr and DNA fragmentation was studied (Ariffin *et al*., 2009). The potential of novel anti-DR5 monoclonal antibody WD1 a new anti-DR5 monoclonal antibody to induce tumor cell apoptosis was studied and was proved that Jurkat cells acquired typical features of apoptosis, including cell shrinkage, membrane blebbing and nuclear pyknosis (Wang *et al*., 2008). The present study showed altered cell morphology induced by H_2O_2which was rescued by the presence of *P. betle* leaf extract. There was not much changes noted in the cells treated with leaf extract alone indicating their non toxicity to the cells. The methanolic extract showed less number of apoptotic cells when compared to the aqueous extract indicating its protective effect.

Table 1
Effect of *P. betle* leaf extract on the morphological changes of *S. cerevisiae* cells subjected to oxidative stress (Giemsa staining)

Samples	Number of normal cells/100 cells		Number of apoptotic cells/100 cells	
	Control	H_2O_2 treated	Control	H_2O_2 treated
No extract	90 ± 1	36±1	10±1	64±2
Aqueous extract	88 ± 1	75±1	12±1	25±1
Methanol extract	89 ± 1	84±2	11±1	16±1

Figure 3
Ratio of apoptosing to normal cells (Giemsa staining)

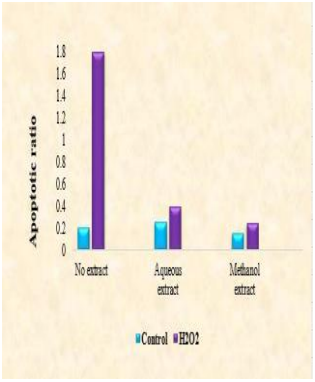
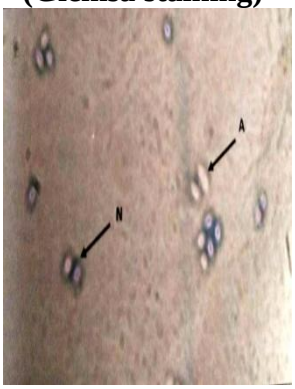


Plate 1
Micrograph of normal and apoptotic cells (Giemsa staining)



NUCLEAR CHANGES

Ethidium bromide staining

The results obtained suggest that the leaf extract of *P. betle* significantly reduced the number of apoptotic cells as evidenced by decrease in apoptotic ratio. As observed from the results the methanolic extract well inhibited apoptosis when compared to that of aqueous extract and the results are depicted in Table 2, Figure 4 and Plate 2. The effect of Saikosaponins –a and –b, was investigated for their chemosensitization effect on cisplatin-induced cancer cell cytotoxicity on two cervical cancer cell lines, HeLa and Siha, an ovarian cancer cell line SKOV3, and lung cancer cell line, A549 by Acridine orange/Ethidium bromide staining (Wang *et al*., 2010a).

Table 2
Effect of *P. betle* leaf extract on the nuclear changes of *S. cerevisiae* cells subjected to oxidative stress (Ethidium Bromide Staining)

Samples	Number of normal cells/100 cells		Number of apoptotic cells/100 cells	
	Control	H_2O_2 treated	Control	H_2O_2 treated
No extract	92 ± 1	28 ± 1	8 ± 2	72 ± 1
Aqueous extract	90 ± 1	80 ± 1	10 ± 1	20 ± 1
Methanol extract	91 ± 1	89 ± 2	9 ± 1	11 ± 1

Figure 4
Ratio of apoptosing to normal cells (Ethidium Bromide staining)

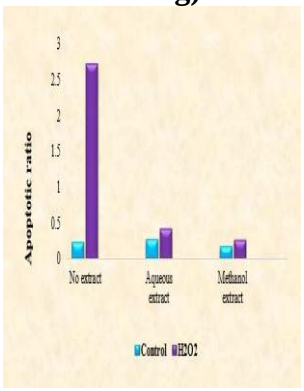
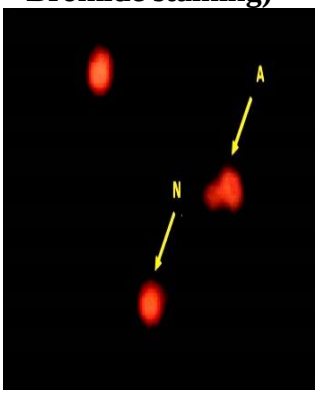


Plate 2
Micrograph of normal and apoptotic cells (Ethidium Bromide staining)



PI Staining

The nuclear changes were studied using PI staining. From the results presented in Table 3 and Figure 5 it is clear that incubation of *S. cerevisiae* cells with H_2O_2 increased the apoptotic ratio. Incubation of cell with betel leaf extract and H_2O_2substantially reduced the apoptotic ratio. These results prove the protective role of *P. betle* leaf extract against the H_2O_2induced oxidative stress. Plate 3 shows the nuclear morphology of both normal and apoptotic cells.

Table 3
Effect of *P. betle* leaf extract on the nuclear changes of *S. cerevisiae* cells subjected to oxidative stress (Propidium iodide Staining)

Samples	Number of normal cells/100 cells		Number of apoptotic cells/100 cells	
	Control	H_2O_2 treated	Control	H_2O_2 treated
No extract	92 ± 1	34 ± 1	8 ± 1	66 ± 1
Aqueous extract	89 ± 1	81 ± 2	11 ± 1	19 ± 1
Methanol extract	90 ± 1	88 ± 1	10 ± 2	12 ± 1

Figure 5
Ratio of apoptosing to normal cells (Propidium iodide staining)

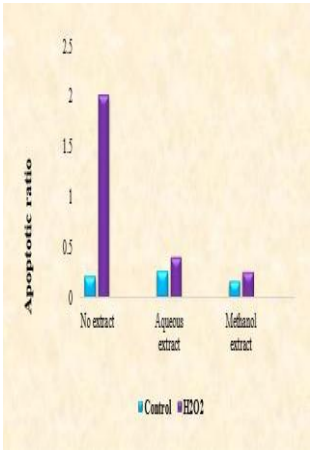
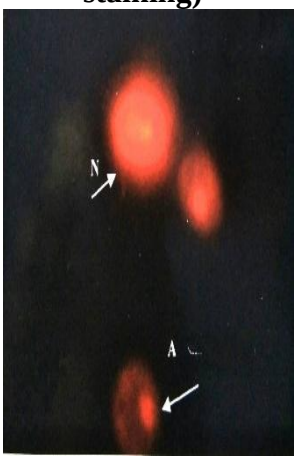


Plate 3
Micrograph of normal and apoptotic cells (Propidium iodide staining)



The potential cytotoxic effects of danthron on SNU-1 cells were investigated for morphological changes and cell viability by the phase contrast microscope and PI exclusion method (Chiang *et al*., 2011). The antioxidant property of esculetin (6, 7-dihydroxycoumarin) against H_2O_2-induced Chinese hamster lung fibroblast (V79-4) damage was investigated. It was proved that radical scavenging activity of esculetin protected the cells from lipid peroxidation, protein carbonyl and DNA damage induced by H_2O_2 (Kim *et al*., 2008).

DAPI Staining

DAPI staining was performed to analyze the nuclear changes like cornering and the results are given in Table 4 that the apoptotic ratio decreased drastically on treatment with betel leaf extract in cells incubated with H_2O_2. This shows that the leaf extracts of *P. betle* exerts protective effect on *S. cerevisiae* cells. The effect of the methanolic extract was found to be better when compared to the aqueous extracts. The results are depicted in Figure 6 and Plate 4. Selaginellin (*Saussureapulvinata*) protected PC12 cells against glutamate toxicity, as determined by characteristic morphological features, lactate dehydrogenase release and cell viability and apoptosis (Wang *et al*., 2010b). The toxicity of glyphosate (G)-based herbicides in Roundup (R) formulations on the cell death mechanism on three different human cells, HUVEC primary neonate umbilical cord vein cells, human embryonic kidney 293 cell line and the human choriocarcinoma derived placental JEG3 cell line was determined (Benachour and Seralini, 2009).

Table 4
Effect of *P. betle* leaf extract on the nuclear changes of *S. cerevisiae* cells subjected to oxidative stress (DAPI Staining)

Samples	Number of normal cells/100 cells		Number of apoptotic cells/100 cells	
	Control	H_2O_2 treated	Control	H_2O_2 treated
No extract	94 ± 2	30 ± 1	6 ± 1	70 ± 1
Aqueous extract	91 ± 1	76 ± 2	9 ± 1	24 ± 1
Methanol extract	93 ± 1	87 ± 1	7 ± 2	13 ± 1

Figure 6
Ratio of apoptosing to normal cells (DAPI staining)

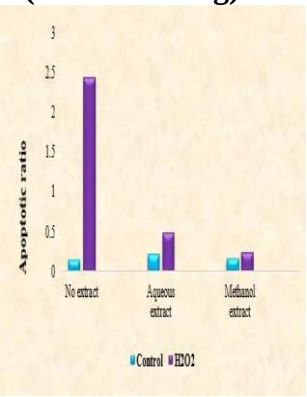
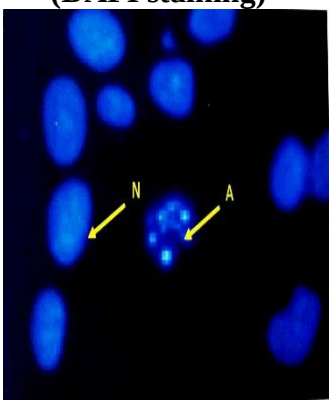


Plate 4
Micrograph of normal and apoptotic cells (DAPI staining)



Thus the present study demonstrated an increase in oxidative stress in H_2O_2 treated cells and a dampening in this increment in cells treated with leaf extracts of *P. betle*. Methanolic extract exhibited better activity compared to the aqueous extract. The ability of *P. betle* to inhibit the apoptosis induced by H_2O_2 could be responsible for the observed cytoprotective activity. The present study also revealed the use of *S. cerevisiae* as a model organism for studying the effect of medicinal plants under conditions of oxidative stress.

SUMMARY AND CONCLUSION

The cell viability assessed by MTT and SRB assays, showed a decrease in the number of viable cells on exposure to H_2O_2. Methanolic betel leaf extract showed high percentage of cell survival in both the MTT and SRB assays compared to the aqueous extract. The morphological changes and nuclear changes were assessed by Giemsa, EtBr, PI and DAPI staining. The morphological changes and nuclear changes were observed in cells treated with H_2O_2 while the cells treated with betel leaf extract and H_2O_2 was similar to that of control cells. These staining procedures revealed the protective role of *P. betle* leaf extract over the oxidative stress assault induced by H_2O_2 in *S. cerevisiae* cells. From the above results, it can be concluded that the leaf extracts of *P. betle* have protective effect against H_2O_2 induced oxidative damage and thus increased the survival of cells. The attributes to the use *P. betle* leaf extract with any chemotherapeutic drug, since it reduces side effect of drugs by protecting normal cells from damage.

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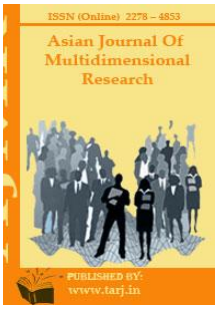

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FORMULATION AND QUALITY EVALUATION OF PIRANDAI POWDER INCORPORATED SPICY DIAMOND CUTS

Aruna M*; Mrs. Sathya Suba R.D**

*MSC Student,
Department of Foods and Nutrition,
Rathnavel Subramanium College of Arts and Science,
Sulur, Coimbatore, Tamil Nadu, INDIA
Email id: aruna2julie@gmail.com

**Assistant Professor,
Department of Foods and Nutrition,
Rathnavel Subramanium College of Arts and Science,
Sulur, Coimbatore, Tamil Nadu, INDIA

ABSTRACT

New product is new to consumers; it may be original product, modified product or new brand. There is an increasing demand for traditional and healthy products among the people nowadays. Making healthier food choices can be challenging, snacks can also provide important nutrients to the diets of adults and children. Pirandai is a perennial plant which contains much sources of vitamins and minerals especially calcium and fibre. So in the present study Spicy Diamond Cuts was selected for incorporation of Pirandai Powder. Pirandai Powder was incorporated at 10%, 20%, 30% and 40% instead of refined wheat flour in standardised recipe. The prepared products along with Standard were subjected to sensory analysis and most acceptable proportion was selected for shelf life study. The Standard and the selected proportion of Pirandai Powder incorporated Spicy Diamond Cuts was packed in air tight container and kept in room temperature analysed for a period of 8 days to find the shelf life. It is an attempt to create awareness about the benefits of Pirandai Powder and to find out the acceptability of the product a popularization study was conducted among 30 adult women. A questionnaire was used to assess the impact of the program. The result of the sensory analysis showed that the Product B with 20% Pirandai Powder scored the highest. The formulated product had a shelf life of seven days without any microbial growth in proper packaging. Most of the women selected for the popularisation study accepted the formulated Product.

KEYWORDS: *Pirandai Powder, Formulation, Nutrient Content, Popularisation*

INTRODUCTION

The new product development involves creating a new product from concept to the market. The new product development process is a complex task that becomes even more challenging in terms of the global market. **(Kasturi shinde, 2016)** The changing of lifestyle pattern and demand for convenience foods have increased the market for snack foods. Snacking is an effective way to fit extra nutrients into the diet and prevent overeating at meals. Choosing healthy snack is crucial. Pirandai is a succulent herbal plant belonging to the family, Vitaceae. It is also known as Adamant Creeper. It is native to India, Bangladesh and Sri Lanka. It is found in Africa and Southeast Asia. It is being imported to Brazil and the southern United States. **(Sirisha Mittapally, 2017)** It is one of the most commonly used medicinal plant in Thailand. It is traditionally used in Africa. All the parts of the plant are used as medicine. It has many therapeutic uses in Ayurveda and Unani. **(Aarthy, 2016)** Various Phytochemicals such as carotene, ascorbic acid, anabolic steroidal substances, calcium and fibre have been reported to be present in Pirandai. **(Savitha, 2018)** Because of its medicinal properties that impact health, Pirandai was powdered and it is added in the snacks. So the present study was undertaken to incorporate Pirandai Powder in Traditional snack.

METHODOLOGY

Spicy Diamond Cuts is one of the crunchy favourite snacks among the Indian Kids. Spicy Diamond cuts are made with plain flour and some spices which are made into dough, rolled, cut into diamond shapes and then deep fried. Pirandai Powder was incorporated at 10%, 20%, 30% and 40% instead of the main ingredients refined wheat flour in the standard recipe in the variations. The sensory attributes of the product was found out using five point hedonic scale by a semi-skilled panel comprising of 30 post graduate students from Department of Foods and Nutrition, Rathnavel Subramaniam College of Arts and Science, Sulur, Coimbatore. The product that scored the highest in the sensory analysis along with the standard was taken for shelf life study and nutrient analysis. The standard and the selected Pirandai Powder incorporated Spicy Diamond Cuts was packed in Air tight container and kept at room temperature for 8 days to assess the shelf life. The microbial analysis was carried out on the 1st day, 4th day and 7th day. The sensory analysis was done after the microbial analysis by the same panel members. The cost of preparing Standard and the formulated Spicy Diamond cuts was calculated. The product was popularised among 30 adult women with a help of questionnaire to create awareness about the health benefits of Pirandai Powder.

RESULT AND DISCUSSION

Mean Sensory Scores of Standard and Pirandai incorporated Spicy Diamond Cuts: The Mean Sensory Scores for the overall acceptability obtained by Standard Product and varying proportions of Pirandai Powder Incorporated Spicy Diamond Cuts was depicted with the help of Score Card. It is clear that among the prepared products, Sample B had the highest Mean Score in all the criteria when compared to other samples like sample A, C and D. So that we can conclude that Sample B was chosen as the best product and subjected to further analysis.

TABLE I MEAN SENSORY SCORES OF STANDARD AND PIRANDAI POWDER INCORPORATED SPICY DIAMOND CUTS

Product	Appearance Mean ± SD	Colour Mean ± SD	Texture Mean ± SD	Flavour Mean ± SD	Taste Mean ± SD
Standard	4.93±0.25	4.8±0.40	4.9±0.30	4.76 ±0.43	4.8±0.40
Sample A	4.53±0.72	4±0.69	2.9±0.60	3.1±0.66	3±0.5
Sample B	**4.43±0.57**	**4.6±0.47**	**4.63±0.49**	**4.4±0.72**	**4.6±0.49**
Sample C	4.43±0.72	3.73±0.73	3.86±0.73	3.63±0.71	3.76±0.62
Sample D	4.53±0.57	3.86±0.81	4.06±0.73	3.66±0.80	3.93±0.73

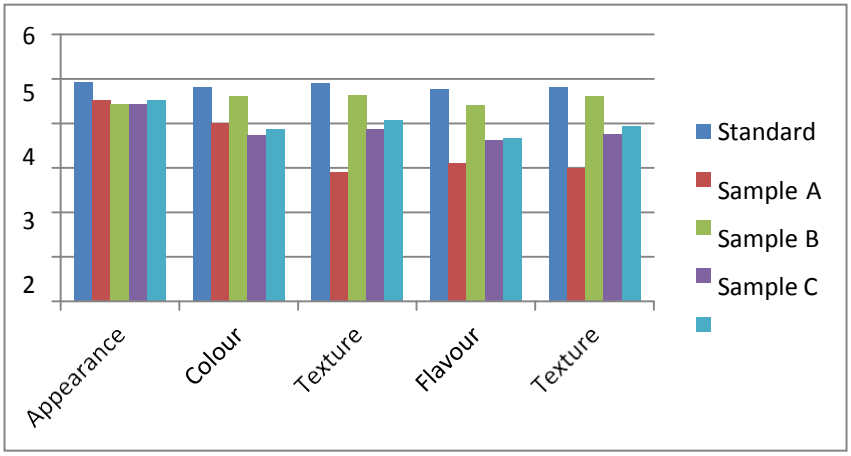

FIGURE 1

Mean Sensory Scores of Standard and Pirandai Powder Incorporated Spicy Diamond Cuts

Comparison of the Standard with the Sample Product: Table II depicts the comparison of the sensory attributes of the Standard and selected proportion of Pirandai Incorporated Spicy Diamond Cuts.

TABLE II COMPARISON OF THE STANDARD WITH THE SELECTED SAMPLE PRODUCT

S.NO.	CRITERIA	SCORE	STANDARD PRODUCT	SELECTED PRODUCT
1.	Appearance	5	4.93±0.25	**4.53±0.72**
2.	Colour	5	4.8±0.40	**4.6±0.47**
3.	Texture	5	4.9±0.30	**4.63±0.49**
4.	Flavour	5	4.76±0.43	**4.4±0.72**
5.	Taste	5	4.8±0.40	**4.6±0.49**

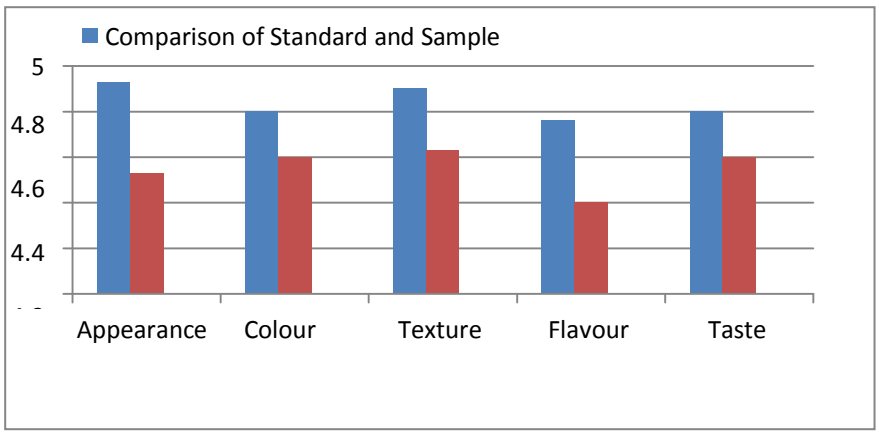

FIGURE 2

Comparison of the Standard with the Selected Sample Product

Nutrient Analysis of Pirandai incorporated Spicy Diamond Cuts: It was observed that the Nutrient Value of Calcium and Fibre is higher in the sample product when compared to standard product. Body uses 99% of its calcium to keep your bones and teeth strength, thereby supporting skeletal structure and function. Fibre helps to feel fuller for longer, can improve cholesterol and blood sugar levels and can assist in preventing some diseases such as diabetes, heart disease and bowel cancer

TABLE III NUTRIENT ANALYSIS OF THE STANDARD AND SELECTED PRODUCT

S. No	NUTRIENT	STANDARD	SAMPLE B
1	Calcium(mg)	34	54.4
2	Fibre (g)	1.8	4.21

Microbial Analysis of the Standard and Selected Product on Storage: From the Table IV it was clear that there was no microbial growth in both Standard and Sample immediately after preparation and on 1st, 4th and 7th day. So, from the result we can conclude that the product is safe for consumption.

TABLE IV MICROBIAL LOAD OF THE STANDARD PRODUCT AND SELECTED PRODUCT ON STORAGE

Day	Name of the product	Indicator Test Result (CPU/gram) and interpretation /Std plate count Air Tight Container			
		G	M/S	US	PH
1st day	Standard	□	-	-	-
	Sample	□	-	-	-
4th day	Standard	□	-	-	-
	Sample	□	-	-	-
7th day	Standard	□	-	-	-
	Sample	□	-	-	-
Remark	On the 7th day after sampling NO contamination and organism was found.				

(Good= **G**; Satisfactory = **S**; Marginal= **M**; Unsatisfactory = **US**; Potentially Hazardous **PH)**

Cost analysis of the Standard and Selected Product: The Cost Analysis revealed that the cost of 100g Pirandai Powder Incorporated Spicy Diamond Cuts was Rs.22 whereas the cost of Standard was Rs.24. Though the Cost of the Standard was slightly higher compared to the Selected Product.

CONCLUSION

From the study, it is concluded that the Pirandai Powder incorporated Spicy Diamond Cuts with 20% of the Pirandai Powder was accepted in studies. The prepared product is high in Calcium and Fibre when compare to the Standard Product. The prepared product is acceptable till 8th day without any microbial analysis if it is stored in Air Tight Container properly. The cost of the best product was higher than standard. In the popularization study most of the adult women accepted the product.

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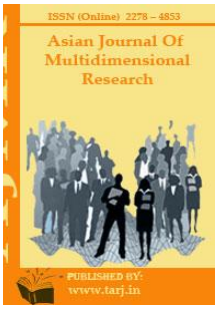

Asian Journal of Multidimensional Research (AJMR)

(Double Blind Refereed & Reviewed International Journal)

UGC APPROVED JOURNAL

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PESTICIDE RESIDUES IN SELECTED FRUIT AND VEGETABLES AND THE EFFECTIVENESS OF HOME BASED METHODS IN REDUCING ITS LEVELS

Dr. Anu Joseph*; Dr. Nisha Vikraman; Aldha Gelu***; K.R. Chithira*****

*Associate Professor,
Department of Home Science,
St. Teresa's College, Ernakulam, Kerala, INDIA
Email id: anujosephstc@gmail.com

**Assistant Professor,
Dept. of Home Science,
St. Teresa's College, Ernakulam, Kerala, INDIA

***Project Fellow,
Dept. of Home Science,
St. Teresa's College, Ernakulam, Kerala, INDIA

***Project Fellow,
Dept. of Home Science,
St. Teresa's College, Ernakulam, Kerala, INDIA

ABSTRACT:

Food *security does not abolish food adulteration. Virtually all items of food in India have chemicals or adulterants added to them, which make them unsafe to various degrees. Food adulteration in India starts from the field itself where fertilizers and pesticides are overused. Therefore one kind of contaminant that is present across all range of food is very high level of pesticide residues. These pesticides are widely used worldwide to control agricultural and household pests. In the present study, commonly used fruit and vegetables were selected and the levels of pesticides were determined. The presence of pesticides particularly organochlorine and organophosphorus compounds which are the common classes of pesticides applied in fruits and vegetables were assessed using gas chromatography (AOAC method) to analyse the presence of pesticides. The effectiveness of different home based treatments commonly practiced such as immersing in salt, turmeric, vinegar, commercially available vegetable wash solution r to reduce pesticide residue levels were determined. The results of the analysis indicated that in the samples of fruit and vegetables tested, all the 16 compounds of organochlorines were present in amounts Below*

Detection Level (BDL). Results of the analysis of organophosphorus compounds indicated that the sample of curry leaves contained high levels of Malathion and parathion-ethyl while the sample of green chilly contained very high levels of parathion-methyl. All the other organophosphorus compounds were found to be below detection level in all the samples. Among the home based treatment methods, salt was found to be most effective in reducing pesticide levels.

KEYWORDS: *Pesticide Residue, Organophosphorus, Organochlorine, Below Detection Level*

INTRODUCTION

In the past, "food security" referred primarily to the adequate supply of and access to food. The concept has since been expanded to preventing contamination. The business of making food appear appealing and attractive often spoils the quality of food. Food adulteration in India starts from the field itself where fertilizers and pesticides are overused. Therefore one kind of contaminant that is present across all range of food is very high level of pesticide residues. Pesticides and insecticides are used as food additives during production and post - production of different foods (Nandakumar, 2016). Pesticides, used during cultivation of crops, can remain as residues in foodstuffs, especially vegetables and fruits.

Pesticides maybe important for food production, but their use might cause potential health risks from both occupational and non-occupational exposures. Pesticides have been implicated in chronic neurotoxicity, endocrine disruption, immune impacts, genotoxicity, mutagenicity and carcinogenesis. Fruits and vegetables contain higher pesticide residue levels compared to other foods of plant origin, because they are mainly consumed raw or semi-processed.

According to Roshni (2017), highest consumed pesticides in India in terms of % usage are organochlorines which constitute 40%, followed by organophosphates 30%, carbamates 15%, synthetic pyrethroids 10% and others 5%. Use of banned pesticides like DDT and BHC for sprinkling on vegetables and fruits and also mixing with food grains as a preservative is rampant (Gahukar, 2014). According to an estimate, an average Indian eats about 40 times more pesticides through food than the average American or Englishman.

Food contaminated with toxic pesticide is likely to be associated with severe effects on human health. Hence emphasis should be given to monitor pesticide residues in agricultural commodities and to standardize simple cost effective methods which can be practiced by home makers to eliminate pesticide residues. Hence the present study was conducted to evaluate the residual concentration of organophosphorous and organochlorine pesticides in selected raw samples of fruit and vegetables. The effectiveness of home based treatments to reduce residual pesticide levels in fruits was also assessed.

METHODOLOGY

Samples of selected fruit and vegetables (250 gs each) namely grapes, green chilly, tomato and curry leaves were collected from local market in Ernakulam, Kerala. Each sample was processed and analysed for organochlorines and organophosphorous compounds which are the common classes of pesticides applied in fruits and vegetables. The 16 compound of organochlorides tested for were aldrin, 4,4-DDD, 4,4-DDE, 4,4- DDT, dieldrin, endosulfan I, endo sulfan II, endosulfan sulphate, endrin, endrin aldehyde, α-BHC, β-BHC, γ-BHC, δ- BHC, heptachlor, heptachlor epoxide. The 8

compounds of organophosphates tested for were azinphos-methyl, demeton, diazinon, ethion, Malathion, parathion- ethyl, parathion-methyl and disulfoton.

Gas chromatography was used to analyse the presence of pesticides by AOAC method 2007.01 (Quechers method).

A comparative study was also conducted to analyse the effectiveness of various home based treatment methods as cited by homemakers to reduce levels of pesticide residues present on fruits and vegetables purchased from the market. The different decontaminating solutions used in the experiment are common salt 1 % (7.5 g of dry salt dissolved in 750 ml water), turmeric 1 % (7.5g of turmeric dissolved in 750 ml water), vinegar 1 % (7.5 ml of vinegar diluted in 750ml water) and commercially available veg wash 1% (7.5ml diluted in 750ml water) .

Samples (grapes, green chilly, tomato and curry leaves) were dipped individually in these treatment solutions for thirty minutes. Samples were then homogenized after chopping into small pieces and the representative sample (2 g) in duplicates was used for residue estimation. Levels of pesticides present were estimated using the formula;

$$\text{Pesticide residue (mg/kg)} = \frac{\text{Area of sample x Std. concentration x volume made up}}{\text{Area of standard x weight of sample}}$$

RESULTS AND DISCUSSION

1. Concentration of organochlorine pesticides in the selected samples of fruits and vegetables

The results obtained on testing for the compounds of organochlorines in the raw samples of fruits and vegetables are given.

TABLE 1 CONCENTRATION OF ORGANOCHLORINE PESTICIDES IN SELECTED SAMPLES OF FRUIT AND VEGETABLES

Organochlorine	Curry leaves	Grapes	Green chilly	Tomato
Aldrin	BDL	BDL	BDL	BDL
4,4-DDD	BDL	BDL	BDL	BDL
4,4-DDE	BDL	BDL	BDL	BDL
4,4-DDT	BDL	BDL	BDL	BDL
Dieldrin	BDL	BDL	BDL	BDL
Endosulfan 1	BDL	BDL	BDL	BDL
Endosulfan 2	BDL	BDL	BDL	BDL
Endosulfan Sulfate	BDL	BDL	BDL	BDL
Endrin	BDL	BDL	BDL	BDL
Endrin Aldehyde	BDL	BDL	BDL	BDL
α-BHC	BDL	BDL	BDL	BDL
β-BHC	BDL	BDL	BDL	BDL
γ-BHC	BDL	BDL	BDL	BDL
δ-BHC	BDL	BDL	BDL	BDL
Hepatachlor	BDL	BDL	BDL	BDL
Heptachlor Epoxide(isomerB)	BDL	BDL	BDL	BDL

The detection limit for the organochlorides was 50 ppb.

***BDL- Below Detection Level **ppb- parts per billion**

It was seen that in all the samples of fruit and vegetables tested, all the 16 compounds of organochlorine were present in amounts Below Detection Level (BDL) which was below 50 ppb. The levels of 4, 4-DDD, endrin aldehyde and heptachlor were comparatively higher than the other parameters in raw green chilly and level of 4, 4-DDE was comparatively higher than other parameters in curry leaves though BDL.

Though the concentration of the various pesticides were well below the established tolerances, continuous consumption of such vegetables even with moderate contamination level can accumulate in the receptor's body and may prove fatal for human population in the long term.

2. Concentration of organophosphorus pesticides in the selected samples of fruits and vegetables

The results obtained on testing for the compounds of organophosphorus in the samples of fruit and vegetables are presented in Table 2.

TABLE 2 CONCENTRATIONS OF ORGANOPHOSPHORUS PESTICIDES IN SELECTED SAMPLES OF FRUIT AND VEGETABLES

Organophosphorus	Curry leaves	Grapes	Green chilly	Tomato
Azinphos-methyl	BDL	BDL	BDL	BDL
Demeton	BDL	BDL	BDL	BDL
Diazinon	BDL	BDL	BDL	BDL
Ethion	BDL	BDL	BDL	BDL
Malathion	**1728 ppb**	BDL	BDL	BDL
Parathion ethyl	**661 ppb**	BDL	BDL	BDL
Parathion-methyl	BDL	BDL	**9565 ppb**	BDL
Disulfoton	BDL	BDL	BDL	BDL

***The detection limits of organophosphates are 100 ppb.**

Among the selected samples, curry leaves contained high levels of malathion and parathion-ethyl (above BDL) and green chilly also contained very high levels of parathion-methyl (above BDL). All the other parameters were found to be below detection level in all the samples.

The result of the present study is in compliance with a pesticide residue analysis report of samples of vegetables, fruits, and condiments collected from outlets in different districts. The report says that the analysis detected residues of hazardous materials in curry leaves, green chilli, mint leaves, coriander leaves, and cowpea (Roshni, 2017). High pesticide levels, above the level of detection cause several diseases, even cancer. Thus it is important to identify proper effective methods for reducing the effect of such pesticides over the fruits and vegetables.

Effectiveness of home based methods on reducing the concentration of organochlorines and organophosphorus in selected samples of fruit and vegetables

Methods to reduce the level of the pesticide in fruit and vegetables before consumption using home based treatments were tested for.

Effectiveness of home based treatments on reducing the concentration of residual organochlorine pesticides

The results obtained on testing for the reduction in the parameters of organochlorine in the samples of fruit and vegetables treated with home based solutions are given.

TABLE 3 EFFECTIVENESS OF HOME BASED TREATMENTS ON CONCENTRATION OF ORGANOCHLORINE

Sample	Organo chlorine	Pre treatment sample	Treatment with salt	Treatment with turmeric	Treatment with vinegar	Treatment with veg. wash
Grapes	16pesticides	BDL	BDL	BDL	BDL	BDL
Tomato	16pesticides	BDL	BDL	BDL	BDL	BDL
*Curry leaves	4,4' DDE	**14.5ppb (BDL)**	BDL	BDL	BDL	BDL
*Green chilly	4,4' DDD	**8.44ppb (BDL)**	BDL	BDL	BDL	BDL
	Endrin aldehyde	**8.71ppb (BDL)**	BDL	BDL	BDL	BDL
	Heptachlor	**12.36ppb (BDL)**	**BDL (100%)**	**BDL (100%)**	**8.14 ppb (34%)**	**BDL (100%)**

The detection limit for the organochlorides was 50 ppb.

*All other organochlorine compounds of curry leaves (15) and green chilly (12) were found in low concentrations

The concentration of the 16 organochlorine pesticides was BDL in all the samples even before treatment. The treatment methods only reduced the residual concentration further. All the treatment methods were effective in reducing the levels of all organochlorines in curry leaves and tomato except for heptachlor. Hepatochlor levels were more effectively reduced with salt, turmeric and veg wash solutions followed by vinegar. In the samples of grapes and tomato since the initial level of organochlorines were BDL, it was not possible to identify the effect of treatments.

In a study on 'methods for removal of pesticide residues in tomato' by Vemuri (2014) it was proved that, by washing with 2% salt water, dimethoate is reduced to 78%, 82% of reduction in methylparathion, quinolphos reduced to 91%. Endosulfan has got reduction up to 89% and 88.20% of reduction shown in profenophos. Washing with 2% salt water yielded very good effect in the removal of the residues below MRL levels.

Effectiveness of home based treatments on reducing the concentration of residual organophosphorus pesticides

The results obtained on testing for the reduction of organophosphorus levels in the samples of fruits and vegetables treated with home based solutions are given in the below table.

TABLE 4 EFFECTIVENESS OF HOME BASED TREATMENTS ON CONCENTRATION OF ORGANOPHOSPHORUS

Item	Organo phosphorus	Pretreatment sample	Treatment with salt	Treatment with turmeric	Treatment with vinegar	Treatment with vegwash
Grapes	8pesticides	BDL	BDL	BDL	BDL	BDL
Tomato	8pesticides	BDL	BDL	BDL	BDL	BDL
Curry leaves	Malathion	**1728 ppb**	BDL	BDL	BDL	BDL
	Parathion	**661 ppb**	BDL	BDL	BDL	BDL

	ethyl					
Green chilly	Parathion methyl	**9565 ppb**	**Nil (100%)**	**9507 ppb (0.6%)**	**8604 ppb (10%)**	**8934 ppb (6.6%)**

***The detection limits of organophosphorus are 100 ppb.**

The results indicated that on treatment with the various home based methods, salt was most effective followed by vinegar while treatment with turmeric was least effective in bringing down the level of pesticide residue in the samples.

The selected samples of grapes and tomatoes originally contained pesticides below the detection level (0.1 ppm) except for curry leaves and green chilly. Curry leaves showed presence of malathion (1.73 ppm) and parathion ethyl (0.66 ppm) above detection level. Parathion methyl was present in the sample of green chilly in quite a high concentration (9.565 ppm).

On treating with all the solutions the level of Malathion and parathion ethyl in curry leaves present was reduced to BDL probably because of its presence in low levels.

In green chilly while parathion methyl was completely removed by salt water (100%), with water alone the level was reduced by 32%, in vinegar by 10%, commercial veg wash by 6% and turmeric by 0.6%.

In a study conducted by National Canners Association (2000), loosely held residues of several pesticides on various fruits and vegetables are removed with reasonable efficiency by types of washing processes normally used in home or commercial preparation.

CONCLUSION

The study revealed that in the samples of vegetables and fruit tested, organochlorine pesticides were present though in concentrations below detection level (BDL). Curry leaves contained the organophosphorus pesticides malathion and parathion-ethyl in low concentrations above the detection level while green chilly contained very high levels of parathion-methyl. Among the home based treatments, immersing in 1% salt solution for 30 minutes was most effective for reducing the concentration of pesticide residue.

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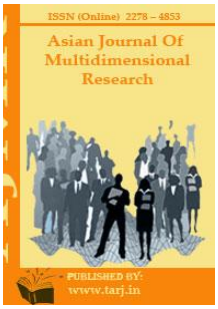

Asian Journal of Multidimensional Research (AJMR)

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ASSESSMENT OF DIETARY HABITS, PHYSICAL ACTIVITY AND MENSTRUAL HEALTH OF THE SELECTED COLLEGE GIRLS AGED 17 TO 20 YEARS

Dr. Lalitha Ramakrishnan*; K.Geethanjali**

*Former Head of the Department,
Department of Nutrition and Dietetics,
PSG College of Artsand Science,
INDIA

**M.Phil. Scholar,
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women, INDIA

ABSTRACT

According to WHO, adolescence are the individuals between the age of 10 and 19 years. It is the period of transition from childhood to adulthood with accelerated physical, biochemical and emotional development. Food choice of adolescents depends on a number of factors influencing human psyche in a different way.The phenomenal growth that occurs in adolescence increases the demands for energy and nutrients. Physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure. Regular physical activity have several physical and mental health benefits. Menstrual cycle is a repetitive phenomenon due to the interaction of hypothalamic-pituitary-ovarian system. Menstruation causes psychological changes such as irritability, mood liability, depression and anxiety and physical symptoms such as breast tenderness, diarrhoea, back pain, vomiting and fluid retention. Two hundred adolescent girls (17-20 years) were selected for the study from PSG College of Arts and Science. A questionnaire was formulated for collection of general information, dietary habits, physical activity and menstrual health. The collected data were consolidated and statistically analysed. The mean height and weight of the study participants of all age group was lower than the ICMR standard. Half of the study populations were skipping their breakfast and one fourth of the populations avoid eating in spite of being hungry. The physical activity of the adolescent girls in the study was significantly low. Irregular menstruation was reported by one fourth of the girls and they were also experiencing menstrual symptoms such as pain, tiredness, vomiting, headache and mood swings. Minimum percent (5.5) of the study participants were found with Polycystic Ovarian Syndrome.The maximum mobile usage was 4 hours

to 5 hours per day that may greatly influence the sleeping pattern. Nutrition education was given on the importance and benefits of diet and physical activity and Polycystic Ovarian Syndrome.

KEYWORDS: *Dietary Habits, Adolescents, Physical Activity, Menstruation, PCOS*

INTRODUCTION

According to WHO, adolescence are the individuals between the age of 10 and 19 years. It is the period of transition from childhood to adulthood with accelerated physical, biochemical and emotional development. Many physical and mental changes occurs due to the influence of hormones (Stang and Story, 2005). The phenomenal growth that occurs in adolescence increases the demands for energy and nutrients. Nutrition and physical growth are integrally related; optimal nutrition is a necessary for achieving full growth potential. Failure to achieve an adequate nutrition at this time can result in delayed sexual maturation and can slow the growth. At the peak of the adolescent growth spurt, the nutritional requirements may be twice as high as those of the remaining period of adolescence.

The diet consumed by the human beings is not same. So, the dietconsumed may or may not provide adequate nutrients for the body. The nutritional need also varies from infancy to old age i.e. throughout the life cycle. The quantity of nutritional constituents may be excess in someone diet causing over growth, increased weight of the body or the quantity of the nutritional constituents in daily diet in some cases may be deficient resulting in deprivation and poor health(Pattanaik, 1996). Food choices have an impact on providing the nutritional needs of an individual (Bbicz, 2006). Food choices depends on physiological (sensory, genetic, endocrinology etc) and psychological (preferences, moods, phobias etc.) (Bove et al., 2003)

Any bodily movement produced by skeletal muscles that require energy expenditure is defined as Physical activity. WHO recommends 60 minutes of moderate to vigorous intensity physical activity daily for adolescents (Global recommendation; WHO). Regular Physical activity have many health benefits including maintaining blood pressure, body weight, increases high density lipoproteins, reduce triglyceride concentration. In addition physical activity also improves mental health. Physical activity is one of the strategies for treating mental related illness such as stress and depression (Thompson et al., 2003).

Menstrual cycle is a repetitive phenomenon due to the interaction of hypothalamic-pituitary-ovarian system. Menstrual period causes psychological changes such as irritability, mood liability, depression and anxiety and physical symptoms such as breast tenderness, diarrhoea, back pain, vomiting and fluid retention. Menstrual cycle occurs every 28 days. Menstrual period also influence the academic performance of women students. Heavy and painful menstrual period affects the academic and social lives of the womem. Mental status also changes during and days before menstrual period (Fujiwara et al., 2007).

OBJECTIVE OF THE STUDY

- To assess the dietary habits among college girls
- To evaluate the physical activity amid college girls
- To assess the menstrual health among college girls

METHODOLOGY

The study was conducted in PSG College of Arts and Science becauseof easy proximity, familiarity and convenience. The population for the study comprised of 200 female students of first and second year under graduate courses. The subjects selected for the study fell in the age group between 17-20 years of age.A questionnaire was framed to assess the dietary habits, physical activity and menstrual health of college girls.The purpose of the study and the procedures of the investigation was explained to the participants. Then the self-administrated questionnaire was distributed and doubts regarding the questions were cleared.The data was collected in relation to anthropometry, dietary habits, physical activity and menstrual health.

Anthropometric Assessment

Height -The height is measured using a stadiometer. The students stood bare footed with legs together and the head positioned straight, arms hanging freely by the side and the head, back and buttocks and heels in contact with the scale. A scale is bought onto the topmost point of the head with sufficient pressure to compress hair and height was recorded.

Weight-Weight is measured using a weighing balance. The balance is set to zero before reading. Students stood bare foot and facing straight and arms resting at the side. Then the weight of the student was recorded.

Body Mass Index -Body Mass Index is a simple index of weight for height that is commonly used to classify underweight, overweight and obesity. BMI was calculated using the formula weight in kg divided by height in m^2.

Body Fat-Body fat analyser is used to measure the percentage of fat in the human body. Gender, Height, weight and age was set in the body fat analyser and student is asked hold thehand held in front of them and start button is pressed and the reading are displayed in the screen.

Dietary habits, Physical activity and menstrual health:

Dietary information regarding type of diet, meal timing, snacking pattern,food frequency, volume of water consumed, frequency of eating in restaurant and breakfast skipping was collected using the questionnaire.

Details on Physical activity pattern, type of exercise preferred, exposureto sun light, sleep timings were collected.

Information regarding age at menarche, symptoms during menstruation,menstrual problems and presence of polycystic ovarian syndrome wascollected.

Statistical Analysis

The data collected are consolidated and tabulated. Mean and standard deviation are the statistical tools used in the study.

Nutrition education

The nutrition education emphasised on importance of diet, benefits of physical activity and awareness about Polycystic Ovarian Syndrome among adolescent girls.

RESULT AND DISCUSSION

Majority of the participants (83 percent) were in the age group of 18-19 years and minimum of 4.5 percent belong to 20 years of age.The participants of the study were classified as per their age and their mean height was calculated. The mean height of selected adolescent girls ranged from 156.7± 6.8 to 158.5 ± 8.5 cm (Table 1).The height of the girls was compared with the ICMR standard (2010).The mean height of the participants was lower than the ICMR standard height for their respective age(Figure 1).The mean body weight of 17 years old girls was found to be higher (54.12±12.2) than 20 years old girls (50.9± 7.0). Not much of a difference in body weight was observed between 18 and 19 years old girls.The mean weight of the girls was compared with the ICMR standard (2010). The mean weight of study participants of 17 age was higher than the ICMR standard weight and the mean weight of selected adolescent girls of 18, 19 and 20 years of age was lower than the ICMR standard weight of respective age.The mean BMI was reported to be higher among 17 and 18 years of study participants than 19 and 20 years of age of the participants (Table 1).The mean BMI of 17, 18 and 19 was higher than the ICMR standard BMI whereas the mean BMI of 20 years was lower than the ICMR standard. Sixty two percent of the selected girls arewith normal BMI, followed by 23.5 percent underweight and 12.5 percent areoverweight and a meagre of 2 percent as obese.The mean body fat percentage of the adolescent girls in the study was 24.69 + 6.13.34 percent of adolescent girls were categorised under lean body fat, 29 percent with normal body fat, 29.5 percent with latent obesity and 7.5 percent obese.

Age	Mean height (cm)	Mean weight (kg)	Mean BMI
17	158.4 ± 4.4	54.12 ± 12.2	21.5 ± 4.6
18	157.7± 6.4	52.9 ± 10.18	21.6 ± 3.9
19	156.7± 6.8	52.18 ± 9.8	21.1 ± 3.8
20	158.5 ± 8.5	50.9 ± 7.0	20.0 ± 2.3

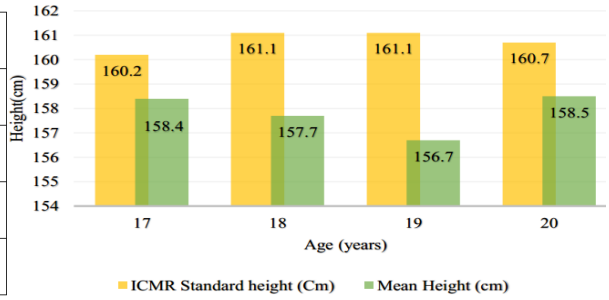
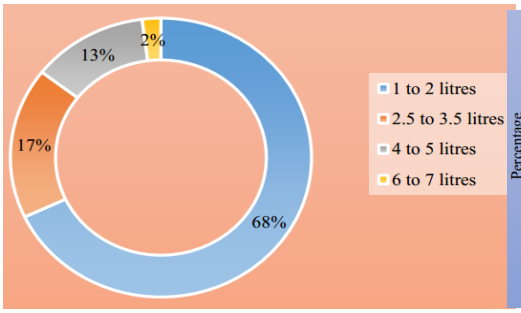


Table 1 Mean height, mean weight and mean BMIFigure 1 Mean height compared with ICMR Standard value

Fifteen percent of the adolescent girls consumed vegetarian food while four percent and 8.5 percent were lacto vegetarians and ova vegetarians. Majority of the adolescent girls consumed three meals per day i.e. Breakfast, lunch and dinner and 27.5 percent consumed two meals a day and eight percent of them consumed four meals a day. A meagre (10.5) percentage of the girls in the study did not consume snacks regularly, 68 percent consumed snacks once and 21.5 percent of them consume snacks twice a day.

Figure 2 indicatessixty eight percent of the girls in the study drank 1 to 2 litres of water a day, 17.5 percent of them drank 2.5 to 3.5 litres of water, 12.5 percent drank 4 to 5litres of water and two percent drank 6 to 7 litres of water a day.Figure 3 represents that only one percent eat in a restaurant daily, 49.5 percent eat once or twice in restaurant in a week, 14.5 percent eat 3 to 5 times in a week, and 13.5 percent eat more than 6 times in a week and 21.5 percent do not eat in restaurant in a week.



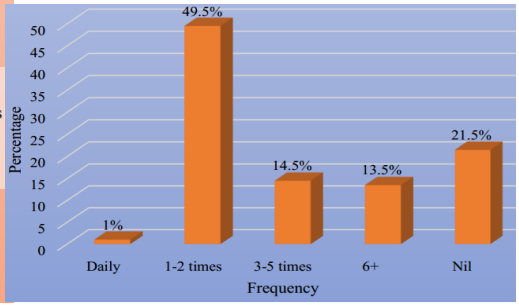


Figure 2 Volume of water consumedFigure 3 Frequency of eating in restaurant in a week

Forty eight percent of the girls skip their breakfast and 52 percent of them do not skip their breakfast.Lack of time, not feeling hungry and dislike of food were the reason found to skip breakfast. Twenty eight percent of the participants eat more when they are angry and 72 percent told they do not eat more when they are angry.Most of the girls (79.5 percent) do not continue to eat after feeling full and 20.5 percent of the girls continue to eat after feeling full.

Majority of the students are not involved in regular exercise. Only 20 percent of the adolescent girls do regular exercise and remaining 80 percent were not involved in regular exercise.Fifty one percent of the adolescent girls in the study walk only for half an hour a day, 35.5 percent walk for 1 hour a day, 8.5 percent of the girls walk for 1 and half an hour a day, 5 percent of the girls walk 2 hours a day. Only 13.5 percent of the adolescent girls participated in the study are involved in sports activity and remaining 86.5 percent are not involved in sports.

Fifty nine percent of the adolescent girls in the study are exposed to sun light for half an hour, 28.5 percent are exposed for 1hour, 8 percent are exposed to sunlight for 1 and half hour and 4.5 percent are exposed to sunlight for 2hours in a day.Most of the girls (45 percent) sleep for less than 8 hours and 37.5 percent sleep for 8hours, seven percent sleep formore than 8hours.

Most the adolescent girls in the study have regular menstrual period. Most of the study participants (69.5 percent) had regular menstrual period and 30.5 percent of the girls have irregular period.

Figure 4 shows twenty five percent of the adolescent girls in the study had pain during the menstrual period, 29 percent of the girls experience tiredness, 21 percent experience back pain, 7 percent experience nausea/vomiting, 7 percent experience headache and 11 percent experience mood swings during the menstrual period.

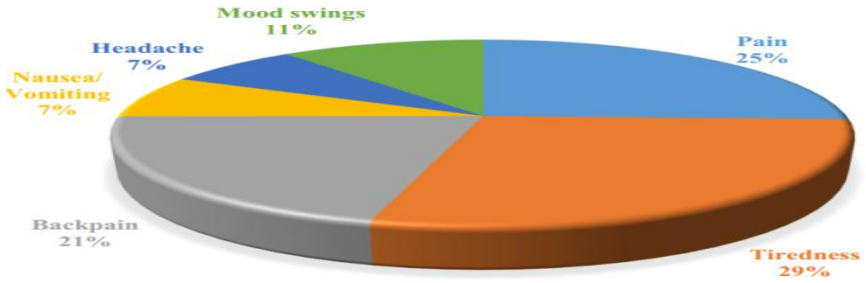


Figure 4 Symptoms experienced during menstrual periods

Only nine percent of the adolescent girls take medication during pain and remaining 91 percent do not take medication for the pain. Only 5.5 percent of the adolescent girls participated in the study have Polycystic Ovarian Syndrome and remaining 94.5 percent do not have Polycystic Ovarian Syndrome.

CONCLUSION

The mean height and mean weight of the study participants of all age group was lower than the ICMR standard.Half of the study population were skipping their breakfast and onefourth of the population avoid eating in spite of being hungry. The physical activity of the adolescent girls in the study was significantly low. Irregular menstruation was reported by one fourth of the girls volunteered for the study also experiencing menstrual symptoms such as pain, tiredness, vomiting, headache and mood swings. Only 5.5 percent of the study participants was found with Polycystic Ovarian Syndrome. They were given awareness on health effects, dietary intake and physical activity as a measure of correcting Polycystic Ovarian Syndrome.

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SPECIAL ISSUE

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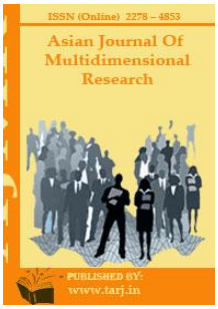


Asian Journal of Multidimensional Research (AJMR)

(Double Blind Refereed & Reviewed International Journal)

UGC APPROVED JOURNAL

IMPACT OF NUTRITION EDUCATION ON HOUSEHOLD FOOD SAFETY AMONG URBAN WOMEN IN COIMBATORE

K. Devi*; P. Sujithra**

*Assistant Professor,
Avinashiligam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: devi.karuthapandian@gmail.com

**M.Sc. Scholar,
Avinashiligam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Food safety is an embodiment of food and nutrition security. Household food safety is the key step to attain food safety at national, which is the need of the hour towards public health threats in the present trend. This study was attempted to design and develop a home food safety questionnaire according to WHO (2006), the questionnaire has five food key principles of food hygiene such as, (i) keep clean, (ii) separate raw and cooked foods, (iii) cook foods for the appropriate temperature, (iv) store food at the proper temperature, (v) use safe water and safe raw materials was used to collect information on knowledge, attitude and self-reported behaviour of household food safety. Convenient sampling method was used to select urban areas of Coimbatore city. Women who were play the main role to responsible for food handling in their household (n=30) were selected randomly from three urban areas in Coimbatore city. Nutrition education was executed as an intervention strategy based on the assessment of knowledge, attitude and behaviour on household food safety based on WHO's five keys on food safety. The results between pre and post-test of nutrition education revealed the significance of difference on knowledge, attitude and self-reported behaviour on food safety among urban women (P<0.05). Hence, the study proved the importance of nutrition education on household food safety among women.

KEYWORDS: *Food safety, Nutritional security, Nutrition education, WHO safety keys*

INTRODUCTION

Food safety is defined as the degree of confidence that food will not cause harm to the consumer when it is prepared, served and eaten according to its intended use (FAO/WHO, 2003). Food safety is a global health goal and foodborne diseases are a major health issue (Velusamy *et al.*, 2010).

Poor food handling and hygiene practices in the domestic kitchen are thought to cause a significant number of food borne illnesses. Micro-organisms can cause a variety of effects in food products including spoilage, which primarily affects product quality, and food poisoning (Priyadarshini, 2015).

Food safety knowledge, attitude and socio-demographic factors, educational level and ethnicity of hawkers or mobile food handlers can influence of their knowledge in food safety practices (Toh *et al.*, 2000).

The most common food handling mistakes include serving contaminated foods, inadequate cooking, heating and re-heating foods, obtaining foods from unsafe sources, cooling and storage of foods in inappropriate ways and allowing too much of a time lapse (Badrie & Duncan, 2006). Separating raw and cooked food is important in minimizing food contamination (Tegegne *et al.*, 2017).

Household food safety indicators includes food handling practices and knowledge, microbial quality of foods and water used in the household. Food safety variables were, food handling practices (self-reported and observed practices), food handling knowledge and microbial quality of water and food collected from the households. Hence the study was attempted to assess the impact of nutrition education on knowledge, attitude and selfreported bhaviours on household food safety among urban women.

METHODOLOGY

A) Selection of area

Convenient sampling method was chosen to select urban areas Ramalingam colony, Saibaba colony and Alaganandhan Street based on the convenience of vicinity to investigator and acceptability of responses from participants.

b) Selection of sample

A total number of 30 houses were selected inclusive of 10 houses from each of Ramalingam colony, Saibaba colony and Alaganandan street using simple random sampling method so that 30 household women inclusive of 15 house wives and 15 working women in the range of 25-55 years of age, were selected in the study.

c) House hold food safety

The interview method of collecting data was adopted using household food safety questionnaire by WHO (2006). The questionnaire consisted of totally 31items for food safety, inclusive of 11 items on knowledge, 10 items on attitude and 10 items on self-reported behavior. The whole questionnaire covered the five key areas of food safety namely (1) keep clean; (2) separate raw and cooked; (3) cook thoroughly; (4) keep food at safe temperatures; and (5) use safe water and raw materials (WHO,2006).

d) Impact of Nutrition Education Strategy

Educational materials such as WHO's leaflets and pamphlets focusing food safety and slideshows on balanced foods, food pyramid on balanced dietary intake were prepared and nutrition education was

given to household women subjects for three consecutive days to bring out behavioral changes in house hold food safety practices among family members at house hold level. Impact of education was assessed before and after education on knowledge, attitude and self supported behaviours of food safety among subjects of the study.

RESULTS AND DISCUSSION

(i). Distribution of subjects based on age

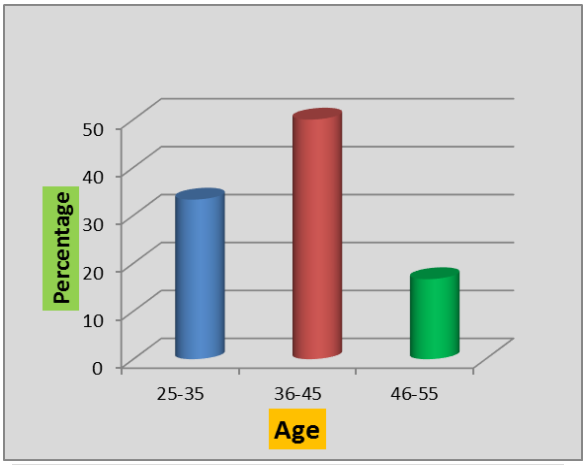


Figure 1
Distribution of sample based on age

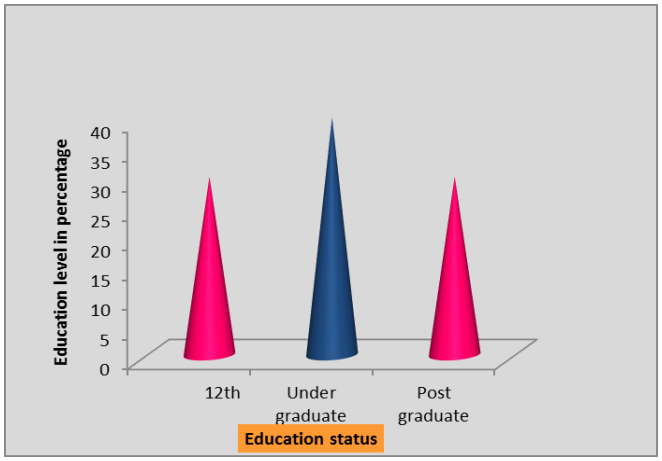


Figure 2
Distribution of sample based on education

Age wise distribution of sample is illustrated in Figure 2. As shown in figure 1, distribution of women was 33.3, 50 and 16. 7 per cent between the age group of 25 – 35 years, 36-45 years and 46 – 55 years respectively. Hence the women in the age group of 36-45 years were highest number of participants than other groups in the study.

c) Impact of Nutrition Education on Household Food Safety

House hold food safety was assessed on knowledge, attitude and self-supported behaviours among urban women sample of the study. Nutrition education was implemented to improve knowledge, attitude and practices on household food safety among urban women of the study. The results were discussed on the impact of nutrition education on improving the knowledge, attitude and self-supported behaviours among sample of the study.

(i). Impact of nutrition education on house hold food safety knowledge

The impact of nutrition education on improving the knowledge on household food safety is illustrated in Figure 3a. Mean score of knowledge was 8.200 and 10.5 before and after education. The impact of education on increasing the score of knowledge on household food safety was found to be significant by observing the significant difference in mean score of knowledge before and after education ($P < 0.05$) by paired‘t’ test.

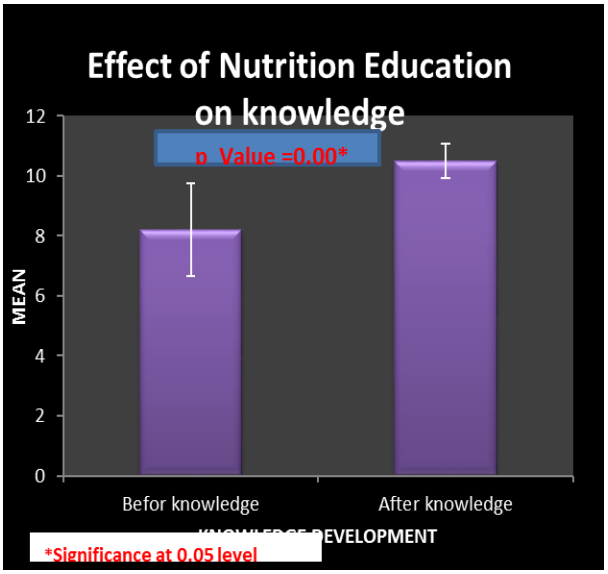
(ii). Impact of nutrition education on attitude of household food safety

The impact of nutrition education on improving the attitude on household food safety is illustrated in Figure 3b. Mean score of attitude was 7.8 and 9.66 before and after education. The impact of education on increasing the score of attitude on household food safety was found to be significant by

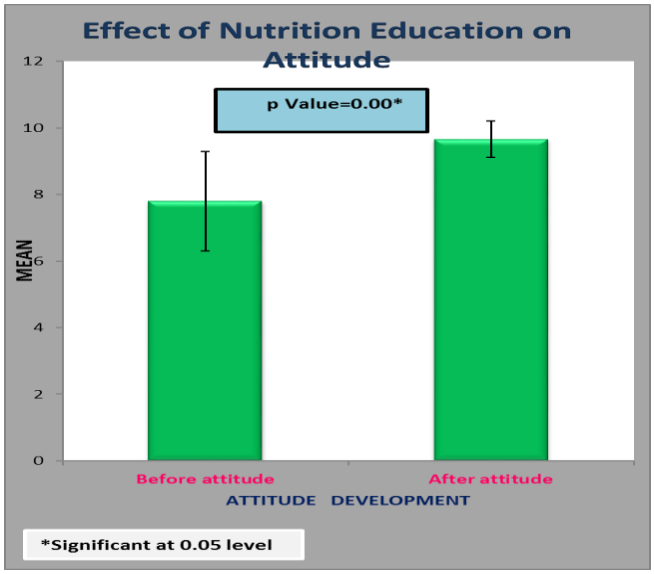
observing the significant difference in mean score of attitude before and after education ($P < 0.05$) by paired't' test.

(iii). **Impact of nutrition education on self- supported behaviours of household food safety**

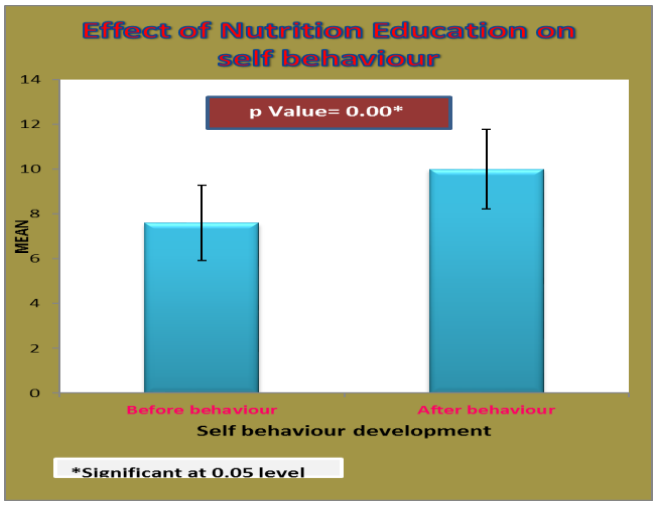
The impact of nutrition education on improving the behaviours on household food safety is illustrated in Figure 3a. Mean score of behaviour was 7.6 and 10.0 before and after education. The impact of education on increasing the score of behaviour on household food safety was found to be significant by observing the significant difference in mean score of behaviour before and after education ($P < 0.05$) by paired't' test.



a. Knowledge



b. Attitude



c. Self Reported Behaviour

Figure 3
Impact of Nutrition Education on Household Food Safety among Urban

d) Microbial Analysis of Food Sample

TABLE I MICROBIAL ANALYSIS OF FOOD SAMPLES

FOOD SAMPLE	HOUSES WITH NUTRITION EDUCATION			HOUSES WITHOUT NUTRITION EDUCATION	
	HOUSE 1 Cfu/gm	HOUSE 2 Cfu/gm	HOUSE 3 Cfu/gm	HOUSE 4 Cfu/gm	HOUSE 5 Cfu/gm
Batter	$190.0*10^4$	$212.0*10^4$	$160.0*10^4$	$240.0*10^4$	$232.0*10^4$
Tomato	$156.0*10^4$	$148.0*10^4$	$142.0*10^4$	$160.0*10^4$	$170.0*10^4$
Chilly	$11.0*10^4$	$09.0*10^4$	$13.0*10^4$	$11.0*10^4$	$12.0*10^4$
Corriader leaves	$68.0*10^4$	$66.0*10^4$	$74.0*10^4$	$88.0*10^4$	$80.0*10^4$

Table 1 explains the difference in total colony count in foods stored in refrigerator for two days from houses imparted and not imparted nutrition education. Batter showed the range of colony count between 160 and 190 x 10^4 cfu/g in houses imparted with nutrition education and $232X10^4$ and $240X10^4$ cfu/g in houses not imparted with nutrition education. Tomato was observed with total colony count between 140 and 156 x 10^4 cfu/g in houses imparted with nutrition education and 170 and 160 x 10^4 cfu/g in houses not imparted with nutrition education. Chilly was found with total colony count between 9 and 13 x 10^4 and between 11 and 12 x 10^4 cfu/g in houses with education and without education respectively. Coriander leaves were counted with total colony count between 66 and 74 X 10^4 in houses imparted with education and 80 and 88 X 10^4 cfu/g in houses not imparted with nutrition education.

CONCLUSION

The present study showed that there was the lack of knowledge, attitude and practices on household food safety among urban women and proved the need of food safety education. It was found that nutrition education had the great impact on improving the knowledge, attitude and self-reported behaviour among the selected urban women of the study. Microbial analysis revealed the changes in the storage practices of food stuffs with the impact of nutrition education on household food safety among urban women.

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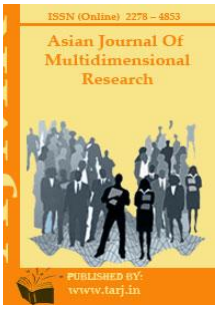

Asian Journal of Multidimensional Research (AJMR)

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UGC APPROVED JOURNAL

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IMPACT OF TRAINING ON FRUITS AND VEGETABLE PRESERVATION IN SELECTED VILLAGES OF COIMBATORE

Dr.R.Jansi Rani*

*Assistant Professor (SS),
Department of Home Science Extension Education,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: jansi3393@gmail.com

ABSTRACT

India is the second largest producer of fruits and vegetables in the world, contributing 10.2 and 14.5 per cent of the total world production of fruits and vegetables, respectively. Women form the major workforce in agriculture sector. In food processing sector participation of women is substantial particularly upstream activities. Keeping in view of involvement of women in fruits and vegetable preservation, the present study was conducted in selected village of Coimbatore District. A total of 100 rural women were selected randomly for the study and training was imparted on fruits and vegetables preservation. Data were collected with the help of interview schedule. The objective of the present study was to know the socio-economic background of selected women, identify the participation of rural women in preservation of fruits and vegetables, create awareness, sensitize and motivate rural women towards technology innovation and adoption in food preservation, impact training on selected fruits and vegetables preservation technology and assess its impact in the form of gain in knowledge and attitudinal change of rural women.

KEYWORDS: *Training, Fruit Preservation, Rural Women, Food Processing*

INTRODUCTION

India is the second largest producer of fruits and vegetables in the world, contributing 10.2 and 14.5 per cent of the total world production of fruits and vegetables, respectively. Women form the major workforce in agriculture sector. In food processing sector participation of women is substantial particularly in upstream activities. Food preservation and food processing sector generated significant employment. The multiplier effect of investment in food processing industry on employment generation is 2.5 times than in other industrial sectors, higher than any other sector. Even within food processing industry, the employment intensity is significantly higher in the unorganized sector as compared to the organized sector for the same level of investment. A study found that maximum percentage (85%) of women have participated in vegetable preservation, (57.14%) were found to participate in transportation of produce and pickle making and 7.14 percent Jam making (Baba et al, 2015). Viewing the involvement of women in fruits and vegetable processing, the present study was undertaken with the following objectives.

METHODOLOGY

The present study was conducted in selected villages of Coimbatore District. A total of 100 rural women were selected randomly for the study. After developing good rapport with the respondents, the data were collected through personal interview, using a pretested interview schedule, which was specially constructed for the study.

RESULTS AND DISCUSSION

Profile of Women

Out of 100 women 83 percent were young (15 to 45 years). A majority of rural women undertook training in the age of 31 – 45 years. About 35 percent of women were educated upto secondary level. With regard to marital status 78 percent of the women were married. A majority of 80 percent were from nuclear family structure. The study revealed that 92 percent were Hindus, 64 percent were from the Backward Community 43 percent of the head of the families were self employed. Annual family incomes were above Rs. 50,000.

Sources of Information about the Training

The major sources of information were SHG leaders (48 percent) and KVK staff members (40 percent).

Views about the Training

Training is one of the key inputs for enhancing their knowledge, attitude and skill. The aim of training is to achieve development and change through planned efforts. Training designed to fill the gap between the present knowledge of the women and the knowledge that is required for further development (Mali, 2015).Impact of training was given in Table 1

TABLE 1 IMPACT OF TRAINING - CHANGE IN KNOWLEDGE, SKILL PERFORMANCE AND ATTITUDE

S.No	Aspects	Percentage of Trainees	
		Before Training	After Training
	Knowledge		
1.	Raw material availability	20	85
2.	Record keeping	25	79
3.	Hygiene	30	78
4.	Quality control	25	79
5.	Food Safety and Security	28	72
6.	Food waste management	40	64
7.	Time management	47	58
8.	Money management	27	79
9.	Resource management	18	86
10.	Marketing	8	95
11.	Cost calculation	-	100
	Skill Enhancement Hands on Training on Preservation of Fruits		
1.	Varieties of Jam	10	95
2.	Varieties of Squash	8	93
	Preservation of Vegetables		
1.	Varieties of Pickle	40	65
2.	Varieties of Vathal and Vadam	30	70
	Attitude		
1.	Entrepreneurship in Food processing gives new scope in life	10	95
2.	Confidence to take new challenges in the future	12	89
3.	Self employment improves status in society	25	80
4.	Provides economic independence	40	70
5.	Gained the knowledge	20	88
6.	Improved the decision making	25	78

The questionnaire were prepared and administrated before and after training.

It was evident from the data (Table 1) that all the rural women respondents possessed low pre exposure knowledge in all the fruits and vegetable preservation technologies, after imparting training, respondents gained sufficient knowledge in all the technologies.

TABLE 2. PRE AND POST EXPOSURE ATTITUDE TOWARDS FRUITS AND VEGETABLE PRESERVATION

S.No	Category	Percentage	
		Before Training	After Training
1.	Favourable	20	80
2.	Some what Favourable	60	40
3.	Unfavourable	85	15

Majority of the respondents (85%) had unfavourable attitude, followed by somewhat favourable (60%) and favourable only (20%) before training. After getting training programme on preservation, majority of the respondents 80% had favourable attitude, followed by somewhat favourable (40%) not favourable attitude only (15%) towards fruits and vegetable preservation.

CONCLUSION

During this study a vast change in knowledge was observed which means great difference in pre and post training programme. Majority of the respondents gained knowledge, skill and high favourable attitude after getting training. Most of the respondents have favourable attitude to adopt processing unit at a small scale as it is easy to manage micro enterprise at village level. It may therefore be concluded that rural women succeeded in acquiring knowledge, skills and attitude after exposure training on preservation.

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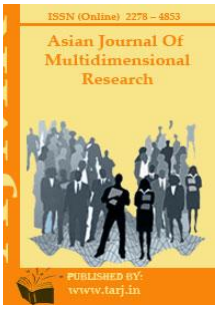

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UGC APPROVED JOURNAL

TRANS Asian Research Journals

ENHANCING IRON NUTRITURE STATUS OF ADOLESCENT GIRLS (13-18YRS) FROM RURAL COIMBATORE THROUGH KITCHEN GARDENING AND INTERVENTIONAL STRATEGIES

Sujatha, K.*; Kowsalya, S. **

*Department of Food Science and Nutrition,
Avinashilingam Institute for Home,
Science and Higher Education for women,
Coimbatore, Tamil Nadu, INDIA

**Department of Food Science and Nutrition,
Avinashilingam Institute for Home
Science and Higher Education for women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Anaemia in adolescent girls contributes to maternal and foetal mortality and morbidity in future. India had always been the country with the highest prevalence of anaemia and the home of the largest number of anaemic individuals in the world. Anaemia is the most common micro-nutrient deficiency disorder in the world. The prevalence of anaemia is higher in developing countries than in developed countries. Anaemia affects half a billion women of reproductive age worldwide. Adolescent girls are considered as the backbone of not only healthy but also progressive family and thus future builders of healthy community. A cross sectional community based study was conducted to estimate the prevalence of anaemia among adolescent girls in rural areas and to assess the iron nutriture status of 920 adolescent girls in the age group of 13-18 years studying in Government Higher Secondary Schools hailing from different rural areas of Karamadai block from Coimbatore District.. Data on anthropometric measurements, biochemical investigations and dietary details were recorded using a pre-designed, pre-tested proforma. Data were analyzed statistically using mean, standard deviation and ANOVA. Hemoglobin estimation (Cyanmet haemoglobin method) revealed that the prevalence of anaemia among adolescent girls (N = 920) and it was reported that 59.5% of the adolescent girls were moderately anaemic and 39.5% were mild anaemic. A subsample of 165 moderate anaemic subjects were divided into Group 1 (Nutrition Education + Food supplement intervention), Group 2 (Nutrition Education+Kitchen garden intervention) and Group 3 (Nutrition Education intervention) and subjected to respective intervention for four months.

*Biochemical analysis revealed significant increase ($p<0.01$) in haemoglobin level among the subjects belonging to Group 1(t = 14.56**), Group 2 (t = 8.73**) and Group 3 (t = 10.45**) after intervention. In general the intervention has brought about reduction of anemia from moderate level to mild anemia (83.7 per cent) and from mild anaemia to normal level (16 per cent).Therefore the intervention measures are more effective when they are integrated with other approaches namely better nutritional practices, fortification, dietary modification, infection control, public health measures and income generation programmes. Continuous nutrition education, kitchen garden activity and adequate intake of micronutrients are recommended as long term strategy. Disseminating knowledge and awareness through participatory approach and social actions proved to be the best strategy for combating anemia.*

KEYWORDS: *Anaemia, Cyanmethaemoglobin, Nutrition Education, Food Supplement, Intervention, Kitchen Garden*

INTRODUCTION

Globally, anaemia is a public health problem and hampers the health thus adversely affecting the social as well as economic development of the country. WHO (2016) defines anaemia as a condition in which the number and size of red blood cells, or the haemoglobin concentration, falls below an established cut-off value, consequently impairing the capacity of the blood to transport oxygen around the body. Anaemia is an indicator of both poor nutrition and poor health. Mean blood haemoglobin concentrations and prevalence of anaemia varied substantially across regions and countries[1].

Anemia is still one of India's major public health problems, despite more than 37 years of iron and folic acid supplementation by the Government of India through the National Nutritional Anaemia Prophylaxis Programme (NNAP) launched in 1970. Some modifications of NNAP have been done to make it more effective and efficient, but the basic problem still remains. This may be due to the fact that supplementation during pregnancy may be too late for desirable birth outcomes[2]. NFHS-4 (2015-16) also reported prevalence of anaemia among 53.9 % urban women (15-49 years) and 56.9 % of rural women comprising a total women population of 55.4 per cent[3].

Nutritional anaemia is a major public health problem worldwide particularly in developing countries among women of reproductive age group[4]. In India, most researches and efforts to reduce anaemia have been focussed primarily on pregnant/ lactating women and adolescent girls[2]. Micronutrient deficiencies affect almost two billion people worldwide or roughly one third of human race, the most prevalent of which is iron deficiency affecting 34 % of the 6.25 billion people on our planet[5].

An estimated 2.8 million child deaths is reported each year in the nine low income Asian countries including India[6]. Low dietary intake of iron, folic acid and other nutrients involved in hemopoiesis is the major factor responsible for the high prevalence of anaemia in developing countries. Poor bioavailability of iron from phytate and fibre rich vegetarian diets aggravates the gap between iron requirement and absorbed iron. Food based strategies play a vital role in preventing micronutrient deficiencies. Dietary approach should aim at improving as well as maintaining the iron status. Knowledge on choice of diet that is rich in iron should also be considered along with imparting ways to improve absorption and bioavailability. In a nutshell, importance should be given to aspects of food security through dietary strategies and associative factors[7].

Food fortification is being increasingly recognized as the most effective, long term approach for nutritional value addition and eradication of micronutrient deficiencies. Supplementation could be an effective preventive and curative strategy, in contrast to dietary intervention and food fortification[8]. Energetic steps are being taken in India to increase dietary intake of iron through dietary diversification and increasing the consumption of micronutrient rich vegetables, increased use of iron-fortified iodised salt to partly bridge the gap between intake and requirement[9].

In developing countries, fortified food may not be beneficial enough for all the population, since few households ever consume commercial foods. Therefore, fortification through public distribution programme will be more beneficial. Further home gardening can be encouraged that focuses on provitamin A rich vegetables, iron rich green leafy vegetables to combat nutritional deficiencies which are of public health significance in developing countries[8]

Hence the need arises for effective intervention of creating nutrition awareness among the population through dietary intake, nutrition education and home / community garden as community based approach. With this background, this community based study was undertaken to find out the prevalence of anaemia and assess the iron nutritional status and to create awareness on kitchen garden activities and study the impact of interventions on anaemic status of adolescent girls from rural areas of Karamadai Block, Coimbatore district.

MATERIALS AND METHODS

Selection of Subjects

Karamadai block consisting of 12 villages and a total of 12,446 households was selected as the study area. 1330 adolescents girls belonging to the age group of 13-18 yrs volunteered to participate in the study were screened for the prevalence of anaemia by conducting blood haemoglobin analysis. Finally 920 Adolescent girls (13-18years) enrolled in Government schools hailing from different rural areas of Karamadai, forming a homogeneous group, representing a true sample of population who were screened to be anaemic were selected for the initial study.

Initial rapport was created with the subjects and family members about the project and its objectives. Written consent from the subjects was obtained for participation in the study. The study proposal was presented to Institutional Human Ethical Committee (IHEC) of Avinashilingam Institute for Home Science and Higher Education for Women and Ethical clearance was obtained (HEC.2010:16).

Nutritional assessment

Assessment of the nutritional status of subjects was done through anthropometric measurements such as height, weight, Body Mass Index using standardized procedures and through biochemical tests to diagnose deficiencies/diseases at the sub clinical stage and confirm the disease state. The selected 920 anaemic adolescent girls (13-18years) were subjected to blood haemoglobin estimation using Cyanmet haemoglobin (CMG) method, a standard method for estimation of Hemoglobin recommended by the International Committee for Standardization in Hematology (ICSH) and suggested by NIN[10]. All the subjects were dewormed using Albendazole tablet (Bendex-400mg) as prescribed by the physician after initial haemoglobin estimation.

Dietary assessment

From among the 920 anaemic adolescent available, a sub sample of 165 anaemic subjects willing to participate in the intervention phase were chosen and a 24 hour food recall survey was conducted

using the standardized cups and spoons for collecting information regarding the food and nutrient intake. The subjects were asked to recall all the food items consumed by them on previous day along with quantity of each food item consumed. The intake of foods consumed by an individual per day was recorded and the raw equivalent of each food item was computed. The daily food and nutrient intakes were computed using tables of food composition and nutritive value of the Indian foods[13] and were compared with Recommended Dietary Allowances for nutrients (RDA) of the corresponding age groups[11].

Conduct of intervention

A subsample of 165 moderate anaemic subjects (mild anaemic) willing to participate in the intervention phase was selected for further study. The anaemic subjects were categorized into three groups namely Group1 (Food Supplement+Nutrition Education), Group 2 (Kitchen garden+Nutrition Education) and Group 3 (Nutrition Education) based on the intervention given during the experimental period. Nutrition education was provided to all the three groups using demonstration, informal meetings, focus group discussions and modules through posters, charts, pamphlets and booklets.

Group 1

Group1 subjects were supplemented with 50g of the iron rich food supplement along with nutrition education. The amount of the food supplement was determined based on the dietary intake of iron in order to meet the adequacy of dietary iron per day. The food supplement, Micronutrient iron rich laddoo was prepared using i) Roasted and "powdered rice flakes (25g), gingelly seeds (5g), amla (5g) and flax seeds (10g)" and "roasted wheat flour (10gm) and bengal gram flour (20g)" ii)Cleaned, washed, dried (shade drying followed by oven drying) and powdered green leafy vegetables namely Amaranthustritis (5gm), Solanum nigrum (5g) and Amarahtus gangeticus (5g). Jaggery (20g) syrup was prepared and mixed well with all the powdered ingredients and made into laddoos.

Sensory qualities of the food supplement were assessed by 9 point hedonic rating scale for sensory attributes namely colour, flavor, texture, taste, mouth feel and over all acceptability by trained panel of 25 judges.

Group 2

Group 2 subjects were motivated to develop kitchen garden based on the space in their home or willingness to develop roof garden and encouraged to consume vegetables and fruits grown in their kitchen gardens and nutrition education was provided to the subjects

Group 3

Group 3 subjects were given only nutrition education using demonstration, informal meetings, focus group discussions and modules through posters, charts, pamphlets and booklets. The moderate anaemic subjects underwent intervention were assessed for their nutritional status especially anthropometric profile, clinical profile and estimation of haemoglobin before and after the intervention period of 4 months.

Statistical analysis

Descriptive statistics (mean and standard deviation) was used to represent the basic distribution of various parameters. One way ANOVA was done to find out the statistical significance between the types of anaemia and distribution of subjects in different categories. Paired 't' test was used to determine the significance of the impact of interventions using pre and post intervention values.

RESULTS AND DISCUSSION

The present study has been conducted to assess the nutritional profile and prevalence of anaemia among rural adolescent girls.

Nutritional Assessment of Adolescent Girls

The adolescent subjects (N = 920) were assessed for their nutritional status through anthropometric profile, clinical profile and estimation of blood haemoglobin level.

Anthropometric Profile of Adolescent Girls

Anthropometric profile was assessed through Height, weight and BMI of all the 920 respondents; mean and standard deviations for different age groups were calculated and the same is presented in Table 1. The results of anthropometric measurements of the study revealed that the average height of female subjects (12-14 yrs) was 151.0 ± 5.30cm; whereas the subjects with 15-18 years were reported with the mean values of 153.4 ± 5.0cm height.

Mean weight of 12-14 yrs female subjects was found to be 38.34 ± 7.38 kg and the 15-18 yrs subjects were reported with mean value of 40.4 ± 6.1 kg. Mean Body Mass Index (BMI) of adolescent girls in the age group of 12-14 years and 15-18 years were found to be 16.8 and 17.7 respectively. Mean height, weight and BMI of all the adolescent girls were below the standard reference value[12]. The findings of Sachan et al., (2012) revealed that the mean height and weight of the subjects from urban as well as rural schools were below the expected measures for their age group[13].

TABLE 1 ANTHROPOMETRIC PROFILE OF ADOLESCENT GIRLS (N=920)

Profile	Age (years)	Standards (WHO, 2007)	Mean ± SD
Height (cm)	12-14	155.8	151±5.30
Weight (kg)		43.5	38.34±7.38
BMI (kg/m2)		18.8	16.8±0.71
Height (cm)	15-18	162.5	153.4±5.00
Weight (kg)		53.2	40.4 ±6.1
BMI (kg/m2)		20.8	17.2±0.76

TABLE 2DISTRIBUTION OF ADOLESCENT GIRLS AS PER ANAEMIC STATUS (N=920)

Hb Levels g/dl	Grades of Anaemia*	No	Per cent	Mean Hb g/dl	F value
< 8	Severe	7	1.0	7.4 ± 0.22	
8-10.9	Moderate	547	59.5	9.7 ± 0.12	
11-11.9	Mild	366	39.5	10.80 ± 0.16	123.67**
Total		920	100	9.65 ± 1.25	

*WHO (2011) ** Significant at 1% level

Prevalence of Anaemia among Adolescent Girls

Table 2 gives the distribution of adolescent girls as per anaemic status. The subjects were categorized according to the grades of anaemia specified by WHO (2011) as severe, moderate and mild anaemia. The mean haemoglobin levels of the subjects were found to be 9.65 g /dl. The findings of the present study were in accordance with the study conducted by Hemlatta et al., (2009) [14]. About 59.5 per cent of the subjects had blood haemoglobin levels between 8-10.9 g/dl and was categorized as moderately anaemic; while haemoglobin level of 39.5 per cent of subjects were found to be 11 to 11.9g/dl and were categorized as mildly anaemic. Only one per cent of the subjects had severe anaemia and was referred to rural health services for medical attention. There existed one per cent significant difference between moderate and severe anaemic groups on haemoglobin level when compared between moderate and mild anaemic group statistically using Post-Hoc test. However, there is no significant difference between moderate and severe anemic subjects.

Trivedi (2007) reported that the prevalence of anaemia amongst the adolescent girls were found to be 82 per cent and may be attributed due to poor diet, ongoing blood loss during menstruation and inadequate intake of dietary iron[15].

Impact of Interventions on Nutritional Status of Adolescent Girls

Anthropometric Profile

The anthropometric profile of the moderate anaemic subjects (N= 165) were assessed through weight, height and Body Mass index (BMI). The mean weight, height and BMI of the subjects before and after the intervention period of 4 months are presented in Table 4.

Group 1 (t = 2.56*) and Group II from the age group of 12-14 years showed significant weight gain (t = 2.67*) due to intervention; however significant difference was observed only on mean BMI among the participants of Group I.Significant mean gain in weight was also recorded in Group1 (t = 3.47*) and Group III (t = 1.96*) subjects belonging to the age group of 15-18 years after the intervention.

Similar results were shown in the study conducted by Kalhan et al., (2010)[16.] Chatterjee (1990) reported that major consequence of girls' nutritional deprivation in early childhood and adolescence is their failure to achieve full growth potential[17].

TABLE 3 ANTHROPOMETRIC PROFILE OF ADOLESCENT GIRLS BEFORE AND AFTER INTERVENTION (N = 165)

Profile	Age	Group I (N =56)			Group II (N=54)			Group III (N=55)		
	(years)	Before	After	t value	Before	After	t value	Before	After	t value
Height (cm)	12-14	144.0±6.2	144.6±6.0	0.53	140.6±24.2	141.2±24.3	0.643	139.6±23.7	140.0±24.1	0.38
Weight (kg)		33.1± 6.5	34.9±6.6	2.56*	32.7± 4.09	33.2±4.02	2.67*	30.4±3.09	30.9±3.06	0.69
BMI (kg/m)		16.0±0.59	16.7±0.77	3.15*	16.54	16.65	0.58	15.6±0.79	15.8±0.82	0.84
Height (cm)	15-18	149.6±4.1	150.2±4.3	1.046	146.8± 6.0	147.2±5.8	0.82	148 ±5.5	148.6±5.9	0.37
Weight (kg)		38.0± 4.3	39.1± 4.4	3.47*	35.6± 6.07	36.2± 6.09	1.45	32.0±4.0	32.7± 4.09	1.96*
BMI (kg/m2)		17.0±0.56	17.3±0.58	0.843	16.52±0.62	16.7± 0.59	0.94	14.6±0.43	14.8±0.47	0.67

** Significant at 1% level *Significant at 5% level, NS – Non Significant

TABLE 4 BLOOD HAEMOGLOBIN STATUS OF ADOLESCENT GIRLS BEFORE AND AFTER INTERVENTION

Subjects	Blood Hemoglobin Levels (g/ dl)			
	Standard (g/ dl)	Before	After	t value
Group 1 (n=56)	≥12	9.14 ± 0.68	12.2 ± 0.92	14.56**
Group 2 (n=54)	≥12	9.0 ± 0.41	11.8± 0.73	8.73**

Group 3 (n=55)	≥12	9.1±0.53	11.7±0.62	10.45**

** Significant at 1% levelGroup 1 Nutrition education +Food supplement

Group 2 Nutrition education +Kitchen garden

Group 3 Nutrition Education

Biochemical Profile

Table 4 exposes the mean haemoglobin levels of adolescent girls belonging to the three groups before and after intervention period. Analysis of the blood haemoglobin status of the children revealed that the majority of the children in all the 3 groups had moderate degree of anaemia with their mean haemoglobin levels which ranged between 9.1 to 9.14g/dl during the baseline period, It is evident that these level fall under deficiency category according to WHO (2007)[18]. A Similar status of mean haemoglobin levels between 7 to 10 g/dl have been reported among school girls in India by Batra and Groves (2011)[19].

The mean values of hemoglobin concentration in anaemic adolescent girls group I before intervention was 9.14 ± 0.68 g/dl and after intervention the normal mean hemoglobin levels were 12.2 ±0.92 g/dl. Whereas the mean values of group II before intervention were 9.0 ± 0.41 and after intervention was 11.8 ± 0.73 g/dl, while in group III before intervention was 9.1 ±0.53 g/dl and after intervention was 11.7±0.62 g/dl respectively.

The mean hemoglobin levels of adolescent girls before intervention showed moderate degree of anaemia with haemoglobin levels of 9.14 g/dl, while at the terminal end of intervention the mean haemoglobin levels were found to be 12.2 g /dl which indicates that there was a substantial improvement in their hemoglobin levels. This finding shows that the majority of them were found to improve from moderate to mild level and from mild level to normal level of hemoglobin. The reason for the improvement can therefore be attributed to the effectiveness of intervention.

These findings are endorsed by the findings of Kakkar (2011)[20] who revealed that the mean hemoglobin of 11.2g/dl was increased to 12.6g/dl after the intervention of iron and folic acid supplementation and health education. One per cent significant difference between the initial and final level of blood haemoglobin level of Group I (control), II (Iron and Folic acid supplementation and Health education) and (Vitamin C supplementation + Health education) were found. The study results are in par with the findings of Trivedi (2007)[15] too.

CONCLUSION

Majority of the subjects showed moderate anaemia than mild and severe anaemia. Continuous nutrition education, kitchen garden activity and adequate intake of micronutrients can be recommended as long term strategy. Disseminating the knowledge and awareness through participatory approach and social actions proved to be the best strategy for combating anemia. Involving women in the participatory action research was the key factor for enhancing iron security for the community. It may be concluded that supplementation of locally available foods rich in

micronutrient along with nutrition education can be an effective strategy in combating micronutrient deficiency.

The anaemic adolescent girls were also taught the various methods of incorporation of greens in a simple form to be used in their daily diet. Through this awareness programme, it was very interesting to note that the subjects both children and rural women readily accepted the new recipes which is simple to be adopted and different in taste unlike their daily routine and would like to go for a change when exposed to the intervention programmes. It is indeed a challenging task to make the beneficiaries to consume greens and to inculcate this practice to include greens in their daily diet. This kind of community based approach towards dietary modification is very much appreciated by the rural masses and adolescent community.

It may be concluded that supplementation of locally available foods rich in micronutrient along with nutrition education can be an effective strategy in combating micronutrient deficiency. Hence, it is recommended that dietary diversification coupled with education would be a sustainable strategy to combat anaemia among the masses.

Above marked studies showed that the efforts were put in the right direction which included the global burden of anemia, causes of anemia, etiology, seriousness of anemia and intervention strategies to combat anemia viz. supplementation, fortification and improving bioavailability of iron in the diet. Nutrition education and supplementation of indigenous food like Garden cress seeds helps in prevention of anemia. Supplementations of locally available foods helps reduce the prevalence of anemia at lower cost and useful to the community for combating anemia.Thus this study proves the impact of a multipronged strategy of enhancing iron nutritional status through nutrition education and home / community garden as community based approach.

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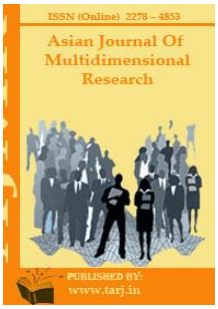

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NUTRITIVE VALUE, ANTI CANCER, ANTI MICROBIAL POTENTIALS OF AYURVEDIC REJUVENATIVE PORRIDGE/ GRUEL FROM KERALA

Priyanka Pradeep V*; M. Sylvia Subapriya**

*Guest Faculty,
Department of Home Science- KAHM Unity,
Women's College Manjer, INDIA
Email id: priyanka pradeepv@ gmail.com

**Professor,
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Ayurvedic Rejuvenative Porridge (Karkidaka Marunnu Kanji), the medicinal porridge is a special therapeutic ayurvedic diet that is prescribed during the karkidakam season of the Malayalam month that falls between Mid July and Mid August to overcome many diseases caused during monsoon. It is a popular dish in Kerala. It improves the immunity and aids in digestion. It can cure arthritis. The porridge is made out of herbs, spices and njavara rice. The herbs are Tragia involucrata, Sida cordifolia, Boerhaavia diffusa, Solanum trilobatum, Strobilanthes ciliates, Desmodium gangeticum, Chrysopogan zizanioides, Glycyzrrha glabra, Caesalpinia sappan Linn. Pseudarthira viscida. The spices are Myristica fragrans, Cuminum cyminum, Syzygium aromaticum, Zingiber officinale Roscoe, Trigonella foenum – graecum, Piper longum. The herbs and spices are used in the treatment of bronchitis, asthma, veneral disease, skin infection, diabetes, rheumatism, anasarca, ascites and jaundice. The porridge exhibits anti inflammatory, antioxidant, anti microbial and anti cancer activities. The spices contain secondary metabolite such as alkaloids, tannins, flavonoids and isothiocyanates which have a wide range of biological activities and known healing effects. It has carminative, astringent, hypolipidiemic, anti thrombotic, antiplatelet aggregation, antifungal, aprodiac properties. It is used to treat flatulence, nausea and dyspepsia. The njavara rice exhibits antioxidant and anti inflammatory activities. The porridge is usually prepared in mud pot. Ten grams of fresh herbs, five grams of spices and hundred grams of njavara rice are taken for preparation of two servings of porridge. The nutrient content, antimicrobial and anti cancer activity of herbs, spices and njavara rice and the porridge were determined in the study.

KEYWORDS: *Porridge, Herbs, Spices, Rice, Arthritis, Anti Diabetic, Antioxidant, Anti Microbial, Anti Cancer*

INTRODUCTION

Ayurveda is a combination of two words *Ayu* and *Veda*, meaning the knowledge of life. It is a comprehensive natural holistic healthcare, which is 5000‐years‐old and is commonly adopted in India, especially rural India, where 70 percent of population lives. It includes all aspects of life and environment through mind consciousness. It works by concept of *tridosha* (*Vata, Pitta, Kapha*), which has been validated with 90 percent certainty through bio statistical studies. Here, decision making mainly depends on the imbalance in these three *doshas*, which are the physiobiological properties made through different combinations of mahabhutas. Their qualitative disturbance leads to*doshas*' disharmony, resulting in the occurrence of various diseases. Hence, for control and regression of the disease, balance in the *tridosha* has been considered as a basic target for therapeutics in ayurveda. According to ayurveda, the concept of *panch mahabhutas* has been found responsible for origin of all the living and non‐living things, which means that every substance in this universe is made up of five basic elements; hence, every substance in nature has the potential to be a medicine. Despite using harsh chemical substances as in allopathy, ayurveda uses natural medicinal substances that are safer for human body (Rastogi, 2010).

Herbs are the green, leafy parts of plants. They are most efficacious and flavorsome when used fresh, and they are mostly grown in temperate to hot regions. Spices are derived from any part of a plant that is not a leaf. Spices are usually used in small amounts, are best used dry because the drying process often enhances the flavor. Spices and herbs are rich in polyphenols. Polyphenols are considered as nutraceuticals. Nutraceuticals are chemicals found as natural component of food and other ingestible form that help human body in preventing or treating one or more diseases or improving physiological performance (Bamji, 2009). Incorporation of spices and herbs into cereals enhances polyphenols which inhibits platelet aggregation and may increase the time for coagulation. It provides anti microbial, antidiabetic and anticancer effects. The addition of spices and herbs into porridge enhances nutrient content, shelf life and flavour. It provides health benefits too.

In Kerala, kanji is one of the popular traditional foods. Kanji derived from tamil word "boilings" referring to porridge or any water in which rice is cooked. Karkida kanji, a medicinal porridge is one of the special therapeutic Ayurvedic diet that is prescribed during karkidakam season (Malayalam month falls between Mid –July and Mid- August) to overcome many diseases caused during monsoon.The karkidaka kanji made of ten different herbs *Tragia involucrata* (Climbing Nettle), *Strobilanthes ciliatus* (Niligris Ciliatus), *Solanum trilobatum*(Purple Fruited Pea Egg Plant), *Desmodium gangetium* (Tick Tree), *Boerhaavia diffusa* (Spreading Hogwood), *Sida cordifolia* (Country Mallow), *Pseudarthira viscida*(Salparni), *Chrysopogon zizanioides* (Vetiver), *Glycyrrhiza glabra* (Licorice), *Caesalpinia sappan* (Indian red wood). *The seven spices Cuminum cyminum*(Cumin), *Syzygium aromaticum*(Cloves), *Piper Longum*(Long Pepper), *Myristica fragrans*(Nutmeg), *Zingiber Officinale Roscoe*(Dried Ginger), *Trigonella- foenum-graecum*(Fenugreek), *lepidium sativum* (Garden Cress), Njavara rice (*Oryza sativa*). The njavara rice is highly rich in nutrients and medicinal properties.

METHOLOGY

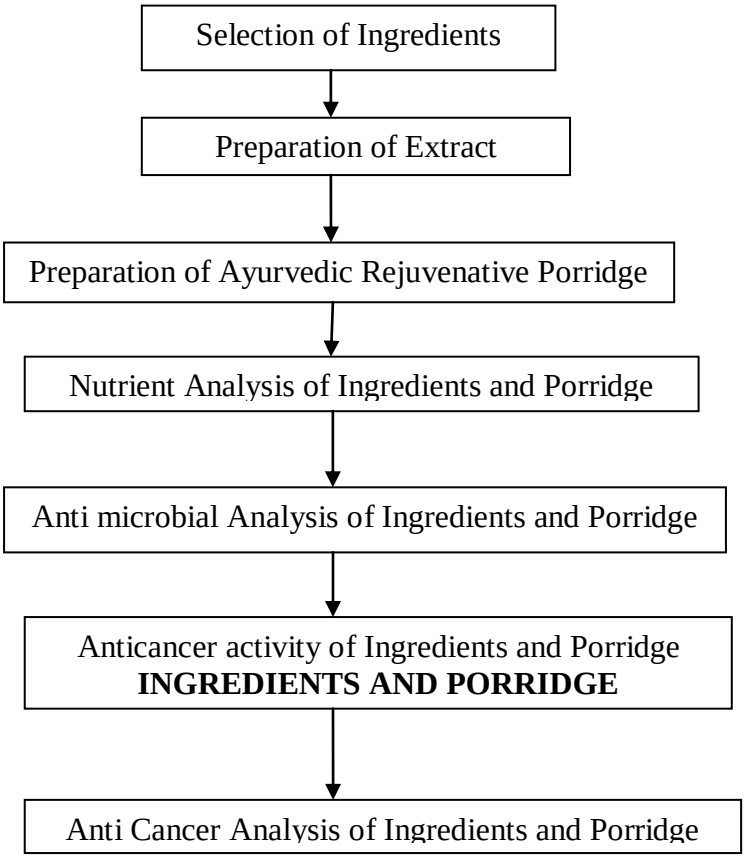

Figure 1 Research Design

A.SELECTION OF INGREDIENTS

The ten different herbs were *Tragia involucrata*(Climbing Nettle) , *Strobilanthes* ciliatus(Niligris Ciliatus), *Solanum trilobatum*(Purple Fruited Pea Egg Plant), *Desmodium gangetium*(Tick Tree), *Boerhaavia diffusa*(Spreading Hogwood), *Sida cordifolia*(Country Mallow), *Pseudarthira viscid*(Salparni) , *Chrysopogon zizanioides*(Vetiver), *Glycyrrhiza glabra*(Licorice) *and Caesalpinia sappan* (Indian red wood).*The seven spices were Cuminum cyminum*(Cumin), *Syzygium aromaticum*(Cloves), *Piper Longum*(Long Pepper), *Myristica* fragrans(Nutmeg), *Zingiber OfficinaleRoscoe* (Dried Ginger), *Trigonella- foenum- graecum*(Fenugreek) *and Lepidium sativum*(Garden Cress). *These herbs and spices along with Njavara rice* (*Oryza sativa*).were the ingredients and were collected from locally available ayurveda pharmacy.

B. PREPARATION OF EXTRACT

Based on the propotions of ingredients, weighed 1g of herbs, 0.25g of spices, 10g of rice, and crushed into fine powder with mortar and pestle. Each of these was added into separate conical flask. These were immersed in 30ml of water for dilution and incubated at 60-80rpm for 24 hrs in shaking incubator at 40ºC and these were filtered using Whatman filter paper then the extract were used for further study.

C. PREPARATION OF PORRIDGE

In a mud pot, one and half liters of water was poured, then fresh herbs of ten grams were added and boiled well, then this water was strained and njavara rice of hundred grams were added and spice powder of five grams each were added and cooked well. When the porridge consistency was attained, the gas was put off.

D. NUTRITIVE VALUE ANALYSIS OF INGREDIENTS AND PORRIDGE

The nutrients carbohydrate, protein, calcium, sodium, crude fiber was analyzed for the sample of ingredients (Herbs, Spices, Rice) and for sample of cooked porridge. The protein was analyzed by Lowry Method (Lowry *et al*., 1951).

The carbohydrate analyzed by Anthrone method. Calcium potassium, sodium were analyzed by spectrophotometer. (AOAC, 2005) The crude fiber was analyzed (AOAC, 2005) . The iron was estimated calorimetrically by (Wong's method).

E. ANTI MICROBIAL ACTIVITY OF INGREDIENTS AND PORRIDGE

Antimicrobial activity against food pathogens *Escherichia coli* (Gram negative), *Staphylococcus aureus* (Gram positive), *Bacillus subtilis* (Gram positive) were tested. Three petridish were sterilized then Muller Histon Agar was spreaded in the petridish **and** five wells were made to put each of the samples and antibiotic disc (ciprofloxain) were used as positive control and incubated for 24 hours. The zone of inhibition was formed was measured in millimeters (Agar well diffusion method) (A.L.Banty, 1976).

F. ANTI CANCER ACTIVITY OF INGREDIENTS AND PORRIDGE

In 96 well plate ,samples (herbs, spices, rice and cooked porridge) of 10 µl were added to each well , human cancer cells of 100µl were added separately to one of the well in the plate and human cancer cells of 100µl were added to the samples containing well, a blank of Dimethyl sulfoxide(DMSO) and incubated for 24hrs in CO_2 incubator. Then 10µl tetrazolium dye was added and incubated in CO_2 for 3 hours and the reading was taken in ELISA reader at 570nm. (MTT assay) (Seely et *al*., 1975).

RESULTS AND DISCUSSION

TABLE I NUTRIENTS IN THE INGREDIENTS AND COOKED PORRIDGE

Parameters	Herbs Extract	Spices Extract	Rice Extract	Cooked Porridge
Carbohydrate (g)	1.8	1.6	2.0	24.3
Protein (g)	3.8	3.2	14.6	23.6
Fibre (g)	0.115	0.105	0.155	0.264
Calcium (mg)	14500	19600	19800	18000
Iron (mg)	33	66	8.3	13
Sodium (mg)	3800	8500	3000	14000
Potassium (mg)	14500	13300	5800	18300

- When compared the nutritive values of Spices, Herbs, Rice and Cooked porridge, Carbohydrate content was high in cooked porridge (24.3 g) when compared to herbs (1.8g), spices (1.6g) and rice (2.0g). The carbohydrate content was found to be low in spices (1.6 g).

- The amount of protein content in cooked porridge was high and it was 23.6 g. In herbs it was 3.8 g and in spices it was 3.2 g. The protein content of rice was found to be 14.6 g.
- Fibre content was found to be high in cooked porridge (0.264 g) in comparison with the fibre content of herb, spice and rice (0.115 g, 0.105 g, 0.155 g respectively).
- There was only slight variation in the calcium content of spices (19600 mg) and rice (19800 mg). The calcium content was less in herbs and cooked porridge. It was 14500 mg and 1800 mg respectively.
- In comparison with herbs, spices, rice and cooked porridge the amount of iron present in spices were found to be higher (66mg). The iron content was low in rice and it was 8.3mg. In cooked porridge it was 13mg.
- The amount of sodium was high in cooked porridge (14000mg) in comparison with spice (8500mg), herbs (3800 mg) and rice (3000 mg). Spices was rich in sodium content (8500mg).
- The potassium content was high in cooked porridge (18300mg) in comparison with herbs (14500mg), spices(13300 mg) and rice(5800 mg).

TABLE II ANTIMICROBIAL ACTIVITY (ZONE OF INHIBITION IN MM) OF INGREDIENTS AND COOKED PORRIDGE

Organism	Herb	Spices	Rice	Cooked Porridge	Antibiotic Disc (ciprofloxacin)
Staphylococcs aureus	2	3	-	5	3
Escherichia coli	3	4	-	5	4
Bacillus subtilis	2	1	1	6	9

- The zone of inhibition produced by the antibiotic disc (standard) was found to be 3.0 mm for *Staphylococcus aureus* (Gram positive), 4mm for *Escherichia coli* (Gram negative) and 9mm for *Bacillus subtilis* (Gram positive). The zone of inhibition developed against *Staphylococcus aureus* (Gram positive), *Escherichia coli* (Gram negative), and Bacillus *subtilis* (Gram positive) by herbs was found to be 2,3and 2mm respectively. The zone of inhibition by spices developed against these organisms was observed to be 3,4and 1mm respectively and in case of rice the zone of inhibition was found against only *Bacillus subtilis* (Gram positive) is 1mm.The zone of inhibition against these organisms found to be 5, 5 and 6 mm respectively in cooked porridge.

TABLE III ANTICANCER ACTIVITY OF INGREDIENTS AND COOKED PORRIDGE

Samples	Concentration (µl)	OD Value of control	Percentage of Anti cancer activity
Herbs	10	0.350	51
Spices	10		62
Rice	10		63
Cooked Porridge	10		71

In the present study the percentage of anticancer activity for herbs, spices and rice was found 51 percent, 62 percent and 63 percent respectively. The percentage of anticancer activity was, found to be high in cooked porridge with 71 percent

CONCLUSION

The combination of selected Herbs, Spices and Navara rice (Oryza sativa) improves the nutritional value of traditional Ayurvedic Rejuvenative porridge. This study shows that, this porridge has Antimicrobial and Anticancer potentials and it is scientifically proved by the antimicrobial analysis and the estimation of the percentage of active ingredients.

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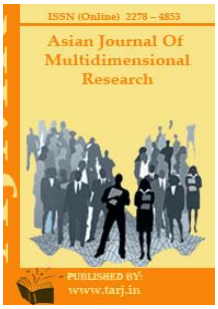

Asian Journal of Multidimensional Research (AJMR)

(Double Blind Refereed & Reviewed International Journal)

UGC APPROVED JOURNAL

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FORMULATION AND QUALITY EVALUATION OF SPINACH LEAVES INCOPORATED PIZZA CRUST

Neema M*; SathyaSuba R D**

* M.Sc Student,
Department of Foods and Nutrition,
Rathnavel Subramanium College of Arts and Science,
Sulur, Coimbatore, Tamil Nadu, INDIA
Email id: neema.sasidharanv@gmail.com

** Assistant Professor,
Department of Foods and Nutrition,
Rathnavel Subramanium College of Arts and Science,
Sulur, Coimbatore, Tamil Nadu, INDIA

ABSTRACT

New product is also called new product management, is a series to steps of steps that include the conceptualization, design, development and marketing of newly created or newly rebranded goods. Formulation is developing new product from concept to commercialization. Spinach (Spinaciaoleracea L.) is widely regarded as a functional food due to its diverse nutritional composition, which includes vitamins and minerals, fiber and to its phytochemicals and bioactive that promotes health beyond basic nutrition. Pizza being widespread almost all over the planet and represents as one of the most popular family foods. So in the present study, Spinach leaves powder made by natural sun drying process, was incorporated in the pizza crust at 5%, 10%, 15%, and 20% instead of refined wheat flour in the standard recipe. The prepared products along with the standard were subjected to sensory analysis and most acceptable proportions were selected for shelf life study and nutrient analysis. The results of the sensory analysis showed that product A with 5% spinach leaves powder scored the highest. The standard and selected proportion of spinach leaves powder incorporated Pizza crust was packed in polythene bag and stored in refrigerated temperature and analyzed for a period of 5 days to find the shelf life. There was no microbial growth in both standard and sample on 1st, 2nd and 4th day of storage study. Most of the selected subjects for the popularization accepted the spinach leaves powder incorporated Pizza crust and ready to buy the product if it is available in the market.

KEYWORDS: *Pizza crust, Spinach, Microorganism*

INTRODUCTION

The new product development process consists of the activities which are carried out by firms when developing and launching the new products. A new product introduced on the market which evolves over a sequence of stages, beginning with an initial product concept or idea that is evaluated, developed, tested and launched on the market **(Vondra, 2010).** The need of new product formulation are, a key element of successful product innovation is the ability to rapidly and reliably develop new product formulations that meet corporate cost and other constraints while exceeding today's ever changing customer and retailer expectations **(Hamilton,2012).**Pizza is one of the most popular consumer foods, pizza markets have been boosted by trends toward frozen processed food consumption growth. As a result, pizza production is expected to increase further in response to a growing world population. Spinach (Spinach oleracea) is an edible flowering plant in the family of Amaranthaceae. Spinach oleracea Linn is an annual plant having medicinal property native to central and southwestern Asia. **(Kavitha et al, 2013).**The incorporated spinach leaves powder has lots of benefits. The nutrient present in spinach leaves include fiber, iron, vitamin k, etc. The pizza crust is mainly given to the school going children and adolescents, because children are full of mental and physical energy. They tend to skip breakfast as they can't manage the morning rush of school. There are lots of attractions about fast foods, junk foods, in electronic and social media. Green leafy vegetables contain important nutrients needed for child's proper growth and development such as folic acid, vitamin C, vitamin A, and dietary fiber. Preventing Iron deficiency is so important when it comes to avoiding long term behavioral and learning issues related to nutrition. Iron deficiency has been found to lead to lower IQ and poor thinking and problem solving skills. Spinach contains high amount of iron, so we incorporated with Pizza crust. Based on the above facts a study was planned with the following objectives;

- To formulate spinach leaves incorporated Pizza crust.
- To analyze the best level of spinach leaves incorporated in Pizza crust. To analyze the nutrients in the standard and best variation.
- To evaluate the shelf life stability of the products. To popularize the formulated product.

METHODS

Pizza is a savory dish of Italian origin. The new product namely spinach leaves powder incorporated pizza crust was developed by using ingredient refined wheat flour in variation of spinach leaves powder. Four samples like A, B, C, and D were prepared by incorporation of spinach leaves powder at a variation of 5%, 10%, 15%, and 20% respectively. Along with this, a standard pizza crust was also prepared without spinach leaves powder. A score card was prepared on the basis of criteria such as appearance, color, flavor, taste and texture was given to the panel members for the selection of most acceptable proportion. The evaluation was done by 30 semi–trained panel members from the Department of Foods and Nutrition in RathnavelSubramaniam College of Arts and Science, Sulur, Coimbatore. The product that scored the highest in sensory analysis along with standard was taken for shelf life study. The standard and selected spinach leaves powder incorporated Pizza crust was packed in polythene bag and stored in refrigerated temperature and analyzed for a period of 1st, 3rd and 5th, days to find the shelf life. The microbial analysis was carried out on the 1st day, 2nd and 4th day. The sensory analysis was done after the microbial analysis by the same panel members. The cost estimation was done on the basis of ingredients used in the new product. It was also done to compare the price of the standard product and the formulated product. The cost involved in preparation and variation of standard is done to check the affordability. The popularization was done

among 30 school going children. The main purpose is to create awareness about the benefits of spinach and also helps increase their immunity. The popularization was done by the help of questionnaire.

RESULTS AND DISCUSSION

Comparison of the Selected Product with the Standard: The mean sensory scores for the overall acceptability obtained by the sensory evaluation of standard Pizza crust and varying proportions of Spinach leaves powder incorporated Pizza crust with the help of score card. It is clear that the prepared products, Sample A had the highest mean score in all the criteria when compared to other samples like sample B, C and D. So it was conclude that Sample A with 5% Spinach leaves powder was selected as the best product and it was selected for shelf life study.

TABLE I
COMPARISON OF MEAN SCORES OF STANDARD AND SELECTED PROPORTION OF SPINACH LEAVES POWDER INCORPORATED IN PIZZA CRUST

SL. NO.	CRITERIA	SCORE	STANDARD PRODUCT	SELECTED PRODUCT
1.	Appearance	5	4.6±0.4	4.5±0.5
2.	Color	5	4.1±0.8	4.2±0.7
3.	Texture	5	4.2±0.7	4.5±0.5
4.	Flavor	5	4.4±0.6	4.5±0.62
5.	Taste	5	4.4±0.5	4.7±0.4

Standard- 100%, Variation A- 5%, Variation B- 10%, Variation C- 15%, Variation D- 20%

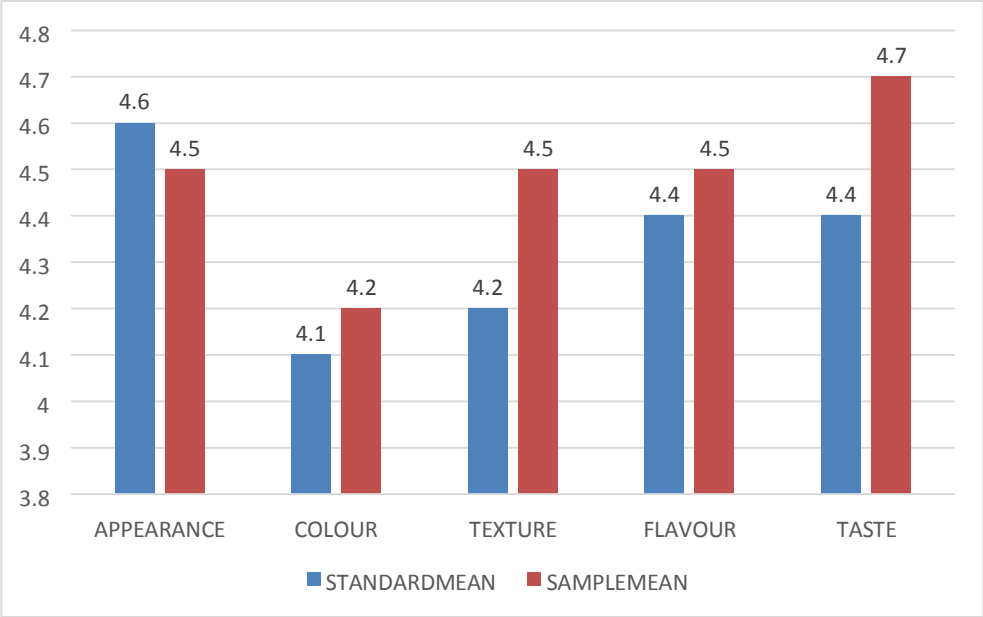

FIGURE I
COMPARISON OF MEAN SCORES OF STANDARD AND SELECTED PROPORTION OFSPINACH LEAVES POWDER INCORPORATED IN PIZZA CRUST

Nutrient Analysis of the Selected Product with the Standard: Spinach has a good amount of Iron and Fiber, these two nutrients were analyzed in the standard and formulated products. Iron is

essential for the proper growth and development of the human body. It plays a role in the production of hemoglobin and red blood cells. Fiber helps to improve cholesterol and blood glucose level. From the Table II it was observed that the formulated product nutrient content is slightly higher than the standard product.

TABLE II NUTRIENT ANALYSIS OF THE SELECTED PRODUCT AND STANDARD PRODUCT

NUTRIENT	STANDARD	SAMPLE A
Iron (mg)	3.43	6.61
Fibre (g)	10.2	12.4

Shelf Life Study of the Selected Product with the Standard: The standard and selected products were analyzed for its shelf life period by evaluating their sensory attributes and total microbial load after packing in polythene bags, at an interval of 2 days.

TABLE III SENSORY ANALYSIS OF THE STANDARD AND SELECTED SPINACH LEAVESINCORPORATED PIZZA CRUST DURING STORAGE STUDY

Sl.No	Day	Standard	Sample A
		Polythene	Polythene
1	1st	4.733	4.8
2	3rd	4.733	4.733
3	5th	4.766	4.7

From the above Table III, it was noted that the quality of the product kept in polyethene bag was accepted for 5 days by the panel members.

Microbial Analysis of the Standard and Selected Product: The sample and standard were good during 1st, 2nd and 4th day. And on the 5th day after sampling no contamination was found in sample A and Standard. There was no bacterial growth observed in samples. **TABLE II**

MICROBIAL LOAD OF THE STANDARD PRODUCT AND SELECTED PRODUCT

Days	Name of the Product	Indicator Test Result (CFU / gram) and Interpretation/Standard Plate Count			
		G	M/S	US	P H
1st day	Standard	-	-	-	-
	Sample A	-	-	-	-
2nd day	Standard	-	-	-	-
	Sample A	-	-	-	-
4th day	Standard	-	-	-	-
	Sample A	-	-	-	-
Organism identified	No organism were identified				

(Good= **G**; Satisfactory = **S**; Marginal = **M**; Unsatisfactory = **US**; Potentially Hazardous = **PH)**

The Cost Analysis of Standard and Best Product: The results revealed that the cost of 100g spinach leaves powder incorporated in Pizza crust was Rs. 18, whereas the cost of standard was Rs.17. Though the cost of the prepared product is slightly higher, when compared with standard.

Popularization of the Selected Product: The scores obtained in the popularization study shows that only 20% of the children are including spinach leaves in their diet and majority of the participants were not using spinach in any form. It created awareness about the health benefits and importance of the spinach. After the product was popularized all the participants accepted the spinach leaves powder incorporated Pizza crust and are ready to buy the product if it is available in the market.

CONCLUSION

From the study, it was concluded that the Spinach leaves powder incorporated with 5%of the Pizza crust was accepted in studies. The prepared product is high in Iron and fiber when compared to the standard product. The prepared product is acceptable till 5th day without microbial deterioration if it is stored in polythene bag under refrigerated condition properly. The cost of the prepared best product was slightly high, when compared with standard. It is good for school going children mainly to prevent anemia. In the popularization study the entire participant accepted the product. It can be concluded that inclusion of green leafy vegetables in the diet not only add variety but also are important for growth and good health as they contain nutrients.

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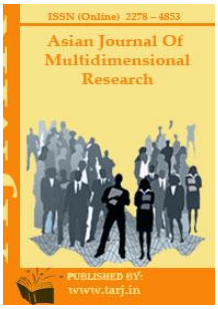

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A VERSATILE METHOD OF SYNTHESIS OF PLANT-ASSISTED METAL NANOPARTICLES USING CYPERUS ROTUNDUS AQUEOUS EXTRACT

S.Santhiya*; P.Lalitha; C.S.Smina*****

*Research Scholar,
Department of Chemistry,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id:santhiyapdf@gmail.com

**Associate Professor,
Department of Chemistry,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

***Research Scholar,
Department of Chemistry,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

In this study the synthesis of gold nanoparticles using aqueous extract of Cyperus rotundus root was carried out. The sequential solvent extraction of the root was performed using refluxing method. The preliminary phytochemical screening of different solvent extracts shows the presence of carbohydrate, proteins, anthroquinone, sterols, phenolic and alkaloids. Conventional method of ultra sonication was employed for the synthesis of gold nanoparticles. Grayish pink colour gold nanoparticles were formed within 1 minute. The prepared gold nanoparticles were characterized using spectroscopy techniques such as UV, FTIR and FESEM. The reduction of nanogold was monitored by UV-Visible spectrometer. The surface plasma resonance (SPR) region obtained between 530 - 550 nm confirms the reduction of ions by plant extract. The results of FTIR revealed the presence of functional groups in the plant extracts to serve as capping agent in the reduction of chloroaurate ion. FESEM analysis revealed spherical shape gold nanoparticles of average size

98nm. Elemental mapping portrays uniform distribution of gold nanoparticles embedded in plant extract.

KEY WORDS: *Cyperus Rotundus, Gold Nanoparticles, FTIR, UV, FESEM*

1. INTRODUCTION

Synthesis of nano particles using plants is gaining more interest in recent research taking into consideration the need to reduce the harmful impacts to our environment. Chemical and physical methods are widely used and this requires very reactive and toxic chemicals. Environmental concern thus necessitates bio-mediated nanoparticles synthesis **(Saif *et al.*, 2016).** Plants are sustainable healthy renewable sources to produce nanoparticles (**Castro *et al.*, 2014).** Simple, low cost and non toxic plant-assisted synthesis have great importance in nano synthesis **(Klekotko *et al.*, 2016).**

Plant sample aided synthesis of nanoparticles is well-documented in literature. Yet it differs from plant to plant as the constituents in the plant vary. Formation of spherical shaped gold nanoparticles using *Peltophorum pterocarpum* flower aqueous extracts **(Balamurugan *et al.*, 2016),** ruby red color gold nanoparticles using *Bougainvillea glabra* leaves **(Rose *et al.*, 2014),** red colour gold nanoparticles using **a**queous extract of the red alga *Corallina officinalis* **(Yassin *et al.*, 2014)**, gold nano particles using *Prosopis juliflora* extracts **(Rao *et al.*, 2017)** are reported**.**

Cyperus routundus is a traditional medicinal plant and it used as a drug **(Jaziri, *et al.*, 2011).** It belongs to the family Cyperaceae **(Imam *et al.*, 2014)**. The tubers of the plant have more health benefits. It used in wound healing activity **(Puratchikody *et al.*, 2006), as** antimalarials **(Thebtaranonth *et al.*, 1995)**, anti-obesity **(Athes *et al.*, 2014)**, anti-inflammatory activity **(Chithran *et al.*, 2012)** diarrhoea **(Daswani *et al.*, 2011)** and antiulcer activity **(Mohammad *et al.*, 2012).**

In this present study synthesis of gold nano particles using aqueous extract of tuber portion of Cyperus rotundus was carried out under sonication method.

2. MATERIALS AND METHOD

2.1 Material

All the chemicals used in the study were of AR grade. Distilled water of pure grade was used throughout the study. The samples are weighed using electronic balance (**Uni Bioc 1987**). Synthesis of gold nanoparticles was carried out using Ultrasonic bath- (Digital Ultrasonic cleaner LMUC series) under sonication method. Refluxing apparatus was used for solvent extraction.

2.1.1 Collection of plant

Dried tuber portion of *Cyperus rotundus* was collected from a local shop in Flower market, Coimbatore. It was ground partially and stored air-tight to prevent spoiling.

2.2 Solvent extraction of plant extract

The partially ground powder of *Cyperus rotundus* root (15g) was refluxed with non-polar and polar solvents. Sequential extraction was carried out using petroleum ether (60-80^{O}C grade), ethyl acetate, acetone, carbinol, alcohol and water. The temperature was maintained at 45˚C and 85˚C for non-polar and polar solvents respectively. After the extraction, all solvent extracts were filtered using plugged cotton and allowed to dry. The weight of the dried samples were taken and refrigerated for further studies.

2.2.1 Phytochemical analysis plant extract

Phytochemical analysis of prepared solvent extracts of *Cyperus rotundus* were carried out using reported procedure **(Jayanthi *et al.*, 2012).** The secondary metabolites present in the extracts were identified by suitable colour tests.

2.3 Preparation of extract for nanoparticle synthesis

Aqueous extract of *Cyperus rotundus* (1g) was sonicated for 15 minutes with distilled water (50 ml) at 30˚C. Then the solution was filtered using a funnel plugged with cotton. The clear filtrate solution was refrigerated for use as capping agents in nano synthesis.

2.3.1 Synthesis of gold nano particles

Constant volumes (10µl) of 3 mM gold chloride solution was treated with different ratio (10µl, 20 µl, 30 µl, 40 µl, and 50 µl) of *Cyperus rotundus aqueous extract under ultra sonication method. T*he formation of gold nanoparticles was initially visually confirmed by the colour change from light yellow to grayish pink colour.

2.4 Characterization of gold nanoparticles

***2.4.1 Separation of* gold nanoparticles**

The prepared gold nanoparticles were separated by centrifuging at 100 ppm for 10 minutes. The filtrate was evaporated and the nanopowder left was characterized by UV-Visible spectroscopy, FTIR and FESEM.

2.4.2 UV-Visible Spectroscopy

Synthesized gold nanoparticles were characterized by using UV Spectrometer (Biospec-nano (230V).The Surface Plasmon Resonance (SPR) was calculate by range of wavelength absorbed by the gold nano particles. The reduction of chloroaurate ion into nanoparticles was confirmed by UV analysis.

2.4.3 Fourier Transform Infra Red Spectroscopy(FTIR)

FTIR is a very fast and reliable non destructive analytical tool to visualize the chemical composition present in the extract and nanoparticles in terms of functional groups of molecules. An aliquot of aqueous extract (blank) and gold nanoparticles (embedded in plant extract residues) were placed on a sample holder. The spectra of nanoparticles and aqueous extract were recorded in the range of 400-800 cm $^{-1}$ in Shimadzu (FTIR – 00585) spectrometer.

2.4.4 Field Emission Scanning Electron Microscopy

Surface morphology of the synthesized gold nanoparticles was examined by TESCAN MIRA 3 FESEM. The prepared nanoparticles were dispersed thoroughly by sonication before coating. Aluminium stubs of 8 mm dia were used as sample holders. Double side adhesive cotated carbon tapes were used on the stubs. The exposed surface with adhesive served as sample stage to hold micrograms of sample. The samplewas coated on glass plate of length 5x5mm and surfaces morphology was analyzed in FESEM. The distributions of gold particles were carried out using SUTW- Sapphire model Sputter coater.

3. RESULTS AND DISCUSSION

3.1 Phytochemical assessment of *Cyperus rotundus* root extract

Preliminary phytochemical screening of the solvent fractionates of *Cyperus rotundus* root was carried out and the results of the study are tabulated in table 1.

TABLE 1 PHYTOCHEMICAL SCREENING OF DIFFERENT SOLVENT EXTRACTS OF CYPERUS ROTUNDUS ROOT

S.No	Solvents	Alkaloids	Phenolic	Sterols	Anthro quinone	Proteins	Carbohydrate	Yield (g)
1	**Pet ether**	-	-	+	-	-	+	**0.096**
2	**Ethyl acetate**	+	+	+	-	-	+	**0.060**
3	**Acetone**	+	+	+	+	-	+	**0.146**
4	**Carbinol**	+	+	+	+	+	+	**1.072**
5	**Ethanol**	+	+	+	+	-	+	**0.224**
6	**Aqueous**	+	+	-	-	+	+	**0.624**

Various metabolites such as alkaloids, phenolic, sterols, anthroquinone, protein and carbohydrates present in different solvent extracts of *Cyperus rotundus* root were confirmed by suitable colour tests (**Harborne, 1980**). The total yield of the solvents extracts are given in the **table 1**. Due to the neutral behavior of water and presence of comparatively more constituents the aqueous extract of *Cyperus rotundus* root employed in the synthesis of gold nanoparticles. In nanoparticles synthesis plant extracts are involved in the bio reducing metal ion into nanoparticles. Protein molecules are active reducing agents to attract the metal ion and the molecules of protein reduce the metal ion resulting in nanoparticles **(Gruen *et al.*, 1975).** Alkaloids, phenolic compounds and carbohydrates play an important role in the reduction of metal ion **(Yasmin *et* al., 2014)**. The presences of the aforesaid secondary metabolites are anticipated to play a role in the synthesis of gold nanoparticles.

3.2 Synthesis of gold nanoparticles using various methods

Different ratio of aqueous extract of *Cyperus rotundus* root were treated with constant ratio of auric chloride solution in the ratio of 1:1, 2:1, 3:1, 4:1, 5:1 under sonication method. The visible colour change from light yellow to grayish pink (Grapes skin colour) confirms the reduction of metal ion. The present study reveals the formation of gold nanoparticles under sonication method requiring one minute for the ratio of extract: auric chloride solution- 5:1 and 1:1. Increase the concentration of plant extract is found to decrease the time for formation of nanoparticles.

TABLE 2 SYNTHESES OF GOLD NANOPARTICLES UNDER SONICATION METHOD

S.No	gold chloride: aqueous extract	Ultra sonication (min)	Colour of the nanoparticles
1	1:1	1	Grayish pink
2	1:2	1.40	Grayish pink
3	1:3	1.35	Grayish pink
4	1:4	1.30	Grayish pink
5	1:5	1	Grayish pink

3.3 Characterization of gold nanoparticles

3.3.1 UV-Visible spectroscopy

The UV-Visible spectrum of synthesized gold nanoparticles show a broad SPR region between 530-550nm (fig.1). The shift of SPR band towards the blue shift (longer wavelength) and broader shape portrays the larger size of the nanoparticle **(Firdhouse *et al*., 2014).**

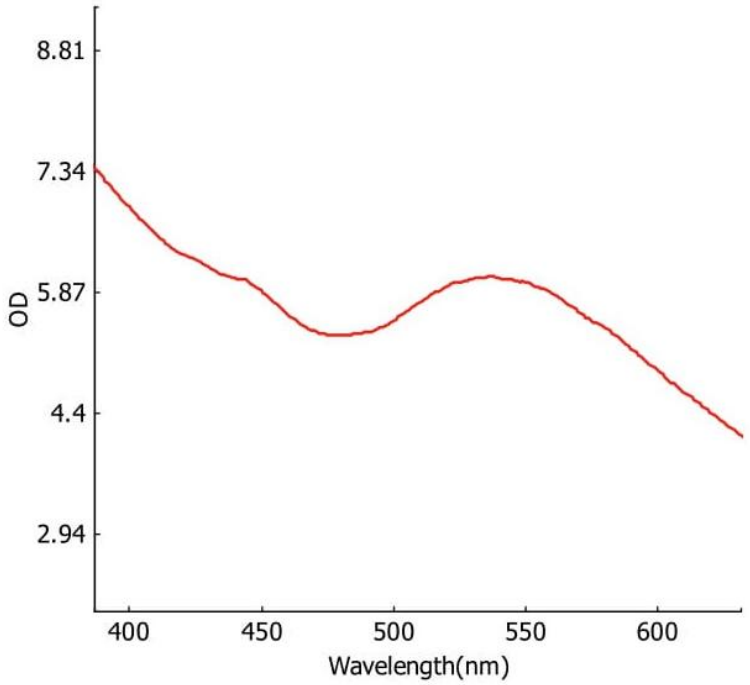


Figure 1. UV-Visible spectrum of synthesized gold nanoparticles using aqueous extract of *Cyperus rotundus* root

3.3.2 Fourier Transform Infra Red Spectroscopy

The FTIR spectrum of aqueous extract and gold nanoparticles prepared from *Cyperus rotundus* root is shown in fig.2a & 2b respectively. The main functional groups in the plant extracts (fig 2a) such as carbonyl group, alcoholic group and –OH due to are assigned to the protein molecule, phenolic compounds etc present in the extract. The synthesized gold nanoparticles showed strong band at 3356.14 cm^{-1} due to –OH, and 1635.64 cm^{-1} due to carbonyl. The results reveals functional group in plant extract to strongly interact with the metal ion and to be involved in the reduction of metal ion.

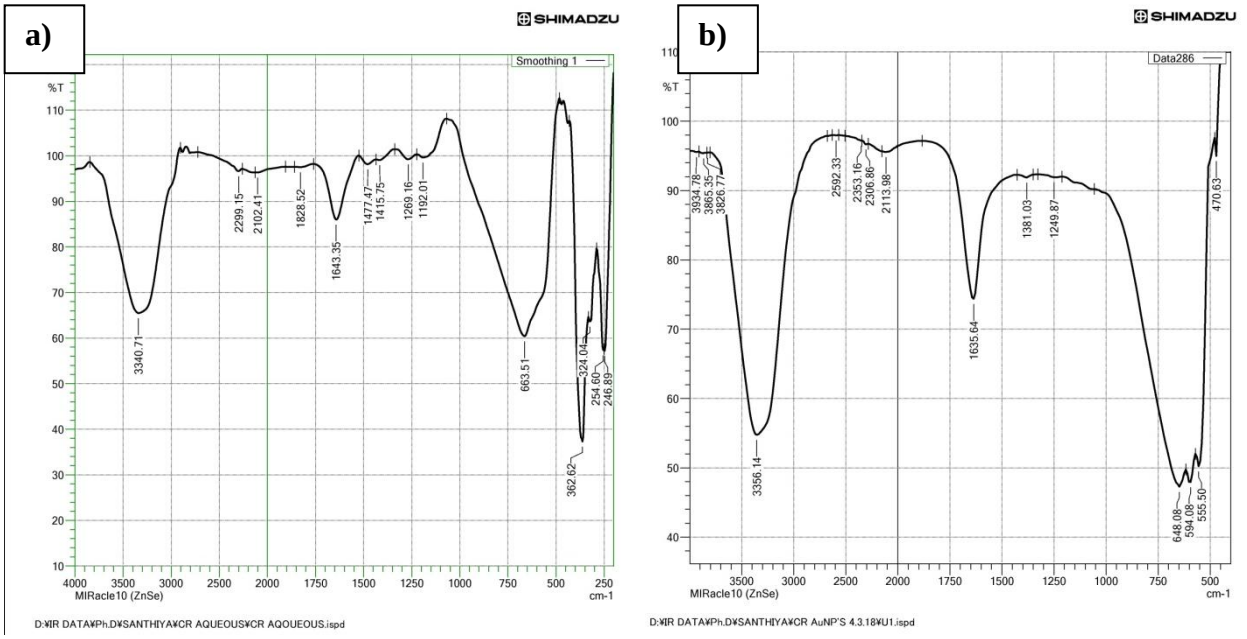
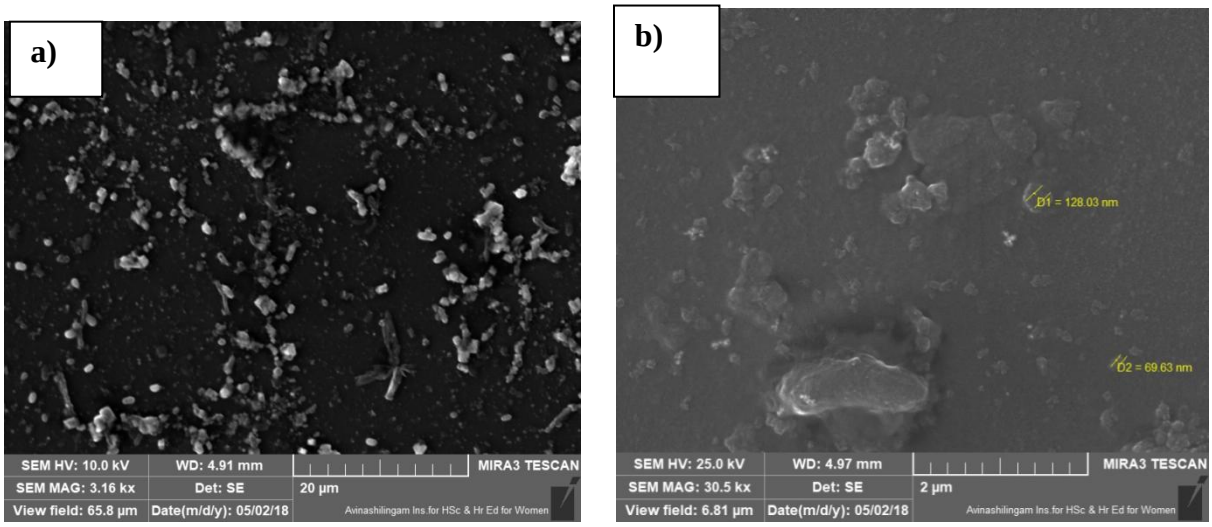


Figure 3.FTIR Spectrum of a) aqueous extract of *Cyperus rotundus* root **extract and b) gold nanoparticles**

3.3.3 Field Emission Scanning Electron Microscopy (FESEM)

Figure 3 shows FESEM images of gold nanoparticles prepared using *Cyperus rotundus* aqueous extract by sonication method. The result reveals the nanoparticles to be spherical in nature and some particles to show non-uniform shape. The nanoparticles are averagely 98 nm in size. The EDAX results given in fig 4c shows 3.4% of gold nanoparticles and remaining elements shown in fig 4c reveals few elements to be present in plant extract that is embedded with gold nanoparticles. Elemental mapping (fig 4d) portrays the gold particles to be uniformly distributed along with plant metabolites.



c

Element	Weight %	Atomic %	Net Int.	Error %	Kratio	Z	A	F
NaK	50.00	60.18	95.77	4.71	0.4233	1.0379	0.8151	1.0006
MgK	15.17	17.26	26.50	7.70	0.1040	1.0524	0.6512	1.0007
AuM	3.20	0.45	2.05	4.79	0.0238	0.6080	1.1063	1.1080
ClK	2.52	1.97	2.81	17.96	0.0225	0.9518	0.9329	1.0046
K K	2.43	1.72	1.92	27.43	0.0225	0.9420	0.9674	1.0129
CaK	26.68	18.42	16.07	7.06	0.2491	0.9562	0.9763	0.9999

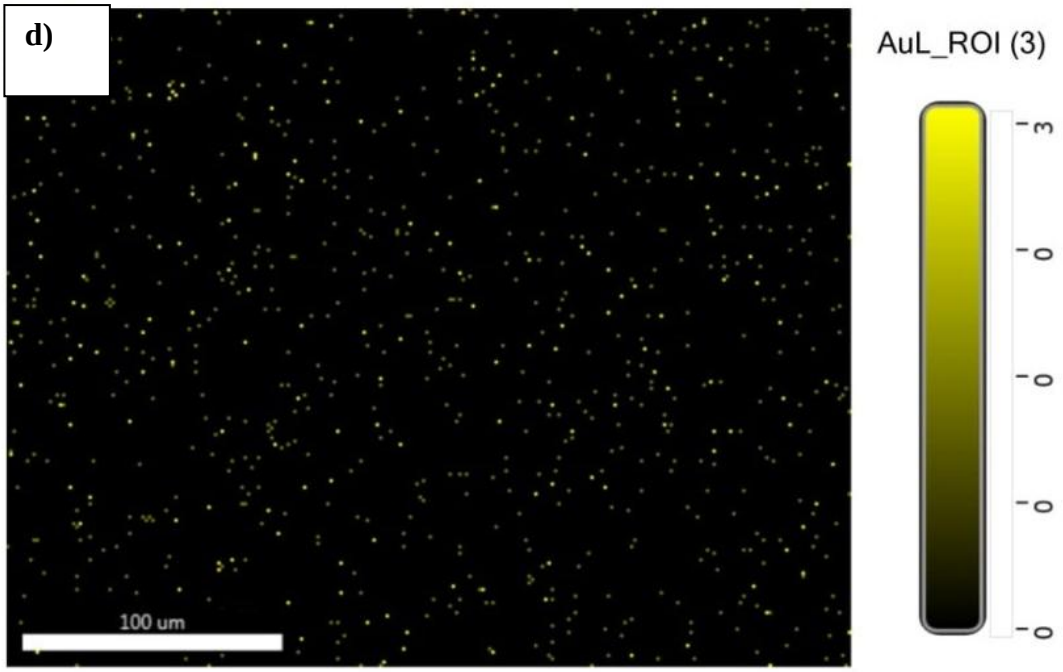


Figure 4. a) and b) FESEM of synthesized gold nanoparticles, c) EDAX image of nanoparticle, d) Distribution of gold nanoparticles- Elemental mapping

CONCLUSION

The phytochemical analysis of dried tuber portion of *Cyperus rotundus* revealed presence of several significant secondary metabolites. Grayish pink colour gold nanoparticles were synthesized using aqueous extract *Cyperus rotundus* by sonication method in 1 minute. The responsible functional group of plant extracts for reduction of metal ion was identified using FTIR. The formation of spherical shaped gold nanoparticles of size 98 nm was established in FESEM analysis. Hence this rapid synthesis of gold nanoparticles may be utilized in pharmacological and biological applications.

Conflict of interest

The authors declare that they have no conflict of interest.

Acknowledgements

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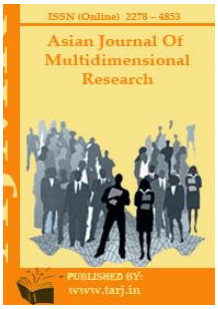

Asian Journal of Multidimensional Research (AJMR)

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SYNDROME (PMS) AMONG REPRODUCTIVE AGE WOMEN

G. Suba*; A Thirumani Devi**

*Assistant Professor and Head,
Department of Food Science and Nutrition,
LRG Government Arts College for Women,
Tirupur, INDIA

**Professor and Head,
Department of Food Science and Nutrition,
Avinashilingam Institute of Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Food is the base for all living beings. Dietary intake plays a major role in the incidence of PMS. Hence the present study was conducted to determine the relationship between the dietary habits and PMS among the reproductive age women.

MATERIALS AND METHODS: *in the present study, totally 541 participants were selected by purposive sampling technique. An interview schedule method was framed to collect the data related to the demographic profile of the participants. PMS symptoms were recorded on the basis of the standard tool known as Premenstrual Daily Diary. The average score for PMS symptom of each individual was noted. The data was statistically analysed using descriptive and inferential statistics.*

ANALYSIS AND INTERPRETATION*: from the study, it was evident that the dietary factors like skipping meal, intake of milk, water, carbonated beverages, fast foods, fruits other vegetables and green leafy vegetables play a major role in aggravating the symptoms of PMS. Skipping meal was positively correlated with anxiety (r=0.112, p=0.041), intake of water was negatively correlated with irritability, anxiety, depression and cry but all were not statistically significant. Intake of fruits was negatively correlated with anger (r=-0.010, p=0.027), depression (r=-0.105, p=0.021) and cry (r=-0.118, p=0.01), intake of other vegetables was negatively correlated with cry (r=-0.108, p=0.017). Green leafy vegetables had negative correlation with depression (r=-0.089, p=0.050), cry (r=-0.142, p=0.002). Percapita oil consumption showed negative correlation with irritability (r=-0.217, p=0.00), anger (r=-0.158, p=0.00), anxiety (r=-0.193, p=0.00), depression (r=-0.290,*

p=0.00). Intake of carbonated beverage was positively correlated with irritability, anger, anxiety and depression but was not statistically significant.

CONCLUSION: From the study it was clear that the symptoms of PMS was aggravated by the faulty eating habits and reduced intake of balanced diet. Milk, adequate water, fruits, vegetables, greens showed to reduce the symptoms like anger, anxiety, cry, irritability etc. A healthy lifestyle and a well-balaced diet can reduce the symptoms of PMS to a great extent.

KEYWORDS: *Dietary, adequate, irritability, anger,*

INTRODUCTION:

According to Meschino (2005), scientific evidence confirmed that appropriate attention given to nutrition and the daily use of specific dietary supplements helped to support women's hormonal balance and improve the management of menopause symptoms, PMS, fibrocystic breast disease, osteoporosis, uterine fibroids and endometriosis and so on.

PMS is probably multi-factorial and it is probably way more complicated than one or two supplements or mineral deficiencies might cause (Moon, 2013).

Vegetables such as peas and spinach contain non heme iron. A diet rich in the minerals may help protect against PMS. Iron may be related to PMS because it is involved in producing serotonin, a neuro transmitter that helps in regulating mood (Bertone-Johnson et al., 2013).

An appropriate dietary pattern is necessary for a healthy life style that could have the effects on much aspect of life such as menstrual cycles in women (Bakhshani and Hasanzadeh, 2012). Gopalan (2013) also suggested that the food based approach is more durable and sustainable that a "drug based "one and we should look into our farms and not our pharmacies to solve health problems.

MATERIALS AND METHODS:

In the present study, purposive random sampling technique was used for selecting the participants to find out the prevalence of PMS among the selected participants. The participants consisted of 541 young adult women between the age group of 18 and 35 years. An interview schedule method was used to collect the data related to the present study. PMS was assessed using ACOG diagnostic criteria for 2 successful menstrual periods to confirm the premenstrual symptoms. The investigator recorded the dietary habits and meal pattern, common foods taken regularly and quantity of food items of the selected participants through dietary recall method. The collected data were processed and analysed using descriptive and inferential statistics.

RESULTS AND DISCUSSION:

It was noted that all the participants had one or the other symptom of PMS (100%).

Dietary pattern and PMS symptom:

Food plays a vital role in the prevalence of PMS. Dietary habits' role in the prevalence of PMS is presented in the following tables.

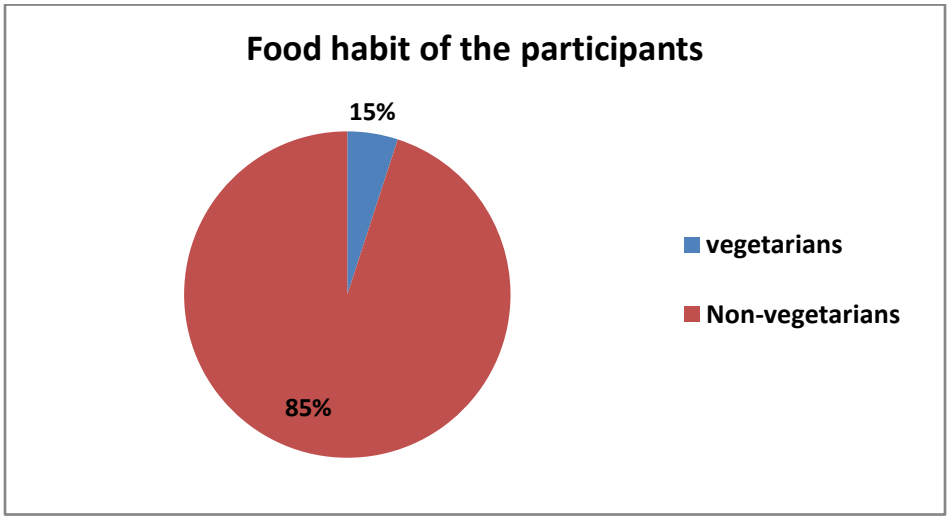

Figure-1

According to Hardey (2010), eating less animal fat and consuming more dietary fibre has also been shown to help lower excessive oestrogen levels and assist in the management of PMS. But the present study does not show significance in the intake of vegetarians and non-vegetarians as the number of vegetarians participated in the study was only 15 per cent (Figure-1).

i. Correlation of dietary habits with emotional symptoms of Premenstrual Syndrome

TABLE-I CORRELATION OF DIETARY HABITS WITH EMOTIONAL SYMPTOMS OF PREMENSTRUAL SYNDROME (N=541)

Food item	Signs and Symptom of PMS	Correlation (r value)	Significance
Skipping of meals	Irritability	0.116	0.011*
	Anxiety	0.109	0.00**
Carbonated beverages	Irritability	0.093	0.033*
	Anger	0.105	0.030*
	Anxiety	0.097	0.042*
Intake of fast food	Cry	0.188	0.00**
	Anger	0.109	0.00**
	Relationship problem	0.093	0.033*
Coffee intake	Irritability	0.258	0.00**
	Anger	0.175	0.00**
	Anxiety	0.096	0.035*
	Depression	0.127	0.005**

*Significant at 5% level **Significant at 1% level NS- not significant

Skipping of meal was positively correlated with irritability (r=0.006, p=0.011) and anxiety (r=0.109, p=0.00). Intake of carbonated beverages showed a mild degree of positive correlation with irritability (r=0.083, p<0.05), anger (r=0.105, p<0.05) and anxiety (r=0.097, p<0.05). Intake of fast food items among the participants showed positive correlation with the symptoms like cry (r=0.188, p=0.00), anger (r=0.109, p=0.00) and relationship problem (r=0.093, p=0.033). Intake of coffee was positively correlated with irritability and anger (p=0.00), anxiety and depression (p<0.005). Caffeine restriction was recommended primarily due to its association with an increase in irritability, anxiety,

insomnia. Alcohol can exacerbate PMS symptom and also deplete body B vitamin stores (Pitman, 2016). Hence, it was noted that excessive intake of coffee was an important determining factor for the emotional symptoms.

ii. Food intake and PMS symptoms:

Food intake by the participants in the present study is presented in Table –II.

TABLE-II CORRELATION OF FOOD INTAKE WITH EMOTIONAL SYMPTOMS OF PREMENSTRUAL SYNDROME (N=300)

Food item	Signs and Symptom of PMS	Correlation (r value)	Significance
Water intake	Irritability	-0.190	0.009**
Fruits	Anxiety	-0.101	0.027*
	Depression	-0.105	0.021*
	Cry	-0.118	0.01**
Vegetables	Cry	-0.089	0.050*
Green leafy vegetables	Depression	-0.089	0.05*
	Cry	-0.142	0.002*
	Relationship problem	-0.097	0.033*
Oil consumption	Irritability	-0.217	0.00**
	Anger	-0.158	0.00**
	Anxiety	-0.193	0.00**
	Depression	-0.290	0.00**
	Relationship problem	-0.093	0.042*
Skipping of meals	Irritability	-0.116	0.011*
	Breast tenderness	-0.214	0.00**
	Back pain	0.210	0.00**
	Muscle pain	0.212	0.00**
	Weight gain	0.182	0.00**
Intake of milk	Cry	-0.188	0.00**
	Anger	0.109	0.00**

*Significant at 5% level **Significant at 1% level NS- not significant

The Table- I shows the correlation of the dietary intake of the selected participants and individual PMS symptom scores. It was noted that intake of water was negatively correlated with irritability (r= - 0.190, p=0.00), but though it was negatively correlated with anger, anxiety, depression and cry, they were not statistically significant. With excess intake of water the PMS symptoms were noticeably reduced.

The intake of fruits had a negative correlation with PMS symptoms anxiety (r = -0.010, p = 0.027), depression (r= - 0.105, p= 0.021) and cry (r= - 0.118, p=0.01).

Intake of other vegetables also showed a negative correlation with the individual PMS symptom scores like cry (r= - 0.108, p= 0.017). Though anger, irritation, anxiety and depression also showed negative correlation, they were not statistically significant.

Intake of green leafy vegetables had negative correlation with depression (r= -0.089, p= 0.050), cry (r= - 0.097, p= 0.002) and relationship problem (r= -0.097, p=0.033).

Per capita oil consumption showed negative correlation with the symptoms like irritability(r= -0.027, p=0.00), anger (r= -0.158, p=0.00), anxiety (r= -0.193, p=0.00)., depression (r= -0.093, p=0.042).and relationship problem(r= -0.097, p=0.033).. Similar pattern was reported by Darabi et al (2014) in which it was noted that there was a negative relationship between milk servings and pain (p=0.038; r=0.224). It was noted that the intake of oil by the participants was 5 ml to 30 ml. only which was very low to normal requirement of oil only. Hence the impact of excess of oil on PMS as stated in other studies was not noted in the present study.

Intake of milk is negatively correlated with the individual PMS symptom scores like cry (r=-0.18, p=0.00) but positively correlated with anger (r=0.109, p=0.00). In the study done by Derman et al., (2014), it was noted that the patients consumed more than 200 ml. of milk, 300 ml yoghurt and more than 50 g of cheese per day the frequency of PMS was less .

CONCLUSION:

The study shows that intake of fast food items, coffee and skipping meal had positive correlation with PMS symptoms. Hence they aggravate the condition of PMS. On the other hand, intake of milk, green leafy vegetables, water, other vegetables and oil (not in excess) had negative correlation with the emotional symptoms of PMS. Intake of a well balanced diet with adequate fruits, vegetables in the diet help in reducing the emotional symptoms of PMS.

From the study is concluded that the symptoms of PMS was aggravated by the faulty eating habits and reduced intake of balanced diet. Milk, adequate water, fruits, vegetables, greens showed to reduce the symptoms like anger, anxiety, cry, irritability etc. A healthy lifestyle and a well-balanced diet can reduce the symptoms of PMS to a great extent.

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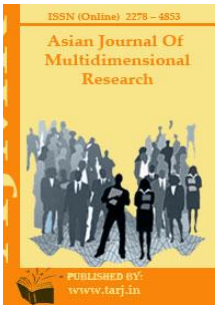

Asian Journal of Multidimensional Research (AJMR)

(Double Blind Refereed & Reviewed International Journal)

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FOOD AND OBESIOGENIC ENVIRONMENT AMONG SCHOOL CHILDREN IN COIMBATORE

Uma Mageshwari.S*; Nangkyrsoiki Langi**

*Professor,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: uma.adu3@gmail.com

**Postgraduate Student,
Department of Food Service Management and Dietetics,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Obesity is becoming a social threat and one of the most important health problems of the 21st century. Obesity is prevalent among all the age groups and in particular it is rising among children. Identifying obesity at childhood stage is imperative so that interventions can be adopted at an earlier stage to have a healthy and quality life. The objective of the study was to find out the prevalence of childhood obesity and influence of obesiogenic and food environment among children between 9 – 13 years. A total number of 641 children both boys and girls were screened to find out obesity. A sub-sample of 287 obese boys (184) and girls (103) were selected depending on inclusion and exclusion criteria to study the food and obesiogenic environment. A 24 hour dietary recall, food consumption pattern, physical activity pattern and family history of obesity was found out. Nutrition education was given to the obese boys and girls. Incidence of obesity was seen prominent among the girls (50%) than boys (46%) among the 13 year age group. The dietary pattern revealed that fibre intake was low for the boys and a deficit in energy and protein among girls was noted. Indoor games were commonly seen as activities among obese boys and girls.Action should start from home and schools should be food and obesiogenic environment friendly.

KEYWORDS: *Childhood Obesity, Obesiogenic environment, Food environment, Physical activity.*

INTRODUCTION:

Obesity is becoming a social threat and one of the most important health problems of the 21st century.Obesity is prevalent among all the age groups and in particular it is rising among children. The high prevalence of overweight and obesity has serious health consequences throughout the globe. The World Health Organization (WHO) Experts have estimated that there are 43 million overweight children under the age group of 5and by 2020 more than 60 percent of global diseases burden will be the result of obesity related disorders[1].

Critically, childhood obesity is a strong predictor of adult obesity, which has well known health and economic consequences, both for the individual and society as whole[2] although longitudinal studies suggest that improving BMI in adulthood can reduce the risk of morbidity and mortality[3] childhood obesity will leave a permanent imprint on adult health[4].

Childhood obesity not only affects physical health but also mental well –being .Obese children are associated with reductions in quality of life and a greater risk of teasing, bullying and social isolation. Obesity negatively influences a child's self-esteem and results in diminished quality of life. Obesity in childhood can contribute to behavioural and emotional difficulties, such as depression and can also leads to stigmatization and poor socialization and reduce educational attainment[5].

Obesity should be prevented during childhood itself as in adult stage prevention becomes difficult due to performed foods habits and opinion about foods .Hence the need to identify obesity at childhood stage is imperative so that interventions can be adopted at an earlier stage to have a healthy and quality life.

OBJECTIVES:

- To find out the prevalence of obesity among school children between 9-13 years
- To understand the influence of food and obesogenic environment among obese children.

METHODOLOGY:

The area selected for the study was Coimbatore city .The target group children were selected from two urban schools .Due permission was taken from the school authorities and parents to conduct the study. Ethical Clearance for the study was obtained from Institutional Human Ethics Committee (IHEC), AUW/IHEC/FSMD-17-18/XPD/07 from Avinashilingam Institute for Home Higher Education for Women, Coimbatore.

A total of 641 students both boys and girls from the two schools who belong to the age group of 9-13 years were selected for the study by purposive sampling.

INCLUSION CRETERIA:

- Both genders
- Children in the age group of nine to thirteen years
- Both obese and non obese

EXCLUSION CRETERIA:

- Children above the age group of thirteen years
- Children below the age group of nine years
- Children with disabilities

Background information was collected from the subjects through direct and face to face interview using an interview schedule

ASSESSMENT OF ANTHROPOMETRY:

Height and weight of all the children was measured using standard procedures and The calculated BMI value was compared with percentile given by centre for Diseases Control (CDC, 2000)

ASSESS THE FOOD AND OBESOGENIC ENVIRONMENT:

To assess the FOOD environment the food eaten in the school canteen and outside the school premises was noted by the observation method. Information regarding food consumption pattern was elicited through a twenty four hour dietary recall. Physical activity pattern was elicited using an interview schedule for a subsample of 287 children.

RESULTS:

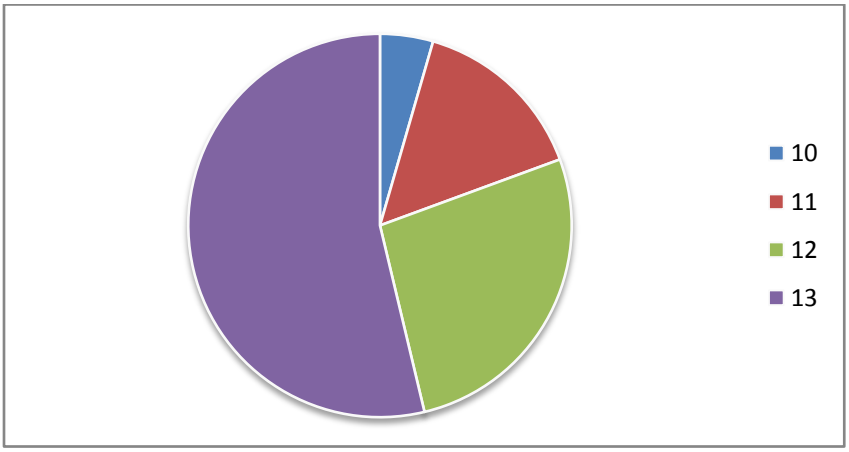
Prevalence of obesity among the selected children

School	BOYS N=415				GIRLS N=226			
	Obese N=49		Normal N=326		Obese N=69		Normal N=157	
	N	Percent	N	Percent	N	Percent	N	Percent
I	42	10	183	44	18	8	85	38
II	47	11	143	34	51	23	72	32

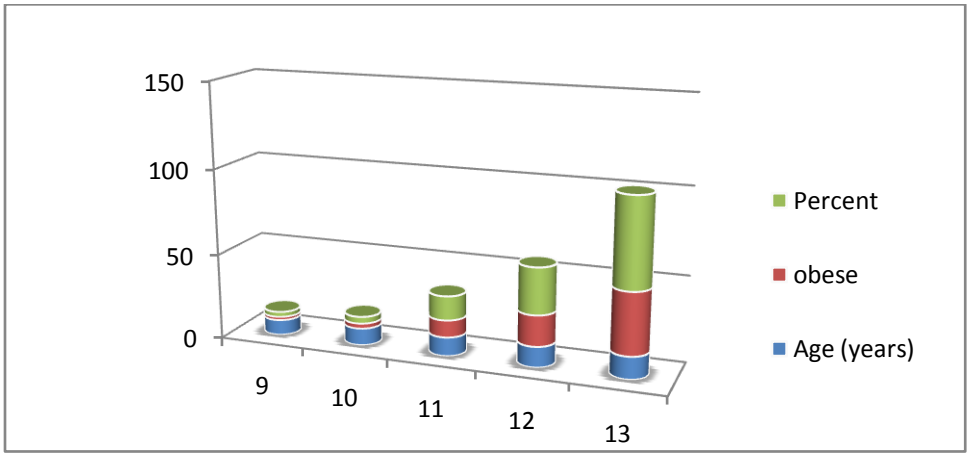
Among 641 children selected in the study 65 percent were boys and 35 percent were girls. The prevalence of obesity among the selected 641 children was 25 percent ie, 158.

Age distribution of selected children

Forty six percent of the boys with obesity were in the thirteen years age group followed by twenty seven percent in the eleven year age group. There was no obesity in the nine year age group and this shows that as age advances children become obese.



Age distribution of girls with obesity:



Fifty percent of the girls with obesity were in the thirteen years age group followed by twenty seven percent in the twelve year age group .There was three percent obesity in the nine year age group.

Monthly Income of the Family

Income (Rs.)	Boys N=184		Girls N=103	
	N	Percent	N	Percent
Economically weaker section≥5000	6	3	5	5
Low income group 5001-10000	20	11	6	6
High income group ≤10000	158	86	92	89

Source: HUDCO, 2010

Eighty six and 89 percent of boys and girls parents respectively had an income above Rs 10,000,which is supported by the fact that many of the parents were involved in business and also many were professional .Also the economically weaker sections also were sending their wards to school and it was seen that three percent of boys and five percent girls families were in this category

Prevalence of obesity in the subsample

Particulars	Boys N=184	Percent	Girls N =103	Percent
Obese	42	23	18	17
Normal	142	77	85	83

Among the 287 children selected 42 boys and 18 girls were obese which is 23 percent and 17 percent respectively.

The following discussions will be given for the obese category children from the sub-sample.

Family details

Most of the school children were from nuclear family with boys being 71 percent and girls being 77 percent but there was joint family system also jointed which was 29 percent of boys and 23 percent among girls.

Among the 287 children selected 42 boys and 18 girls were obese which is 23 percent and 17 percent respectively.

FOOD EATEN OUTSIDE:

Particulars	Obese N=60				Non –obese N=227			
	Boys N 42	Girls N 18	t-value	SED	Boys N 142	Girls N 85	t-value	SED
Street foods	42	18	15*	1.72	120	73	8*	5
Small shop	42	18			112	72		
Stationary shop	40	13			117	60		
Hawkers	40	10			114	62		
School canteen	42	18			106	85		

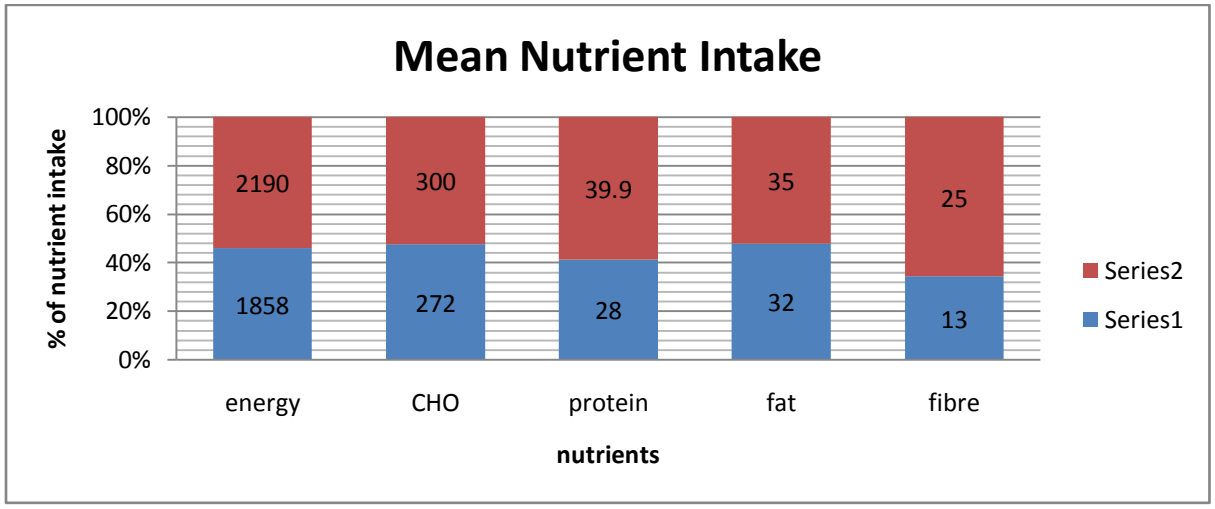
P≥0.005*

It was surprising to find that all the children whether obese or non –obese consumed foods every day from the different food service outlets like school canteen, street foods and from hawker's t-value for both obese and non –obese children. The dietary pattern including breakfast habits, frequency of dining out, commonly preferred outside food and consumption of ready –to eat foods[6]

Lunch:

Regarding the commonly packed lunch which was brought to school by the children it was seen that rice items like briyani, fried rice and tamarind rice were consumed mostly. Noodles were consumed next by the children.

Mean nutrient intake



The mean nutrient intake for the selected school children showed that energy protein, fat and fibre there was a deficit ranging from 8 to 48 percent .Fibre intake was very low with the percent deficit of 48 for the boys with the obesity .Among the obese girls deficit of energy ,protein, and fat was higher than compared to the boys. Among the Non-obese and similar pattern was obesity and all the nutrients were deficit than RDA .It was discouraging to know that protein intake was deficit by 35 to 45 percent among the non – obese boys and girls which show that nutrition education is vital and is much need for the age group.

Physical activity:

Indoor games were commonly seen as activities in both the groups with 12 and 3 percent among obese boys and girls. Screen time was more in both groups which indicates that computers laptop, mobile and T.V screen are very common activities. Twenty two and ten percent of obese boys and girls respectively travelled to school by four wheelers.

Contributing factor towards obesity

Particulars	**Obese N=60**				**Non –obese N=227**			
	Boys N=42	**Percent**	**Girls N=18**	**Percent**	**Boys N=142**	**Percent**	**Girls N=85**	**Percent**
Presence of family history	14	23	6	10	Nil	Nil	Nil	Nil
Increased portion per meal	12	20	7	12	25	11	12	5
Less duration of physical activity	16	27	5	8	30	13	38	12

An analysis of the contributing factors towards the prevalence of obesity when compared against the non- obese children pointed out that ,the obese children has a family history of obesity either with one or both the parents whereas the non –obese children did not show a family history of obesity .In addition to this the consumption of portion size during every meal time was high for the obese children as seen in 20 percent and 12 percent of boys and girls respectively Nevertheless in the non obese category 11 and 5 percent of boys and girls respectively did consume to the a increase portion size .The duration of physical activity was lesser compared to the non obese category showing that physical activity was very less in the obese group.

CONCLUSION:

Obesity in children is mainly due to the faulty dietary habits especially outside home and also lack of physical activity. Children get encouraged from advertisement and social media about false eating practices and as the study points out children weather obese or non- obese if they included good eating practices and get involved in physical activity, childhood obesity can be prevented. Action should start from home and schools should be food and obesogenic environment friendly.

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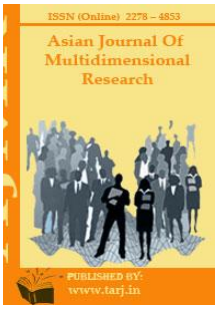

Asian Journal of Multidimensional Research (AJMR)

(Double Blind Refereed & Reviewed International Journal)

UGC APPROVED JOURNAL

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NUTRIENT DENSE YOGURT WITH THE INCORPORATION OF DATES PASTE

S. Naseban sabira*; K. Devi**

*Dietitian,
KMCH Hospital,
Coimbatore, Tamil Nadu, INDIA
Email id: nasebansabira@gmail.com

**Assistant Professor,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Nutritionally dense formulation of foods is an approach towards nutritional security. The objective of the study was to formulate yogurt rich iron and soluble fibres along with protein and calcium through the incorporation of dates paste. Arabian dates paste was incorporated in to yogurt milk mix at 5, 10 and 15 % levels and coded as DPY 5 %, DPY 10 % and DPY 15 % respectively. Sensory results revealed that DPY 5 % and DPY 10 % (P>0.05) had a higher acceptability than DPY 15 % (P<0.05) as compared to control yogurt (CY). Total soluble solids (TSS) were increased doubler while no significant difference in pH and titrable acidity in DPY 5 % and DPY 10 % than CY. However water holding capacity and syneresis were not appreciable in DPY than CY. Nutritionally, Carbohydrate and Ash were significantly increased whereas protein and fat without significant changes in DPY than CY. Iron content of CY was 0.06±0.01mg whereas iron in DPY 5 % and DPY 10 % were 0.12±0.02mg and 0.26±.03mg respectively (p<0.05). Microbial results showed that microbial counts were within the limits for consumption. Hence the study proved the formulation of iron rich yogurt with consumer acceptability through the incorporation of 5 to 10% of dates paste in yogurt.

INTRODUCTION

Yogurt is a cultured milk product obtained by lactic acid fermentation through the action of *Lactobacillus bulgaricus* and *Streptococcus thermophiles*. Yogurt is a healthy probiotic food and nutritionally rich in calcium, phosphorus and potassium in addition with a significant amount of general vitamins[1]. Milk and dairy products as functional foods draws together a wealth of information regarding their functional health benefit. It examines the physiological role and the claimed health effects of dairy constituents such as proteins, bioactive peptides, conjugated linoleic acid, omega 3 fatty acid, vitamin D and calcium.

Dates paste is rich in minerals and functional components like tannins which could contribute to health functions. Recently the plain yogurts are nutritionally and functionally enhanced through value addition with incorporation of 10-30% of fruits. Hence the present study was attempted to formulate iron fortified fruit yogurt through the incorporation of dates paste (*Phoenix dactylifera*) and analyse its acceptability.

MATERIALS AND METHODS

The present study was investigated in the Laboratory of Food Science and Nutrition, Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore.

Preparation of dates yogurt

For preparation of plain yogurt, Aavin milk was added with 4 % Non Fat Dry Milk (NFDM) - skim milk powder and 3% sugar (w/v), whereas fruit yogurt mix was prepared by additionally incorporating dates paste at 5, 10 and 15 % levels to Aavin milk mixed with 4 % Non Fat Dry Milk (skim milk powder) and 3% sugar (w/v) and coded as DPY 5 %, DPY 10 % and DPY 15 % respectively . Then the yogurt mix was blended using household blender at a high speed to obtain emulsified yogurt mix with improved water binding capacity and withholding fat separation. The homogenized mix was heated at 85°C for 30 minutes for increasing the water holding capacity of milk proteins and denaturation of whey proteins. In addition, all pathogenic and most spoilage bacteria could be inactivated. The heated yogurt mix was cooled to 42°C ± 2° C and transferred to plastic cups followed by inoculation with 3% (w/w) of yogurt culture (mixture of *Lactobacillus bulgaricus* and *Streptococcus thermophilus*). Incubation was extended until a firm coagulum was obtained reaching pH of 4.6 ± 0.1 [2]. The set yogurts in cups were stored at refrigeration temperature to inhibit further lactic acid fermentation and for further analysis of the study.

Physical and chemical analysis

Total solids, pH, titratable acidity, moisture, carbohydrates, protein, fat, ash, iron, calcium, vitamin C, syneresis, water holding capacity were analysed [3].

Sensory evaluation

Consumer acceptability was evaluated through a panel of 30 UG and PG students based on the seven point hedonic scale [4]

Microbiological analysis of the yogurt

Microbial analysis of plain and dates fruit yogurt was carried out for the storage period of one week at refrigerator temperature[5].Total plate count of samples was enumerated on alternate days (1st, 3rd, 5th and 7th) of storage period.

Statistical analysis

Data in triplicates were analysed using one way ANOVA in SPSS version 15.0 for. One way ANOVA for significant differences among samples and Duncan Multiple Range Test (DMRT) for pair comparison between samples were performed to study the effect of incorporation of dates paste in yogurt.

RESULTS AND DISCUSSION

Sensory Analysis

From the changes observed in sensory characteristics of yogurt with the effect of incorporation of dates pastes, DPY 5 % with 5 % of dates paste had a higher acceptability and DPY 10 % with 10 % of dates paste had a slightly less acceptability, were observed based on appearance, flavor, texture, taste and overall acceptability comparable to those of control yogurt ($p<0.05$).

TABLE 1 SENSORY CHARACTERISTICS OF YOGURT

Samples**	Appearance#	Flavour#	Texture#	Taste#	Colour#	Overall acceptability#
CY	6.8±0.4 a	6.8±0.3a	6.9±0.3a	6.5±0.6a	6.8±0.3a	6.7±0.5a
DPY 5%	6.9±0.2a	6.7±0.4a	6.6±0.5a	6.7±0.5a	6.9±0.2a	6.8±0.3a
DPY 10%	5.9±0.1b	6.0±0.9b	6.0±0.9b	6.0±1.0b	5.9±1.1b	6.7±0.4a
DPY 15%	5.9±0.1b	4.5±1.4c	4.5±1.4c	4.3±1.4c	4.4±1.4c	4.4±0.6c
ANOVA						
F value	342.194	118.456	118.22	106.973	272.063	279.190
P value	0.00	0.00	0.00	0.00	0.00	0.00

Mean±SD are data of triplicates;

******CY- Control yogurt, DPY 5%- yogurt with 5% dates paste, DPY10%- yogurt with 15% dates paste; Different letters in column indicates significant difference by DMRT test ($p<0.05$).

Mean±SD in triplicates; NS- not significant; * significant at $p<0.05$;

Table 2 explains the physical and chemical characteristics of yogurt with the effect of dates paste at 5 %, 10 % and 15 % levels as compared to control yogurt.

WHC was observed to be decreasing to 49.4±0.3% in DPY 5% and 47.4±0.6% in DPY 10% as compared to control yogurt ($p<0.05$). Control yogurt had a syneresis of 18.2±0.1 % and found to be increasing to 19.3±0.2% in DPY 5 % and 20±0.1% in DPY 10 % ($p<0.05$). The effect of incorporation of dates paste was found to be increasing viscosity to 707.6±2.0 in DPY5% and 766.6±3.2 in DPY10% as compared to 687.3±2.0 in control yogurt. One way ANOVA revealed the significant effect of dates paste on increasing the viscosity among samples and the subsequent Duncan analysis also proved the significant difference in viscosity on the comparison of control with each of dates yogurt ($P< 0.05$) indicating the significant effect corresponding to the level of dates paste in yogurt.

Titratable acidity in control yogurt was 0.83±0.02, and found to be increased to 0.84±0.1 in DPY 5 % and 0.87±0.1 in DPY 10 % ($p<0.05$). PH was also observed to be increasing in DPY 5 %, DPY 10 % as compared to control yogurt ($p<0.05$). Total solids was observed to be 14.8±0.3, 20.8±0.4 and 24.8±0.9 for CY, DPY 5 % and DPY 10 % respectively ($p<0.05$).

TABLE 2 PHYSICAL CHARACTERISTICS OF YOGURT

Samples*	WHC #	Syneresis #	Viscosity #	Titratable acidity #	pH#	TSS #
CY	50.8±0.6a	18.2±0.1c	687.3±2.0a	0.83±0.02 ab	4.56±0.05a	14.8±0.3c
DPY 5%	49.4±0.3b	19.3±0.2b	707.6±2.0	0.84±0.01a	4.53±0.11a	20.8±0.4b
DPY 10%	47.4±0.6c	20±0.1a	7766±3.2	0.87±0.1a	4.56±0.05a	24.8±0.9a
ANOVA						
F value	26.498	101.949	-	5.207	0.167	185.727
P value	0.001	0.00	0.00	0.049	0.850	0.00

****** CY- Control yogurt, DPY 5%- yogurt with 5% dates paste, DPY10%- yogurt with 15% dates paste; # mean±SD are data of triplicates; Different letters in column indicates significant differences by DMRT test ($p<0.05$).

Table 3 depicts the nutritional characteristics of the yogurt moisture content of control yogurt was 75.6±0.1%, and found to be decreased to 69.8±0.4% in DPY 5 % but increased to 72.2±1.2 in DPY 10 % ($p<0.05$). [6]

The carbohydrate content of control yogurt was 15.9±0.3g whereas in DPY 5% and 10 %, it was 18.6±0.1g and 21.5±1.0g respectively ($p<0.05$). The effect of dates paste on protein content of yogurt was not significant as observed from the protein content of 3.39±0.06g in DPY 5 % and 3.42±0.1g in DPY 10 % comparable to 3.30±0.1g in control yogurt ($p<0.05$). Fat content of DPY 5 % and DPY 10 % were observed with a slight difference as compared to control yogurt ($p<0.05$).

Ash content of CY was 0.5±0.0, and increased to 0.7±0.0 in DPY 5 % and 0.9±0.1 in DPY 10 % respectively ($p<0.05$).

Calcium content of CY, DPY 5 % and DPY 10 % were 119±3.9mg, 119.6±0.9mg and 119.9±0.1mg respectively with a negligible level of difference ($p<0.05$). The changes in iron content of yogurt with the effect of dates paste was found to be significant satisfying the main aim of the present study. Iron content of control yogurt was 0.06±0.01mg whereas in DPY 5 % and DPY 10 % that was 0.12±0.02mg and 0.26±.03mg respectively ($p<0.05$).

In the analysis of vitamin C content of yogurt, there was no significant effect of date's paste. Vitamin C content of control yogurt was 117.0±0.5mg, whereas inDPY 5% and 10 %, it was observed to be 117.2±0.6mg and 117.5±0.7mg respectively ($p<0.05$)

TABLE 3 NUTRITIONAL CHARACTERISTICS OF YOGURT

Samples *	**CY#**	**DPY 5%#**	**DPY 10%#**	**ANOVA F value; P value**
Moisture	75.6±0.1a	69.8±0.4b	72.2±1.2c	0.167 0.850
Carbohydrate	15.9±0.3c	18.6±0.1b	21.5±1.0a	60.401 0.00
Protein	3.30±0.1a	3.39±0.06a	3.42±0.1a	1.347 0.329
Fat	4.5±0.1a	4.53±0.3a	4.53±0.01a	0.378 0.701
Ash	0.5±0.0c	0.7±0.0 b	0.9±0.1a	11.015 0.10

Calcium	119±3.9a	119.6±0.9a	119.9±0.1a	0.161 0.855
Iron	0.06±0.01c	0.12±0.02b	0.26±.03a	45.902 0.00
Vitamin C	117.0±0.5a	117.2±0.6a	117.5±0.7a	0.310 0.745

Mean±SD are data of triplicates;

****** CY- Control yogurt, DPY 5%- yogurt with 5% dates paste, DPY10%- yogurt with 15% dates paste; Different letters in column indicates significant difference by DMRT test ($p<0.05$).

Microbial Analysis

The CY, DPY 5%, DPY 10% was analysed for total plate count for one week (1st day, 3rd day, 5th day and 7th day and the result were observed as in table 4. Yogurt samples were found to be contain 10^8/g cfu/g at the time of manufacture the and at the time of consumption will be atleast 10^7 cfu/g .

TABLE 4 MICROBIOLOGICAL ANALYSIS OF THE YOGURT

Sample	1st day	3rd day	5th day	7th day
CY	9.6×10^8	14.3×10^7	17.5×10^7	25×10^7
DPY 5%	11.2×10^8	29×10^7	37×10^7	39.6×10^7
DPY 10%	14.6×10^8	35×10^7	41×10^7	438×10^7

CONCLUSION

It could be concluded that iron fortification of yogurt could be achieved through incorporation of dates paste up to 10% with consumer acceptability as well as total solids and acidity within the range specified by [7]. However the decreased water holding capacity and increased syneresis with the effect of dates paste could be rectified with the addition of hydrocolloids like pectin, corragenam as used in commercial yogurt preparation.

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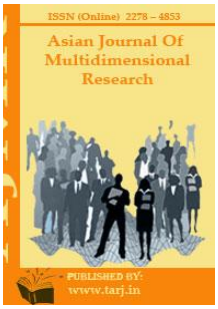

Asian Journal of Multidimensional Research (AJMR)

(Double Blind Refereed & Reviewed International Journal)

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ECO-FRIENDLY AGRICULTURAL PRACTICES FOR SUSTAINABLE LIVING

Dr. (Mrs.) K. Manimozhi*

*Professor,
Department of Resource Management,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: manidurai1962@gmail.com

ABSTRACT

"Extending one hand to help somebody has more value, rather than joining two hands for prayer"

Need for increased agricultural production has led to wide and unwise use of high doses of concentrated chemical fertilizer which pollute the air, water and land. These chemicals leave its residues in food that may even cause cancer. Though the pesticide use in India is only 3.75% of the total quantity consumed in the world, about half of the world's pesticide poisoning cases and almost three quarters of the deaths take place in India. Very soon India will overcome these hurdles and sustainability in agricultural production through the adoption of Organic farming so as to safeguard the soil, plants, animals and people. Organic agriculture is a holistic production management system, which promotes sustainable agriculture and enhances agro-ecosystem health. Eco-friendly farming techniques not only helps to increase the organic matter content of soils but also offers subsidiary income to the economically poor rural farm community through income generating activities. It is high time to realize that proper processing and recycling of organic wastes and residues as resources for agriculture can greatly reduce environmental hazards and pollution. Training of women on organic/eco-friendly agricultural practices especially in rural areas has a much greater and positive influence in factors governing sustainable development as they are playing multiple roles both in family and in the society. The training helped the women farmers to control the avoidable pre and post harvesting losses and to save each and every grain produced. It would ultimately lead to the Nation to attain prosperity and food security.

KEYWORDS: *Eco-Friendly, Sustainability, Food Security.*

INTRODUCTION

"**Agriculture is the soul of the country's economy and Eco- Friendly agriculture is its backbone"**

Agriculture is the back bone of our country but now a day's most of the people are willing to work in IT companies where higher salaries are paid. The government also wants foreign companies to start their business because of employment opportunities and develop their economy with less poverty ratio. (Agriculture Today, 2011) Agricultural land are acquired and utilized for industrial purpose. Agricultural production is getting down trend because of uneven climatic condition, global warming, rainfall shortage, inadequate quantity of fertilizer and seeds, reducing underground water level, improper government subsidiaries for agricultural products, unwillingness of younger generation which induce farmer's mindset to sell the agricultural land and make them to migrate towards urban areas for good earnings (Ajanta *et al.*, 2011).

Sustainable agriculture emphasizes the conservation of its own resources. For a farm to be sustainable, it must produce adequate amounts of high-quality foods, be environmentally safe, and where appropriate, be profitable. Sustainable farms minimize their purchased inputs (fertilizers, energy and equipment) and rely, as much as possible on the renewable resources of the farm itself (http://www.ifoam.org).

Hence agriculture cannot be abandoned for the sake of environment. Therefore, there is a real need to develop the technologies, process and practices, **which are eco-friendly** so that agriculture becomes sustainable (http://www.agriinfo.in).

OBJECTIVES

Training of women on eco-friendly agriculture practices especially in rural areas has a much greater and positive influence in factors governing sustainable development as they are playing multiple roles both in family and in the society. The training will help the women farmers to control the avoidable pre and post harvest loss and to save each and every grain produced. It would ultimately lead a Nation to attain prosperity and food security. (Devarakonda and Reddy, 2012).Therefore the present study on "**Eco-friendly agricultural practices for sustainable living"** was conducted with the following objectives

- To promote Organic Farming among the farm community through the practice of crop rotation, multi cropping, organic land processing methods prior to seedling, growing cover crops
- Promoting efficient use of on-farm resources as organic fertilizers/pesticides/growth boosters with subsequent reduction in off-farm inputs and cost incurred therein
- To promote the adoption of vermin composting
- To reduce considerably the crop and grains damage caused by insect pest and plant diseases through application of botanical insecticides/pesticides both during pre and post harvesting period
- To develop entrepreneurial skills of the farm women
- To motivate the farm women to generate subsidiary income through SGHs in the adopted villages thereby improving their economic status.
- To evaluate the overall development of the farm women through training programmes.

METHODOLOGY

A household survey was conducted in 420 households from the 14 villages with equal representation from marginal, small and large categories of the farming community, using an interview schedule to

elicit the information on food grain production, storage and the problems encountered. The survey emphasized the need for adoption of eco-friendly agricultural practices. Based on the household survey, a training curriculum was formulated to impart knowledge on eco-friendly methods of pest and disease management for agricultural sustainability. In the first phase, a three days training was given to 42 women leaders who were willing to act as frontline workers and deliver the messages learnt to their fellow members - both men and women.

In the second phase, training was given for a period of 5 days for the entire community. The training programme included lectures, participatory discussions, demonstration, meetings, exhibitions and field visits. The visual aids used during the programme were charts, posters, pamphlets, booklets, monograph, book, film and slide shows. The impact of the training programme was evaluated in terms of Knowledge gained and attitudes developed by the leaders and the quantum of food grains conserved by the selected households. Totally, 42 women leaders, and 2312 farmers of the 14 selected villages were trained.

Therefore, there is a real need to develop the technologies, process and practices, **which are eco-friendly** so that agriculture becomes sustainable (Hirevenkamagoudar and Manjunath, 2007).The Research design for the study on **"Eco-friendly agricultural practices for sustainable living"** in the following aspects:

1. Household Survey
2. Training of farm Women Leaders and farmers on Eco-friendly Agricultural Practices
3. Evaluation of the Impact of the training programme conducted

A. Major Findings:

1) Socio-economic Profile of the Selected Households

The socio-economic profile helps to understand the age, education, type of the family, monthly income and occupation of the selected households. Table I explains the socio-economic profile of the selected homemakers.

TABLE I
SOCIO-ECONOMIC PROFILE OF THE SELECTED HOMEMAKERS (N=420)

S.No	Category	Classification	**Marginal** (140)		**Small** (140)		**Large** (140)	
			No.	**%**	**No.**	**%**	**No.**	**%**
1.	Age (in years)	21 – 30 31 - 40 41 - 50 Above 51	40 38 60 2	29 27 43 1	48 43 44 5	34 31 31 4	18 40 75 7	13 28 54 5
2.	Education	Illiterate Primary Secondary Higher secondary Graduate	32 18 72 16 2	23 13 51 12 1	23 43 33 30 11	16 31 24 21 8	- 15 60 48 17	- 11 43 34 12
3.	Type of the family	Nuclear family Joint family	93 47	66 34	72 68	51 49	51 89	36 64
4.	Monthly income of the	Upto 5000 5000 - 10000	4 113	3 81	- 28	- 20	- 2	- 1

	family[#] (in Rupees)	Above 10000	23	16	112	80	138	99
5.	Occupation *	Agriculture	140	100	140	100	140	100
		Subsidiary occupation						
		a) Dairy	110	79	97	69	112	80
		b) Poultry	58	41	82	59	47	34
		c) Business trade	5	4	17	12	38	27

*Multiple responses; [#]HUDCO Classification (2012)

Majority of marginal (43 per cent), small (31 per cent) and large farmers (54 per cent) were aged between 41-50 years. It is encouraging to note that cent per cent of the homemakers who are large farmers in the selected households were literate. Sixty six, 51 and 36 per cent of marginal, small and large famers respectively lived in nuclear family. Sixteen, 80 and 99 per cent of marginal, small and large farmers' family respectively were earning above `10000/- per month through agricultural activities.

2) Diseases identified in the field

The Table II shows the various diseases identified in the field of adopted villages.

TABLE II DISEASES IDENTIFIED IN THE FIELD N=420

S.No	Diseases*	Marginal (140)		Small (140)		Large (140)	
		No.	%	No.	%	No.	%
1.	Wilt in tomato	78	56	62	44	47	34
2.	Cercospora leaf spot	24	17	13	9	8	6
3.	Yellow mosaic	32	23	27	19	16	11
4.	Alternaria leaf spot	60	43	42	30	25	18
5.	Fruit rot	25	18	19	14	11	8

*Multiple responses

From the above table, it is clear that, all the category of farmers face problems due to various diseases that occur in the crops. Among the disease, the wilt in tomato is found to be more profound at the rate of 56, 44 and 34 per cent among marginal, small and large farmers respectively.

All categories of farmers were adopting chemical methods to control pests. Chemicals used by the farmers include Copper sulphate, deltamethrin, Glyphosate and aluminium phosphide.

B. Impact of the training programme on eco-friendly methods of pest and disease management on the women leaders

This aspect is discussed on the following heads:

1) Knowledge gained by the leaders
2) Attitude of the leaders towards the training programme

1) Knowledge gained by the women leaders

Knowledge was operationalized as the amount of information the women leaders possessed regarding eco-friendly practices both prior to and after the training programme.

Table III presents the changes in knowledge towards eco-friendly farming among women leaders

TABLE III CHANGES IN KNOWLEDGE TOWARDS ECO-FRIENDLY FARMING AMONG WOMEN LEADERS N=42

S.No.	Farmers	Maximum score	Before Training	After Training	Difference	't' value
1	Marginal	16	2.29±0.73	15.64±0.63	13.35±0.10	59.363**
2	Small	16	2.57±0.76	15.79±0.43	13.22±0.33	70.705**
3	Large	16	1.64±0.50	15.86±0.36	14.22±0.14	91.867**

**-significant an one percent level

The above Table reveals that't' value for knowledge score was found to be 59.363, 70.705 and 91.867 for Marginal, Small and Large farmers respectively which were significant at one per cent level. The details of the calculation are given in the appendix.

It is concluded that the mean score for knowledge was highest for large farmers and lowest for marginal farmers. The reasons might be due to having more land for cultivation and food grains for storage and also an interest to learn and adopt new concepts and technology to improve agricultural production and conservation of food grains.

2) Attitude of the women leaders towards training programme

Based on the responses obtained against each items, total attitude scores was obtained and shown in Table IV. The't' test was calculated for the attitude scores and the results are replicated below. Table IV presents the attitudes developed by the women leaders towards Eco-friendly methods of pest and disease management.

TABLE IV ATTITUDE SCORES OBTAINED BY THE WOMEN LEADERS N=42

S.No.	Farmers	Maximum score	Before Training	After Training	Difference	't' value
1	Marginal	100	32.50±12.45	70.64±12.18	38.14±0.27	11.02**
2	Small	100	32.86±9.18	67.43±7.00	34.57±2.18	11.44**
3	Large	100	36.43±10.07	86.86±3.91	50.43±6.16	21.48**

**-significant an one percent level

The attitude scores of the leaders of all category increased and also had shown significant't' values of 11.02, 11.44 and 21.48 for Marginal, Small and Large women leaders respectively. Therefore, it can be inferred that the training programme had a positive impact on the change of attitude of leaders in the adoption of eco-friendly methods of pest and disease management for sustainable agriculture.

C. Impact of training on eco-friendly methods of pest and disease management on the community

The aspects discussed under this heading are total number of farmers participated in the training, adoption of eco-friendly practices such as composting, eco-friendly fertilizers, growth boosters, pesticides and methods adopted to control insects and pests during the pre and post harvesting period.

i) Total number of farmers benefitted by the training programme

Table V shows the total number of farmers benefitted by the training programme.

TABLE V TOTAL NUMBER OF FARMERS BENEFITTED BY THE TRAINING PROGRAMME

S.No	Type of Farmers	Number of participants			
		Women	Men	Youth	Total
1.	Marginal	302	224	97	**623**
2.	Small	418	336	157	**911**
3.	Large	446	237	95	**778**
	Total	**1166**	**797**	**349**	**2312**

The above table implies that women's participation was found to be higher while compared to men and youth. It reflects the fact that the women were more interested in learning and adopting new concepts and techniques.

Agricultural technologies should be tested, keeping in view the requirements of the farm women and they should get attention in national and international development programmes.

ii) Adoption of eco-friendly growth boosters

After training, the farmers were encouraged to prepare and use the eco-friendly growth boosters. Adoption of eco-friendly growth boosters by the selected households is given in Table VI.

TABLE VI
ADOPTION OF ECO-FRIENDLY GROWTH BOOSTERS BY THE SELECTED HOUSEHOLDS N=420

Eco-friendly Growth boosters	Percentage of households *					
	Marginal (140)		Small (140)		Large (140)	
	Before	After	Before	After	Before	After
Neem cake	10	80	22	89	36	100
Egg rasam	-	80	-	76	-	53
Organic manure tea	-	83	-	43	-	58
Jeevamirtham	-	12	2	18	7	42
Amuthakaraisal	-	14	-	26	-	78

*Multiple responses

From the above table, it could be seen that, after education, all types of farmers started using the eco-friendly growth boosters. Among the methods application of neem cake and egg rasam was found to be more profound among all category of farmers due to easy availability of its raw material (neem), its cost effectiveness, efficacy and efficiency. For the Marginal farmers, use of Organic Manure tea was high ie.,83 per cent as against Jeevamirtham and Amuthakaraisal due to cost factor and resources. In the case of large farmers, they have started preparing and using Amuthakaraisal and Jeevamirtham due to easy availability of raw materials.

iii) Adoption of Eco-friendly methods to prevent and control pest and disease by the selected households

After training programme, the farmers were encouraged to adopt the eco-friendly agricultural practices. The adoption level of eco-friendly agricultural methods to prevent and control pest and disease is shown in Table VII.

TABLE VII
ADOPTION OF ECO-FRIENDLY METHODS TO PREVENT AND CONTROL PESTS AND DISEASE

S.No.	Methods	Number of households *					
		Marginal (140)		Small (140)		Large (140)	
		Before	After	Before	After	Before	After
1.	Light trap	-	53	-	65	-	79
2.	Yellow sticky trap	-	42	-	48	-	56
3.	Bird perches	7	100	10	100	20	100
4.	Hand picking method	10	49	6	16	-	7
5.	Seed treatment with cow's urine	-	98	-	43	-	110
6.	Neem kernel extract to control pest	-	12	-	8	-	10
7.	Neem leaf extract to control pest	2	89	-	51	-	43
8.	Garlic, Chilli, Ginger extract	3	18	-	22	-	20
9.	Cow dung extract spray	5	86	-	92	-	98
10.	Disinfection of storage rooms and structure with neem leaf extract	-	110	-	140	-	140
11.	Circulation of air with neem treated dunnage	-	140	-	140	-	140
12.	Treatment of gunny bags and polythene bags with neem extract	-	140	-	140	-	140
13.	Coating pulses with red soil	40	60	58	86	92	100
14.	Neemleaf powder to control insects and pests	-	-	-	-	-	-
15.	Pungam leaf powder to control insects and pests	-	40	-	40	-	42
16.	Nochi leaf powder to control insects and pests	-	30	-	48	-	32

From the above Table, it is clear that, among the physical methods, bird perches and light trap method was found to be the most adopted method.

With regard to botanical method during pre-harvesting period, use of neem leaf powder and neem leaf extract to control pest and disease was found to be the best adopted method followed by cow dung extract spray and seed treatment with cow urine as expressed by the farmers.

During the post-harvest period, all the farmers irrespective of the category clean the grains before storage and using neem treated dunnage for proper circulation and avoid wet surface. After education cum training, the adoption of treatment of gunny bags and polythene bags with neem extract was cent per cent among all the category of farmers while the adoption of disinfection of storage rooms and structures with neem leaf extract was cent per cent after education among marginal farmers while the same was 73 and 55 per cent among small and large farmers respectively.

During storage, among the eco-friendly preventive methods to control pests, use of neem leaf powder was found to be the best adopted method followed by the practice of coating the pulses with red soil.

CONCLUSION:

Eco- friendly practices will yield multiple benefits for years to come, including reduced erosion and nutrient loss from farmyard, improved water quality in our waterways and drinking water supply, improved flood mitigation in areas that have experienced considerable loss due to floods, improved air quality, increased biodiversity and wildlife habitat, reduced pest management cost as farmers struggle to stay ahead of changing pest dynamics and increased farm productivity with reduced cost.

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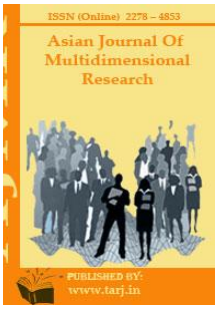

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A STUDY ON THROMBOLYTIC POTENTIAL OF MORINGAPTERYGOSPERMAGAERTN

PappaAmmal R*; Pushpa A; Nivedha C*****

*Assistant Professor,
Dept. of Science and Humanities,
Avinashilingam Institute for Home Science and,
Higher Education for Women
Coimbatore, Tamil Nadu, INDIA
pappins.in@gmail.com

**Professor,
Dept. of Biochemistry,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

***Dept. of Biochemistry,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Nature is a warehouse for various plants with medicinal properties. Plants can be used to treat all diseases because of their widespread bioactivity with minimum side effects. MoringapterigospermaGaertn (Moringaceae) selected for the present investigation is a highly valued plant with impressive range of medicinal and nutritional value. This plant is commonly known asmoringa (drumstick tree) was analysed for its phytoconstituents and thrombolytic property. Phytoconstituents were analysed in leaves and flowers of the MoringapterigospermaGaertn. Thrombolytic activity of leaves and flowers of the MoringapterigospermaGaertnwas determined and a correlation analysis was carried out by comparing the serum cholesterol level and percentage clot lysis by the plant extracts. The phytochemical screening of the aqueous, ethanol and petroleum ether extracts showed positive results for alkaloids, carbohydrates, flavonoids, proteins, phenols, steroids, tannins terpenoidsand saponins, but was negative to quinone. Phytoconstituents namely

carbohydrates, proteins, phenol, flavonoid and alkaloids were quantified and it was observed that leaves showed higher concentration of these phytoconstituents when compared to the flowers. Leaves and flowers of MoringapterigospermaGaertn exhibited a noteworthy clot lysing ability. Comparison of percent clot lysis among leaves and flowers of MoringapterigospermaGaertn revealed that the leaves have a better thrombolytic activity than flower and similarly, aqueous extract of both leaves and flowers showed a slight elevation in thrombolytic activity compared to the other extracts.

KEYWORDS: *MoringapterigospermaGaertn*, Thrombolysis

INTRODUCTION

Thrombosis, formation of a blood clot in a blood vessel is one of the important reasons of blood circulation problem. Thrombi can lodge in a blood vessel and block the flow of blood in that location depriving tissues of normal blood flow and oxygen(Sayeed *et al*., 2014). Cardiovascular disease caused by blood clot formation is one among the most severe diseases (Kamal *et al*., 2015). Thrombolytic agents like tissue plasminogen activator, urokinase, streptokinase are used to dissolve the already formed clots in the blood vessels. However, these drugs have certain limitations such as serious and fatal consequences including haemorrhage, severe anaphylactic reaction and lack of specificity (Shivasharanappa and Londonkar, 2014). The use of plants and plants derived components increases day by day for the discovery of therapeutic agents. The recent research is directed towards searching naturally occurring thrombolytic agents from plant origin since thrombolytic agents play an important role in developing various human diseases such as atherothrombotic diseases, pulmonary embolism, and myocardial infarction (Rahman *et al*., 2018).*MoringapterigospermaGaertn*has long beenrecognized in traditional medicine worldwide as having value both as a preventive and treatment agent of several health condition s including the treatment of inflammation, cardiovascular and haematological disorders (Ndhlala*et al*., 2014).

MATERIALS AND METHODS

Collection and identification of the plant sample

The leaves and flowers of M*oringapterigospermaGaertn* were collected from Coimbatore city, Tamilnadu. Taxonomical identification was made by the taxonomist of Botanical Survey of India, Southern circle, Tamilnadu Agricultural University, Coimbatore. No. BSI/SRC/5/23/2015-16/Tech./1585

Phytochemical Analysis

Preparation of the extract for phytochemical analysis and thrombolysis

The aqueous, ethanol and petroleum ether extracts of leaves and flowers of M*oringapterigospermaGaertn*were prepared at a concentration of 500mg/ml and analysed for phytochemicals and thrombolytic activity.

Preparation of alkaloid extract

Fresh leaves and flowers of ofM*oringapterigospermaGaertn* (5g each) were crushed in a mortar and pestle with 10% acetic acid in ethanoland incubated for 4 hours in the dark. After incubation, the extract was filtered and the solution was concentrated to 1/4th volume in a boiling water bath. To the extract, 25% ammonium hydroxide was was added until a precipitate was formed and the

centrifuged at 200rpm for 5 minutes. The residue obtained was washed with 1% NH_4OH and filtered. The residue that contained alkaloids was then weighed,dissolved in ethanol and stored at 4^oC

Preparation of phenolic extract

Leaf and flower samples (1g) were taken and crushed using a mortar and pestle separately. To the crushed sample, 20ml of 80% ethanol was added and transferred to the conical flask. The conical flask was covered and kept in a boiling water bath for 15 minutes with occasional shaking. The content was then centrifuged and the supernatant thus collected was the phenolic extract.

Preparation of flavonoid extract

Approximately half the volume of the phenolic fraction was transferred to a 50 ml separating funnel. The sample was then extracted with petroleum ether (40-60^{o}C). The aqueous layer thus formed was the flavonoid extract.

Qualitative analysis of phytoconstituents

The aqueous, ethanol and petroleum ether extracts of leaves and flowers of M*oringapterigospermaGaertn* were screened for the presence of phytochemicals, according to the method proposed by Raaman, 2006.

Quantitative analysis of phytoconstituents

Parameters	**Reference**
Carbohydrate	Hodge*et al.*, 1962
Protein	Lowry *et al.*, 1951
Flavonoids	Zhishen*et al.*, 1999
Phenols	Malick and Singh, 1980
Alkaloids	Muthumani*et al.*, 2010

Determination of thrombolytic activity

Thrombolytic activity of the plant extracts was determined using human blood samples by the method of Prasad *et al.*, 2007.

Estimation of Total cholesterol

Total cholesterol was estimated in serum samples obtained from the above human blood used for the determination of thrombolytic activity by Kit method (Allain*et al.*, 1974)

Statistical Analysis

The significance between clot lysis and plant extracts by means of weight difference was tested by ANOVA. Serum cholesterol level and clot lysis were compared by correlation analysis.

Results and Discussion

Plants have been used for food and also for medicinal purposes since ancient times.Qualitative and quantitative screening of phytocostituents of leaves and flowers of *MoringapterigospermaGaertn.* Plants synthesize a variety of phytochemicals and most of them are derivatives of a few biochemical motifs. All plants produce chemical components as part of their normal metabolic activities. These include primary and secondary metabolites (Mohamed *et al.*, 2010). In the present study, the leaf and flower extracts of M*oringapterigospermaGaertn* were subjected to a comparative evaluation of preliminary phytochemical screening and the results are given in Table 1.

The phytochemical screening of the plant extracts revealed the presence of carbohydrates, proteins, alkaloids, flavonoids, flavonoids, phenols, steroids, tannins, terpenoids and saponins in aqueous, ethanol and petroleum ether extracts of both leaves and flowers. Quinone was absent in all the extracts. Phytochemical analysis of leaves and flowers of moringa contain a wide variety of primary and secondary metabolites. The beneficial pharmacological effects of plant materials typically result from the secondary metabolites present in the plant although, it is usually not attributed to a single compound but a combination of the metabolites (Parekh *et al*., 2005). Secondary metabolites such as flavonoids, carotenoids and phenolic compounds are present in *Spinaciaolerace* (Subhash*et al*., 2010).

TABLE- 1 PHYTOCHEMICAL SCREENING OF MORINGAPTERIGOSPERMAGAERTN

S. No	Phytocostituents	*MoringapterigospermaGaertn*					
		Leaves			Flowers		
		Aqueous	Ethanol	Petroleum ether	Aqueous	Ethanol	Petroleum ether
1	Alkaloids	+	+	+	+	+	+
2	Carbohydrates	+	+	+	+	+	+
3	Flavonoids	+	+	+	+	+	+
4	Protein	+	+	+	+	+	+
5	Phenols	+	+	+	+	+	+
6	Quinones	-	-	-	-	-	-
7	Steroids	+	+	+	+	+	+
8	Tannins	+	+	+	+	+	+
9	Terpenoids	+	+	+	+	+	+
10	Saponins	+	+	+	+	+	+

'+'= presence '-'= absence

The leaf and flower extracts of MoringapterigospermaGaertnwere analysed quantitativel and the results are represented in Table 2.

TABLE- 2 PHYTOCONSTITUENTS IN MORINGAPTERIGOSPERMAGAERTN

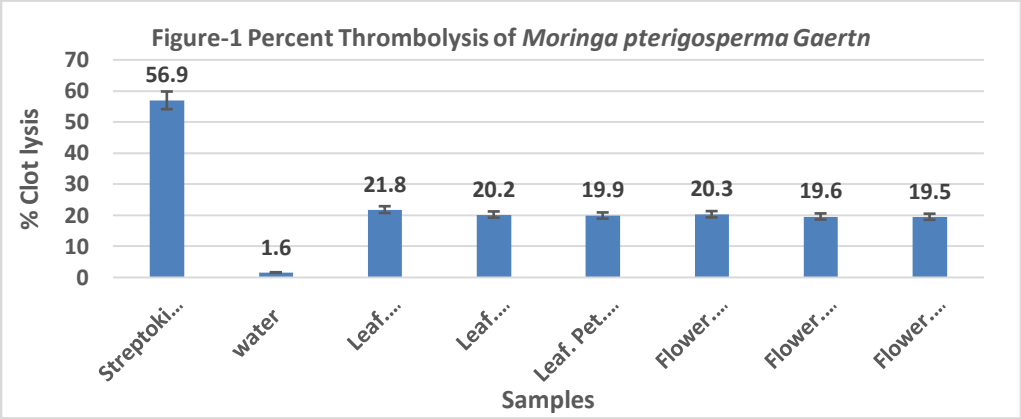
Phytocostituents mg/g	*MoringapterigospermaGaertn*					
	Leaves			Flowers		
	Aqueous	Ethanol	Petroleum ether	Aqueous	Ethanol	Petroleum ether
Carbohydrates	8.4±0.4	16.3±0.1	1.8±1.3	6.5±0.5	8.3±0.6	0.7±0.3
Protein	13.89±0.35	21.5±0.75	5±0.4	15±0.4	16.7±1.3	5.3±0.3
Phenols	1.2±0.3	1.5±0.3	1±0.3	1.3±0.19	1.2±0.1	1±0.2
Flavonoid	2±0.3	2±0.3	2.3±0.2	1.4±0.5	3.3±0.6	3.3±0.4
Alkaloids	2.9±0.6	4±0.3	2.2±0.5	2.8±0.5	3±0.5	1±0.6

Among the various extracts of leaves and flowers M*oringapterigospermaGaertn* the ethanolic extract was found to be rich in carbohydrates and proteins followed by aqueous extracts. Alkaloids were also found to be rich in ethanolic extract whereas phenols and flavonoids were found to be more concentrated in petroleum ether extract.

The findings indicated that leaves were found to be the rich source of all the above phytoconstituents except flavonoids. *Prjna and Bhat* in 2015 reported the highest protein content (80%) in methanolic extract and lowest in petroleum ether extract of roots of *Loseneriellaarnottiana.*

Determination of Thrombolytic Activity of *MoringapterygospermaGaertn*

To combat the shortcomings of the commercially available thrombolytic agent, the present study is focused on the determination of thrombolytic potential in the plant source namely *MoringapterygospermaGaertn.* The thrombolytic activity of aqueous, ethanol and petroleum ether extracts of leaf and flower of *MoringapterygospermaGaertn* was determined using normal uman blood. Water was used as a negative control while streptokinase was used as a positive control. The values are depicted in Figure 1



The above figure revealed that both the leaf and flower samples of *MoringapterygospermaGaertn* exhibited marked clot lysis. The thrombolytic activity of the extracts was confirmed by comparing the percent clot lysis of the individual plant with the positive and negative control. The results indicated that the leaves exerted better thrombolytic activity than the flowers. The results are in coincidence with the findings of Ansari *et al.*, (2014) who have reported that the leaves of *G.pentaphylla* showed significant thrombolytic activity.

Correlation analysis was carried out by comparing the serum cholesterol level and percentage clot lysis by the plant extracts, and the values are tabulated as in table 3.

TABLE 3- COMPARISON OF SERUM CHOLESTEROL AND THROMBOLYTIC ACTIVITY

Level of Serum Cholesterol (mg/dl)	Clot lysis (%)					
	L.A	L.E	L.P	F.A	F.E	F.P
100	28.7	21.1	17	26.8	15.1	17
165	32.95	7.7	23.6	13.35	4.9	20.15
150	12	18	12	5.4	25	7.4
109	14	15	38	21	20	18
111	21	11	35	22	8.5	38
150	18	20	17	17	14	20
138	17	5.6	21	16	20	18
139	20	25	14	9	19	23
145	25	19	20	15	18	20

160 125	23 27	21 13	26 19	17 22	20 17	19 20
114	29	18	13	19	21	23
110	17	19	23	20	19	18
100	15.5	37	15	24	20	13
180	23	32	13	28	26	21
115	18.5	29	20	25	27	17
136	24	26	17	23.5	25	13.7
135	28	25	19	22	29	19
98	20	20.9	26	23.9	22	20
121	16	19	9	27.3	19.7	15.8
110	20	23	19.6	21.8	19.4	17.8
131	34	19.6	14.6	20.7	26.3	23.8
92	17	20.5	27	19	25	24
91	22	20	31	24.6	13.8	21
99	22.9	18.2	9.8	19.8	15.7	20

The results revealed no correlation between cholesterol level and thrombolysis of different solvent extracts of both leaves and flowers of MoringapterygospermaGaertnsuggesting that the plant can lyse the clot whatever might be the cause of clot formation and the cholesterol levels.

CONCLUSION

The findings revealed that all the fraction have appreciable thrombolytic activity. Comparison of serum cholesterol and thrombolytic activity suggests that both the plants can act as potential thrombolytic agents, whatever might be the cause of clot formation. This property could preferably be used in the treatment of thrombus in cardiovascular patients. The present study might have animportant implications in cardiovascular health in developing countries where cheap and effective medicines are the required. This investigation can also help in developing cost effective novel thrombolytic regimens from common plant sources, which are advantageous over synthetic drugs.

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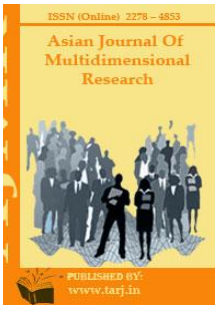

Asian Journal of Multidimensional Research (AJMR)

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FORMULATION OF NOODLES USING SPROUTED VIGNA RADIATA FLOUR

Lakshmi Rathi. R*; Dr.V. Sangeetha**

*M.Tech student,
Department of Food Technology,
Kongu Engineering College,
Erode, Tamil Nadu, INDIA
Email id: rathismile16@gmail.com

ABSTRACT

Proteins are crucial for proper growth and development of humans. But the current lifestyle has led to the consumption of unbalanced diet with low protein intake. The incorporation of sprouted pulse in fast moving goods like noodles makes it a good choice for supporting the protein consumption through sprouted flour noodles. The plain flour was substituted with sprouted Vigna radiata flour in four different combinations namely 20%, 40%, 60% and 80% for formulation of noodles. The optimization of formulation was carried out based on physicochemical and sensory analysis of four respective combinations. Also, the seasonings were formulated using a base spice mix, incorporated with medicinal herbs tulsi leaves, tamarind leaves and mint leaves. The herbs were added in three different combinations of 1%, 3% and 5% and optimized based on preference tests. The compatibility of the seasonings with the formulated noodles was determined using preference tests. The results have shown that formulated noodles have met the specifications of noodles and were found to be accepted easily.

KEYWORDS: *Flour Substitution, Optimization, Physicochemical Analysis, Sensory Analysis, Seasonings, Preference Test*

INTRODUCTION

Proteins are crucial for proper growth and development of humans. They are commonly known as body builders. Based on short-term nitrogen balance studies, the Recommended Dietary Allowance of protein for a healthy adult with minimal physical activity is currently 0.8 g protein/ kg body weight (BW) per day. Some of the functional needs such as promoting skeletal-muscle protein accretion and physical strength can be met by dietary intake of 1.0, 1.3, and 1.6 g protein per kg BW per day for individuals with minimal, moderate, and intense physical activity, respectively. The long-term consumption of protein at 2g per kg BW per day is found to be safe for healthy adults with the maximum tolerable limit of 3.5 g per kg BW per day for well-adapted subjects (Wu 2016).

Pulses are one of the important local food crops in the developing world. They are one of important vegan sources of proteins in the diets of the world's poorest countries. In addition, they provide a good amount of energy, dietary fiber, minerals and vitamins (Ofuya and Akhidue, 2005).

The risk of cardiovascular diseases (Hu, 2003) has been found to decrease on pulse intake. Some of research has shown to decline the threat of diabetes, LDL cholesterol and gastrointestinal diseases on consumption of pulses (Philanto and Korhonen, 2003 and Tharanathan and Mahadevamma, 2003). Further, the process of germination or sprouting has been found to improve the nutritional profile of pulses (Hubner and Arendt, 2013) and antioxidant activity (Hung *et al*., 2011). On sprouting, the amount of phytic acid decreases thereby promoting the bio availability and absorption of certain vitamins and minerals (Azeke *et al*., 2011).

Even though, there are number of health benefits, they are available only in limited number of products. Some of the market available products are roasted pulses, bars, spreads, frozen pulses and as a direct flour and grain source. These products have a less acceptance as they are unappealing and unappetizing. Besides, some of pulse products like direct grain and their milled products require further processing which is tedious and time consuming. Hence, they are less frequently preferred than other products irrespective of their nutrition value. The increasing number of malnutrition demands the development of various healthy food products which also supports the current lifestyle.

Noodle is one of the popular foods all over the world. They have been the staple foods for many Asian countries. They are available in the various contents, formulation and shapes. They are known for their taste and longer shelf life. They provide greater convenience at reasonable cost (Komal *et al*., 2018). Most of the noodles are available in instant form, supporting the current lifestyle. These characteristics make it a good choice for supporting the protein consumption through partial substitution of refined wheat flour / maida with sprouted pulse flour.

MATERIALS AND METHODS

Materials

The raw materials of good quality including green gram, maida flour, corn starch, sodium bicarbonate, salt and spices were obtained from the local market of Pudukkottai District, Tamilnadu. They were stored in appropriate conditions to prevent any quality loss thereby aiding in elimination of errors.

Sprouting of green gram

The green grams were cleaned in distilled water in order to remove any surface dirt. They were soaked in deionized water in the ratio of 1:3 w/v (grain: water) for a period of 8 hrs at 37°C (N.M.

Nnam and G.T. Baiyeri, 2008). The soaked grains were removed by draining of water and rinsed with distilled water.

The soaked seeds were kept in sprouting plates and covered with moistened muslin cloth for 12 to 18 hrs until the sprouts attained the measurement 1.5cm to 2.0 cm in size. The sprouts were rinsed in distilled water and dried at 55°C (Antu Grewal and Sudesh Jood, 2009).

Milling of sprouted green gram

The oven dried sprouted green grams were size reduced into flour using burr mill. The grinding was carried out for 5 minutes and the flour was collected for sieve analysis. The milled flour was sieved using a table top sieve shaker and stored in an air tight container.

Analysis of flour

The partial replacement of maida with sprouted green gram flour was carried out in four different combinations 20%, 40%, 60% and 80% of maida named as T_1, T_2, T_3, and T_4 respectively with maida flour. The other constituents of predetermined amount were kept as control.

The moisture and ash content was determined using AOAC (2000) for each combination. The water holding capacity of maida and sprouted green gram flour was analyzed using standard AACC (1990).

The flour gluten of C, T_1, T_2, T_3, and T_4 was determined using IS 1155:1968. 25g of flour was weighed in a dish and added with about 15ml of water to form dough. The dough was gently placed in a beaker filled with water and let to stand for an hour. Then the dough was removed and placed in a container to water wash the dough till starch completely dissolved in water. The resulting gluten was made into a ball and placed in an oven at 130°C for one hour. Finally, they were cooled in desiccators and weighed.

Wet gluten = (A/C) * 100 and Dry gluten = (B/ C) * 100

Where A = weight of wet gluten (g), B = weight of dry gluten (g) and C = weight of flour (g)

Extrusion and drying of noodles

The noodles was made by partial replacement of maida with sprouted green gram flour in four different combinations 20%, 40%, 60% and 80% of maida named as T_1, T_2, T_3, and T_4 respectively. The noodle made with maida flour was maintained as control. The amount of other ingredients was maintained constant for all including corn starch, sodium bicarbonate and salt was 7%, 1% and 2% of flour respectively.

Cooking characteristics of noodles

5g of noodles was cut into 5cm length and added to 150ml of boiling distilled water. One noodle strand was taken at an interval of 30s and pressed between two plates. The noodle was cooked until the white core in the strand was no longer visible and the corresponding time was noted for each composition. The cooked loss was determined by drying the water drained from cooking of noodles at 105°C until constant weight was obtained. (N. Wang *et al*., 2012)

RESULTS AND DISCUSSION

Sprouting of green gram

The soaked green gram was observed to have increased volume and weight due to absorption of water. This process had also softened the outer coat of grains to facilitate sprouting. A small white

shoot had risen from the grain on resting with moistened muslin cloth. These shoots were found to increase in length as sprouting proceeds. The drying of sprouted green grams was carried when the length of the sprouts attained 1.7cm to 2.0cm. The process of drying at 55°C had stopped the sprouting and encouraged the removal of moisture. The dried sprouted grains had shown reduction in weight and size in contrast with soaking.

Milling of sprouted green gram

200g of dried sprouted green grams feed had yielded 170.23g of milled flour. The efficiency of milling process was estimated to be 85.115%

The milled flour was separated into fractions using a table top sieve shaker of maximum aperture 2mm and minimum aperture of 212µm. The sieve analysis had resulted in five different fractions of flour from 1.45mm aperture to pan. The pan and aperture 212µm was found to have fine particle size similar to maida and hence was used for the noodle formulations.

The water holding capacity of the maida and sprouted green gram flour had shown similar levels with little variation. The water holding capacity of sprouted green gram flour was 0.522 while maida was 0.4605.

The moisture content and ash content of C, T_1, T_2, T_3 and T_4 was found using AOAC 2000. The results of moisture had shown a decrease in moisture content with increase in sprouted green gram flour. There was a small increase in ash content with increase in sprouted flour.

TABLE1. ESTIMATION OF MOISTURE AND ASH

Sample	Moisture content (%)	Ash (%)
C	10.17 ± 0.51	0.09 ± 0.20
T_1	8.04 ± 0.22	3.00 ± 0.02
T_2	7.74 ± 0.06	3.04 ± 0.03
T_3	6.43 ± 0.19	3.13 ± 0.12
T_4	6.07 ± 0.04	3.27 ± 0.03

The flour gluten of C had been estimated to be greater than T_1 and T_2. Similarly, the flour gluten in T_1 was higher than T_2 but less than C (as shown in Table 2). There was a higher amount of water absorption from C to T_2.

TABLE2. ESTIMATION OF FLOUR GLUTEN

Sample	Wet gluten (%)	Dry gluten (%)
C	24.8%	7.76%
T_1	20.96%	5.992%
T_2	9.28%	2.92%

Extrusion and drying of noodles

The moisture content of wet and dried noodles of composition C, T_1 and T_2 was found in triplicates and the average value of moisture content of wet noodles of composition C, T_1 and T_2 was estimated to be as 27.741%, 30.702% and 31.799% respectively. The moisture content of the dried noodles C, T_1 and T_2 were found to as 10.26%, 11.87% and 12.62% respectively.

The visual observation of the noodles had shown variation in the color in C, T_1 and T_2. The control was found to have bright white in color while the test samples were found to have darker shades of brown with the increasing intensity of sprouted green gram flour.

The results of cooking time for C, T_1 and T_2 were found to increase with increasing sprouted green gram flour. In contrast, the cooking yield was decreasing with increasing sprouted green gram color indicating the reduction in swelling volume. There was only a slight difference in the cooking loss.

TABLE3. ESTIMATION OF COOKING CHARACTERISTICS

Sample / Parameters	Cooking time (min)	Cooking Yield (g)	Cooking loss (g)
C	7	20	0.56
T_1	10	16	0.47
T_2	11	14	0.51

CONCLUSION

From this study, it was concluded that the formulation of noodles with 40% replacement of maida with sprouted green gram flour is feasible. Also, the flour analysis have shown reduced gluten content upto 2.92% dry gluten (in 40%) and increased ash content. Since the ash content is directly related to the total mineral content, this property is likely to increase the health of consumers by providing minerals and reducing gluten. Even though, there was reduction in gluten content with higher sprouted green gram flour, there was sufficient gluten to provide the consistency. In addition, the cooking characteristics had shown good results with reduced solid loss besides high cooking time. Further, the extrusion, drying and cooking characteristics of T_3, and T4, will be assessed to find the optimum composition. The sensory analysis of C, T_1, T_2, T_3, and T_4 will be accomplished to find the acceptability of noodles. The formulation of seasonings S_1, S_2 and S_3 will be carried out and analyzed for the compatibility with optimized noodle composition through sensory test.

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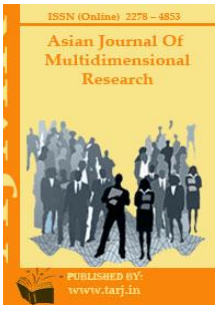

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DEVELOPMENT AND SENSORY EVALUATION OF VEGETABLE AND FRUIT PEEL INCORPORATED SNACKS

SouminiG.P*; Poornima Jeyasekaran; P.Revathi*****

*Assistant Professors,
Dept of Food Science & Nutrition,
The American College,
Madurai, Tamil Nadu, INDIA
Email id: sgagniputri@gmail.com

**Assistant Professors,
Dept of Food Science & Nutrition,
The American College,
Madurai, Tamil Nadu, INDIA

***Assistant Professor & Head,
Dept of Food Science & Technology,
ArulAnandar College,
Karumathur, Tamil Nadu, INDIA

ABSTRACT

In the current scenario, food wastage is more when comparing to utilization especially in developing country like India and it is happening at every level; from harvesting, transporting, processing, packaging and consuming. The portion of a food especially for fruits and vegetables, from the beginning it is assumed that peel is considerably a non-edible portion and eliminated apparently. But there is a lot of studies proved that the peel of a food is rather healthier for consumption and also can contribute significant nutrients and especially functional compounds to our diet. The present study was carried out to develop some edible peels incorporated fibre rich healthy snack, followed by the nutrient composition analysis and sensory evaluation of the formulated products. The ingredients used for the formulation of fibre rich food products were selected based on their nutrients composition especially rich source of fibre. Formulation of the fibreadai is mainly based on the ease of preparation and low cost ingredients used for it makes away to the management of various diseases among population. Banana peel is rich in fibre which can be used as a dietary management for relieving constipation. Cucumber peel is rich in fibre which can be as a dietary management for relieving obesity and constipation. Orange peel is rich in fibre which can be as a dietary management for relieving heart problems and lungs problems.The sensory evaluation of

fibre enriched adai by using numerical score card done by untrained panel numbers were accepted as excellent 53.33%.

KEYWORDS: *Dietary Fibre, Food Waste Management. Fruit and Vegetable Peels*

INTRODUCTION

The waste materials such as peels, seeds and stones produced from the fruit and vegetable processing unit can be successfully used as a source of phytochemicals and antioxidants. Higher amount of phenolic compounds and ascorbic acids has been reported in the peel than in pulp [4] and in green form than in ripe [3] for most of the fruits. The majority of fruit peels exhibited 2 to 27 fold higher antioxidant activity than the fruit pulp [5]. Edible pulp of bananas (Musa paradisiaca) contains 232 mg/100g of dry weight phenolic compounds, this amount is about 25% of that present in the peel [7].

Fruits and vegetables peels are good source of phytochemicals and antioxidants and also consisting higher amount of phenolic compounds and ascorbic acids. Peels containing Dietary fibrehas shown beneficial effects in the prevention of several diseases,such as cardiovascular diseases, diverticulosis, constipation, irritable colon, colon cancer, and diabetes [14].

A high dietary fibre content of banana peel (about 50 g/ 100 g) is indicative of a good source of dietary fibre. HappiEmaga et al. (2008) found that the maturation of banana fruits has shown to impact the dietary fibre compositions of banana peels. Cellulose, lignin, and hemicellulose contents of banana peels, the components of the insoluble dietary fibre fractions, varied from 7 to 12 g/100 g, 6.4 to 9.6 g/100 g and 6.4 to 8.4 g/100 g, respectively, whereas pectin contents, a component of the soluble dietary fibre ranged from 13.0 to 21.7 g/100 g.

Banana peel, an underutilized source of phenolic compounds is considered as a good source of antioxidants for foods and functional foods against cancer and heart disease. Polyphenolic content of banana peel ranges from 0.90g – 3.0g/100g dry weight [13]. The peel of the fruit contains various antioxidant compounds such as gallocatechin [8] and dopamine [17]. The antioxidant effects of crude extracts from green banana and yellow peel were investigated and the results indicated that the extract of green banana peel recorded more significant activities than that of yellow peel [12].

Cucumber is a primary source of vitamins and minerals in the human diet [11]. In addition to its delicious taste and fairly good caloric value, it has high medicinal value for human beings. It is well known for natural diuretic and thus can serve as an active drug for secreting and promoting flow of urine. Due to high content of potassium (50-80 mg/100g), cucumber can highly be useful for both high and low blood pressures [9].

Many studies have reported antioxidant and in many antibacterial effect of juice and edible parts of oranges are different origin and from different varieties [2]. As far as the peel is concerned, extracts from this part of the low fruit were found to have a good total radical antioxidative potential [15].

The total sugar content of orange peel varies between 29 and 44 % [7], soluble and insoluble carbohydrates being the most abundant and economically interesting constituents of this residue [10]. Approximately 50 % of the dry weight of orange is soluble in alcohol [16], and soluble sugars are the major components also of this fraction. Glucose, fructose and sucrose are the main sugars, although xylose can also be found in small quantities in orange peel.

MATERIALS AND METHODS

The present study was carried out to development and sensory evaluation of vegetable and fruit peel incorporated snacks. The ingredients used for the formulation of fibre rich food product was selected based on their nutrients composition especially rich source of fibre, sensory evaluation done among adolescents.

The selected ingredients were weighted and then separated according to the required quantity, powdered /grinded the ingredients and mixed in mentioned proportion. After the formulation of the fibre rich products were made to analyze nutrients composition and sensory evaluation.

The sensory panel members of the formulatedfibre rich food products were 30 adolescent girls.The sensory evaluation was done by using five point hedonic score card, numerical score card and composite test score card.

This study was analyzed by using percentage method. Percentage are one of the simplest and useful statistical tool used for the interpretation of collected data in the research, business, economic and statistics.

RESULTS AND DISCUSSION

The sensory evaluation of fibre incorporatedadai by using hedonic scale method. It has shown that majority (40%) of the untrained panel members accepted the food quality appearance as excellent. Acceptance of taste (43.33%) was found as very good followed by texture (43.33%) and flavour (46.66%) and the overall acceptability was found to be excellent (36.66%).

The sensory evaluation of fibre incorporatedadai by using numerical score card it can be observed that quality analysis revealed that majority of the untrained panel members rated as excellent (53.33%).

CONCLUSION

The present study revealed that the sensory attributes accepted by the untrained panel members, thereby can be introduced as healthy snacks with potential benefits and also could reduce the food wastage and effective utilization of different parts of fruits and vegetables especially peels which are rich in antioxidants and phytochemicals. Further this study can be extended to clinical trials in conditions such as cardiovascular diseases, diverticulitis, constipation, irritable colon, colon cancer, and diabetes.

Sensory Evaluation of Fibre Enriched Adai

TABLE.24A. NUMERICAL SCORE CARD

Variables	No.	%
90&above marks	16	53.33
80 – 90 marks	14	46.6
70-79marks	-	-
Below 60 marks	-	-

Sensory Evaluation of Fibre Enriched Adai

TABLE.2B. HEDONIC SCALE METHOD

Variables	Appearance		Taste		Texture		Flavour		Overall Acceptability	
	No.	%	No.	%	No.	%	No.	%	No.	%
Excellent	8	26.66	4	13.33	7	23.33	5	16.66	7	23.33
Very good	12	40	13	43.33	13	43.33	14	46.66	10	33.33
Good	7	23.33	11	36.66	10	33.33	9	30	11	36.66
Poor	3	10	2	6.6	-	-	4	13.33	2	6.6
Bad	-	-			-	-	-	-	-	-

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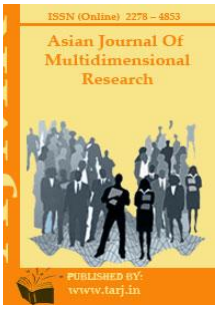

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FORMULATION AND STANDERDIZATION OF BROWN RICE BASED READY-TO –EAT SNACK PRODUCT USING EXTRUSION TECHNOLOGY

Sugantha Rajamani*; Raajeswari PA.**

*Assistant Professor,
Department of Food Processing,
Technology and Management,
PSGR Krishnammal College for Women,
Peelamedu, Coimbatore, Tamil Nadu, INDIA
Email id: rsugantha267@gmail.com

**Assistant Professor,
Department of Food Science and Nutrition,
Avinashilingam Institute of Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: raajraajeswari@gmail.com

ABSTRACT

Extrusion cooking is an ideal method for manufacturing a number of food products from snacks and breakfast cereals to baby foods. Extrusion cooking technologies are used for cereal and protein processing in the food industry and closely related pet foods and feeds sectors. Brown rice is whole grain, produced by removing only the husk or hull using pestle and mortar, retaining the bran layer causing the grain to remain intact and retain its soluble fibre and antioxidant content. An attempt has been made to develop a Ready- to – Eat snack product from Brown rice flour using extrusion cooking method. Composite flour was prepared using brown Rice Flour and whole wheat flour as the cereal base combined with processed lentil flour as the pulse base. Five different composite flours were prepared by combining the two cereals and pulse flour in different proportions. Extrusion was carried out at 120 ^{o}C using a Twin Extruder. The extruded pre – forms was deep fried in cooking oil prior to consumption. These were then evaluated for its acceptability using quantitative numerical scoring method by 20 semi trained panelists. Sensory and statistical analysis showed the extruded snack product prepared from the combination of brown rice flour, whole wheat flour, lentil flour (60:20:20) as the most acceptable.Proximate analysis revealed energy as516.4 kcals, 8.35g protein , fat31.2g and dietary fibre as 8.9g.The product had a shelf life of 15 days under

normal storage conditions. Hence a value addition has been done in ready to eat snack product by incorporating brown rice.

KEYWORDS: *Extrusion, Brown Rice, Ready –to-Eat.*

INTRODUCTION

Consuming diets deficient in calories tends to affect the utilisation of other nutrients. Varieties of foods that enhance the absorption of nutrients are ideal the bottom line for better nutritional status. Sufficient calories should be consumed and it is advantageous if they come from a variety of foods. According to Singh and Raghuvanshi (2012) nutritional quality of food is a key element in maintaining an overall physical well-being because nutritional well-being is a sustainable force for health and development and maximization of human genetic potential. Therefore, for solving the problem of deep-rooted food insecurity and malnutrition, dietary quality should be taken into consideration.

Extrusion cooking is a high-temperature, short-time process in which moistened, expansive, starchy and/or protenacious food materials are plasticised and cooked in a tube by a combination of moisture, pressure, temperature and mechanical shear, resulting in molecular transformation and chemical reactions (Castells *et.al*, 2005).

The extrusion process denatures undesirable enzymes; inactivates some antinutritional factors (trypsin inhibitors, haemagglutinins, tannins and phytates); sterilises the finished product; and retains natural colours and flavours of foods. Bhandari*et. al*, (2001).

Brown rice is unpolished whole grain rice that is produced by removing the hull or husk using a mortar and pestle or rubber rolls. It may be distinctly brownish or purplish red. It has a mild nutty flavour, is chewier than white rice and becomes rancid more quickly but it is very nutritious.

This traditionally denigrated kind of rice is now more expensive than the common white rice partly due to relative low supply and difficulty of storage and transport (Anonymous, 2000).The health benefits of brown rice are immeasurable. Brown rice has high dietary fibre (a gentle laxative), rich in B vitamins and minerals (prevents beriberi) and high in fat (energy source). Also brown rice contains high phytic acid (antioxidant, anti-cancer); it decreases serum cholesterol and is considered a low glycemic index food (GI Value 55) decreasing the risk to type 2 diabetes.

The objective of the present study was to develop brown rice flour based ready- to-eat extruded snack product using composite flour (Brown rice flour, whole wheat flour, lentil flour, evaluate it acceptability, analyse the nutrient composition, study its shelf life.

MATERIALS AND METHODS

Brown Rice, Whole wheat, Lentil, were purchased from the local market. Milling process was carried in a food processor ((Panasonic Super- Mixer Grinder, Model No AC 220).

a. Processing of raw materials

i. Brown Rice flour

The material was cleaned manually to remove stones, and other extraneous matter, washed to make it dirt and filth - free and shade dried. The grains were ground in a food processor to a granular size similar to that of *sooji*.

ii. Whole Wheat Flour

Whole wheat was procured from the local market. It was cleaned to remove stones and extraneous matter, washed, drained, and sundried. The dried grains were then milled into flour in a flour mill. The flour was stored in an air- tight container for further use.

iii. Lentil Flour

Lentils were made free from foreign particles, soaked overnight to increase the nutrient availability and digestibility, sundried (2-3 days) and ground into flour in a food processor. The flour was sieved and stored in air – tight container.

b. Composite flour preparation and Extrusion

Flour blends were prepared from brown rice flour, whole wheat flour, lentil flour. Brown rice flour, whole wheat flour and lentil flour were combined in different ratios on dry basis. The combinations have been shown in Table I. These blends were chosen according to preliminary tests without jamming of extruder, acceptability as well as contribute a better nutritive value in the final product. The blended samples were conditioned by spraying with a calculated amount of water and mixed continuously by manual method. The flour was passed through a sieve mesh for removal of lumps. The sieved semi- moist flour was fed into the pre-heated Twin Extruder. Extrusion took place at a temperature of 120^{o}C. The product was produced as a continuous length. This is known as pre-form. It was cut with an in built knife into pellets. The pellets were cooled to room temperature. These pellets were the deep fat fried in vegetable oil (180^{o} C, 30 sec) and mixed with spices. The product was packed into LDPE pouches and stored at room temperature.

TABLE I COMBINATION FOR READY –TO-EAT EXTRUDED SNACK PRODUCT

Variations	Rice flour	Wheat flour	Lentil flour
Variation 1	60g	20g	20g
Variation 2	50g	30g	20g
Variation 3	50g	30g	20g
Variation 4	60g	10g	30g
Variation 5	60g	30g	10g

c. Product Analysis

The organoleptic evaluation of the products was carried out by a panel of 20 semi- trained panelists. The panelists were naive to project objectives. Samples were coded using single digit random alphabets and served with the order of presentation. Panelists were provided with a glass of water, and were instructed to rinse and swallow water between samples. They were asked to evaluate the products for acceptability based on its colour, appearance, taste, texture and overall acceptability using quantitative numerical scoring method (5-excellent to 1-poor). The sensory parameters included colour, flavour, texture, taste and overall acceptability. The panelists were asked to record their observations in the sensory evaluation sheet.

The scores were then subjected to statistical analysis like mean score, 2 way ANOVA and coefficient of variation using MATLAB software 2007.The best variation was further evaluated for nutrient and shelf life analysis.

Nutrient Analysis

The nutrient analysis was carried using standardised protocols (AOAC, 2000). The parameters analysed include moisture, total ash, protein, total carbohydrate, total fat and dietary fibre content.

d. Shelf Life Analysis

The extruded Ready –to-eat snack was subjected to microbiological analysis for the parameters – Total Viable Count and E-coli. The shelf life analysis was carried out by storing the product in the Low Density Polyethylene (LDPE) zip- lock pouches at room temperature. Sensory evaluation was carried out at definite time intervals, on the day of preparation (0 day), fifth day, tenth day and fifteenth day by a panel of 10 members using numerical scoring method from excellent to poor. The sensory parameters include colour, flavour, texture, taste and overall acceptability.

e. Results and Discussion

From the sensory analysis the extruded product prepared from the combination of brown rice flour, whole wheat flour, lentil flour (60:20:20) was found to be the most acceptable. The results have been represented below

TABLE II MEAN SCORES OF ORGANOLEPTIC EVALUATION OF READY-TO-EAT EXTRUDED SNACK PRODUCT

Variations	Colour (5)	Flavour (5)	Texture (5)	Taste (5)	Overall Acceptability (5)
(Brown rice flour+whole wheat flour+lentil flour)					
I	**3.61±0.5**	**4±0.54**	**4±0.49**	**3.89±0.49**	**4.21±0.41**
II	3.38±0.49	3.89±0.58	3.8±0.56	3.56±0.5	3.5±0.52
III	3.15±0.46	3.91±0.4	3.66±0.53	3.3±0.53	3.56±0.5
IV	3.14±0.34	3.46±0.48	3.2±0.38	3.1±0.35	3.19±0.39
V	3.71±0.72	3.91±0.48	3.63±0.56	3.49±0.55	3.41±0.47

From the above table it is observed that Variation I in Combination I has scored the highest scores, (3.61) for colour, (4) for flavour and texture, (3.89) for taste and (4.21) for overall acceptability followed by Variation II and Variation V. Variation III and Variation IV have scored low in colour, texture and taste as a result of increase in the pulse content. Hence Variation 1 has been the most suitable for extrusion.

TABLE III ANOVA AND COEFFICIENT OF COVARIATION FOR READY-TO-EAT EXTRUDED SNACK PRODUCT

Variations	Colour	Flavour	Texture	Taste	Overall Acceptability
(Brown rice flour+whole wheat flour)					
I	13.00%	11.00%	**10.00%**	10.00%	**8.00%**
II	12.00%	13.00%	11.00%	13.00%	14.00%
III	**7.00%**	**10.00%**	11.00%	14.00%	14.00%
IV	**7.00%**	13.00%	**10.00%**	**7.00%**	10.00%
V	10.00 %	10.00 %	13.00 %	13.00 %	13.00 %
Prob>F	0.0197**	0.0030***	$5.10923X10^{-5}$***	$1.37275X10^{-5}$***	$4.31129X\ 10^{-6}$***

***Significant at 1% level **Significant at 5 % Level * Significant at 10 % level
ns- Not significant

Table III represents Coefficient of co variation and ANOVA of the extruded snack.In Combination 1, Variation IV has scored least percentage in colour, texture and taste while Variation III has secures less percentage in colour and flavour and Variation I in texture and overall acceptability. Hence Variation IV can be considered to be consistent in the four trials with respect to colour; texture and taste while Variation III in colour and flavour. Variation I have been found to be consistent in texture and overall acceptability parameters.

In Combination 1, and the P values for flavour, texture, taste and overall acceptability reveal significant difference between the mean scores of variations at one per cent level while for the colour parameter the significance is at five per cent level. Hence the differences between the mean scores of the five variations are highly significant for all the parameters except colour.

TABLE IV NUTRIENT ANALYSIS OF READY –TO-EAT EXTRUDED SNACK PRODUCT

S.No.	Nutrient Parameter	Value (per 100g)	Method Used
1.	Moisture (%)	8.46	Hot – air oven method
2.	Total Ash (%)	1.44	Muffle furnace method
3.	Energy (Kcals)	516.4	By calculation method
4.	Total protein (g %)	8.35	Micro- Kjeldahl method
5.	Total Fat (g %)	31.2	Soxhlet extraction method
6.	Dietary Fibre (g %)	**8.9**	Dietary Fibre Assay Kit method (SIGMA)
7.	Total Carbohydrate (g %)	50.55	By Calculation

The nutrient analysis was carried out in triplicates. The nutrients analysed in the cereal – pulse based ready –to eat extruded snack product.

The Extruded Snack prepared from brown rice flour, whole wheat flour and lentil flour had 8.46 % moisture, 1.44% ash, provided 516.4 kCals energy, 8.35% protein, 31.2 % fat, 8.8 % dietary fibre and 50.55% carbohydrate. Increase in the total fat content is attributed to deep fat frying of the extruded pre-form.

TABLE V MICROBIAL ANALYSIS OF READY –TO-EAT EXTRUDED SNACK PRODUCT

Product Name	Total Viable Count(cfu/ml)		E- Coli	
No.of days	**0 day**	**II day**	**0 day**	**II day**
Extruded product	5 X 10^{-9}	5 X 10^{-9}	No growth found	No growth found

The microbial load of the Extruded Snack was found to be 5 colonies at a dilution of 10^{-7} on the first day. No increase in viable growth was seen even after three days. No fungal growth was also observed. This could be attributed to presence of low moisture content in the products. Coli forms growth was also not reported. This shows that the Extruded products are safe for consumption even after three days.

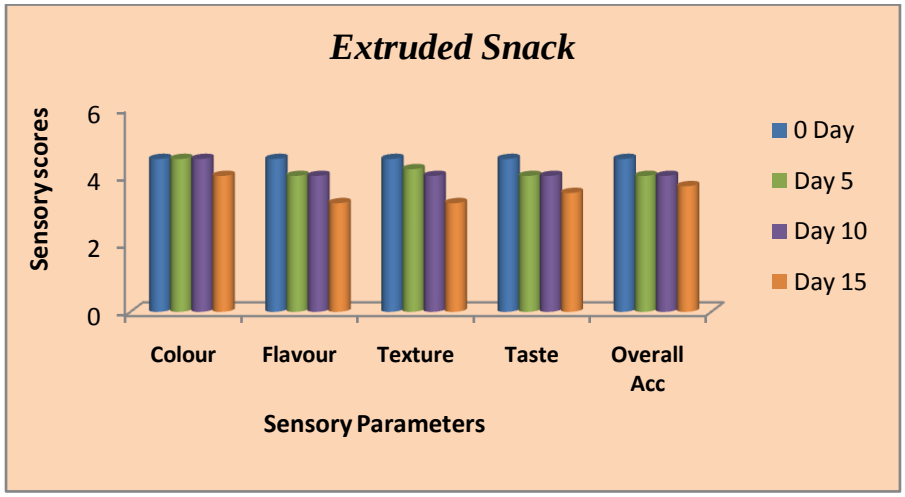

FIGURE I

No changes took place in the sensory parameters during the storage period of fifteen days. Thus the product can be stored for a period of fifteen days.

CONCLUSION

By using different combinations of these less utilised food grains more healthy and whole-grain substitutes can replace refined carbohydrates in Ready – To - Eat snack products category .This would not only help in the management of a healthy life style.Through such initiatives utilization of minor-grain foods like millets and legumes can be exploited for the preparation of ready to eat snack food items.

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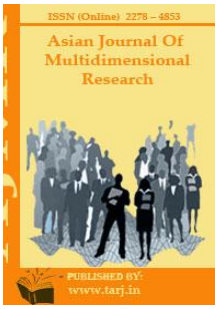

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DEVELOPMENT AND EVALUATION OF PRESERVED FOODS FROM TAMARILLO FRUIT

Suganya A*; Kalpana C.A**

*Assistant Professor,
Dept. of Nutrition and Dietetics,
St.Joseph's college of Arts and Science for Women,
Hosur, Tamil Nadu, INDIA

**Associate Professor,
Dept. of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: suganyaa101@gmail.com

ABSTRACT

Tamarillo fruit (Cyphomandra betacea or Solanum betaceum) commonly known as Tree Tomato is native to South America and is also grown in the Nilgiris District, Tamil Nadu. Tamarillo fruit is one of the low-calorie fruits and has good amounts of nutrients namely fiber, iron, vitamin C and beta carotene. It helps to improve immunity and aids in weight loss, controls diabetes and heart friendly and it is very good for maintaining healthy eyesight. With this in view, the objectives of the study are to develop and evaluate preserved foods from Tamarillo fruit and to analyse the nutrient content. Fruits purchased from local markets of Nilgiris. Jam, sauce and pickle were developed using Tamarillo fruit and for standard, the same products were prepared using locally available tomatoes at the Foods Laboratory, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore. Preserved foods were evaluated by 30 semi trained panel members for their acceptability using score card. The findings of the study revealed that Tamarillo pickle, jam and sauce had better acceptability compared to standard. Moisture, ash, crude fibre, carbohydrate, protein, vitamin C, calcium, iron, phosphorus and β carotene, thiamin were estimated. This study is an eye opener for nutrient content of under exploited fruits and its prevention of degenerative diseases.

KEYWORDS: *Tamarillo, Solanum Betaceum, Preserved Foods, Acceptability, Nutrient Content.*

INTRODUCTION

Tamarillo (*Solanum betaceum*), also known by its popular name as tree tomato, is a small tree native of South America and belongs to the Solanaceae family. Tamarillo fruit contains more seeds. It is used to prepare salads, sauces, soups, jellies, ice creams, juices and liqueurs. Tree Tomato fruits are usually cut in half, and the flesh scooped out, the seeds are soft and edible, the skin is easily peeled off when dipped briefly in hot water. They can be used as savory products in sandwiches and green salads or cooked and eaten in stews, soups, baked goods. It has a very low calorie and are high in vitamins and iron. It contains only 40 calories per fruit. It promotes a healthy brain, besides curing different types of headaches including migraines. It treats sore throats. The high antioxidant content is said to reduce the risk of degenerative diseases such as diabetic, cardiovascular diseases and cancer. It improves immunity and slow down aging. With this in view, the design of the study was to develop, standardize and evaluate preserved foods using tamarillo fruit and to analyse the nutrient content of preserved foods.

MATERIALS AND METHODS

Procurement of fruits:

Tamarillo fruits *(Solanum betaceum)* were purchased from local shops at Ooty, The Nilgiris District, Tamilnadu. Fully matured and ripe fruits were collected from the shops. Tomatoes were collected from the local shops from Coimbatore for the preparation of standard preserved foods using tomatoes.

Development of preserved foods

Fully ripe, matured fruits were taken and the method of preparation of preserved foods are given below.

Preparation of Pickle

Purchase of tamarillo fruits→ washed→ cut→ addition of salt→ transferred into bottles→ soaked for 2 weeks→ for seasoning→ heat mustard oil→ add mustard→ chili powder, cumin seed& fenugreek powder→ then add soaked tamarillos.

Preparation of Jam

Purchase of tamarillo fruits→ washed→ blanched→ removed the peel→ ground → cooked the pulp→ addition of sugar with continuous stirring→ added citric acid and gelatin powder→ poured hot into jar.

Preparation of Sauce

Purchase of tamarillo fruits→ washed→ blanched→ ground→ pulp taken→ cooked the pulp→ addition of sugar, salt, chili powder→ inserted spice bag→ thick consistency → poured into bottle→ stored.

Standardization of preserved foods

In order to standardize the preserved foods with tomato and Tamarillo, they were evaluated organoleptically in comparison with the respective standard preserved foods. A score card was prepared using the guidelines of numerical scoring method. Sensory evaluation of the preserved food products were carried out by 30 semi trained panel members conducted at Foods Laboratory, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore.

Proximate analysis

The preserved foods were arranged on a plate, and then the samples were placed inside a cabinet dryer at 63°C for 48 hours. After 48 hours, dried samples were powdered. The powder was used for analysing ash, fat, protein and fiber analysis. Kjeldahl method was used for protein determination and the Soxplus apparatus was used for analyzing the fat content. For ash content, the sample was weighed and transferred to a muffle furnace at 600°C until a white or light grey ash was obtained.

Estimation of ascorbic acid content was done by using dye (2,6-dichlorophenol indophenol) method. Moisture content of the sample was estimated by Shimadzu moisture balance and was expressed as percentage. The dried sample was taken in a beaker and 200 ml of boiling 0.255N H2SO4 was added and boiled for 30 minutes. The contents were filtered through muslin cloth and washed with distilled hot water until washings are no longer acidic. The residue was transferred into the same beaker and boiled with 0.313N NaOH for 30 minutes and filtered through a muslin cloth, washed with 50 ml of distilled hot water till free from alkali and 25 ml of alcohol. The residue was transferred into a pre weighed crucible, dried for 2-4 hours at 130^{0}C and cooled and weighed. The difference in the weight represents the weight of the fibre.

RESULTS AND DISCUSSION

SENSORY ATTRIBUTES AND OVERALL ACCEPTABILITY OF PRESERVED FOODS

The overall acceptability of preserved foods of Tomato pickle and Tamarillo pickle are presented in Table I.

TABLE I OVERALL ACCEPTABILITY OF PRESERVED FOODS OF TOMATO PICKLE AND TAMARILLO PICKLE

Parameters	Standard tomato pickle Mean ± S.D	Tamarillo pickle Mean ± S.D
Appearance	4.53±0.53	5.0±0
Colour	4.56±0.50	5.0±0
Texture	4.73±0.44	4.78±0.49
Flavour	4.06±0.69	4.75±0.51
Taste	4.63±0.49	4.75±0.44
Overall acceptability	4.3±0.47	5.0±0

The developed preserved foods of tamarillo pickle has got better acceptability compared to standard tomato pickle (5.0±0), (4.3±0.47) in all the characteristics.

The overall acceptability of preserved foods of Tomato jam and Tamarillo jam are presented in Table II.

TABLE II OVERALL ACCEPTABILITY OF PRESERVED FOODS OF TOMATO JAM AND TAMARILLO JAM

Parameters	Standard Tomato jam Mean ± S.D	Tamarillo jam Mean ± S.D
Appearance	4.73±0.52	4.93±0.25
Colour	4.63±0.55	4.83±0.37
Texture	4.53±0.68	4.76±0.43
Flavour	4.4±0.56	4.56±0.50
Taste	4.66±0.56	4.76±0.43
Overall acceptability	4.8±0.40	4.93±0.25

The developed preserved food of tamarillo jam has got better acceptability compared to standard tomato jam (4.93±0.25), (4.8±0.40) in all the characteristics.

The overall acceptability of preserved foods of Tomato sauce and Tamarillo sauce are presented in Table III.

TABLE III OVERALL ACCEPTABILITY OF PRESERVED FOODS OF TOMATO SAUCE AND TAMARILLO SAUCE

Parameters	**Standard Tomato sauce Mean ± S.D**	**Tamarillo sauce Mean ± S.D**
Appearance	4.6±0.56	4.86±0.34
Colour	4.36±0.61	4.8±0.40
Texture	4.4±0.72	4.6±0.56
Flavour	4.3±0.74	4.4±0.67
Taste	4.6±0.56	4.56±0.62
Overall acceptability	4.63±0.49	4.76±0.43

The developed preserved foods of tamarillo sauce has got better acceptability compared to standard tomato sauce (4.63±0.49), (4.76±0.43) in all the characteristics.

NUTRIENT CONTENT OF PRESERVED FOODS OF TAMARILLO AND TOMATO

The nutrient content of preserved foods of Tamarillo jam and Tomato jam are presented in Table IV

TABLE IV NUTRIENT CONTENT OF PRESERVED FOODS OF TAMARILLO JAM AND TOMATO JAM

S.No	**Nutrients**	**Tomato Jam**	**Tamarillo Jam**
1	Ash (%)	0.12	4.0
2	Moisture (%)	22.4	40
3	Energy (kcal)	2052	1368
4	Carbohydrate (g)	57	38
5	Protein (g)	1.5	0.43
6	Fat (g)	10	3
7	Fiber (g)	2.8	4
8	Iron (mg)	2.8	1.3
9	Calcium (mg)	0.08	6.8
10	Phosphorus (mg)	17	20
11	Vitamin C (mg)	19.2	23.2
12	**β** Carotene (µg)	1440	2500
13	Thiamine(mg)	0.09	0.61

From the above table it is revealed that, the preserved foods Tamarillo contain low calorie content compared to preserved foods of tomato. The preserved foods Tamarillo contain low carbohydrate content than the preserved foods of tomato.

The preserved foods tomato jam has high Protein (1.5g) than Tamarillo jam (0.43g). Tamarillo jam contains high in fiber, calcium, Vitamin C, Beta carotene and thiamine compared to standard tomato jam.

The nutrient content of preserved foods of Tamarillo sauce and Tomato sauce are presented in Table V

TABLE V NUTRIENT CONTENT OF PRESERVED FOODS OF TAMARILLO SAUCE AND TOMATO SAUCE

S.No	Nutrients	Tomato Sauce	Tamarillo Sauce
1	Ash (%)	4.16	6
2	Moisture (%)	63.6	63
3	Energy (kcal)	637.2	468
4	Carbohydrate (g)	17.7	13
5	Protein (g)	0.82	0.6
6	Fat (g)	0.7	2
7	Fiber (g)	3.4	4
8	Iron (mg)	8.5	5
9	Calcium (mg)	41.5	7.8
10	Phosphorus (mg)	17	40
11	Vitamin C (mg)	21	25.6
12	β Carotene (µg)	2403	5000
13	Thiamine(mg)	0.2	0.76

Preserved foods of tomato Sauce has high Protein (0.82g) than tamarillo Sauce (0.6g). Tamarillo sauce contains high in fiber compared to standared tomato sauce. Preserved foods of Tamarillo sauce contains high vitamin C content (25.6mg) compared to Tamato jam(21). Preserved foods of Tamarillo sauce has good β carotene content (5000µg) compared to tomato sauce (2403 µg). The preserved foods of Tamarillo sauce contain high Thiamine content than the preserved foods of Tomato sauce.

The nutrient content of preserved foods of Tamarillo pickle and Tomato pickle are presented in table VI

TABLE VI NUTRIENT CONTENT OF PRESERVED FOODS OF TAMARILLO PICKLE AND TOMATO PICKLE

S.No	Nutrients	Tomato Pickle	Tamarillo Pickle
1	Ash (%)	12	8
2	Moisture (%)	66.8	70
3	Energy (kcal)	1010	540
4	Carbohydrate (g)	23	15
5	Protein (g)	0.5	0.25
6	Fat (g)	6.09	6
7	Fiber (g)	6.3	10
8	Iron (mg)	2.8	2
9	Calcium (mg)	19	6.1
10	Phosphorus (mg)	30	32
11	Vitamin C (mg)	19.3	17.4
12	β Carotene (µg)	1346	3500
13	Thiamine(mg)	0.4	0.52

Preserved foods of tomato pickle has high in Protein (0.5g) than Tamarillo pickle (0.25g). Fibre content of preserved foods of tamarillo pickle has more value than the tomato pickle products. Tamarillo pickle has rich in vitamin C, beta carotene and thiamine when compared to standared tomato pickle.

CONCLUSION

From the results of this study, it can be concluded that the preserved foods of Tamarillo pickle, jam and sauce has got better acceptability compared to standard tomato products. The nutritional content of preserved foods of tamarillo shows it is rich in fibre, iron, Vitamin C, thiamine and β carotene that can enhance human health. Tamarillo is an excellent food because it has an enormous amount of biomolecules that are essential for health and are part of our daily nutritional requirements. A great advantage that has the Tamarillo is that it only contributes 262 Kcal per 100 g. It also helps in managing diabetes. Since it is low in calories so it may be helpful for diabetes further studies have to be done to prove this.

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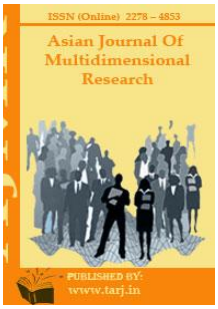

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ANALYSING THE ANTIOXIDANT ACTIVITY OF WHEAT GRASS USING DROSOPHILA MELANOGASTER (FRUIT FLY) AS A MODEL ORGANISM

Jincy, P. A.*; Swathi, K.; Padma, P. R*****

*Department of Biochemistry,
Biotechnology and Bioinformatics
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

**Department of Biochemistry,
Biotechnology and Bioinformatics
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: swathilakshmie@gmail.com

***Department of Biochemistry,
Biotechnology and Bioinformatics
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Free radicals are uncharged molecules that scavenge the cells and tissues, which lead to adverse alterations in the normal functioning of the body. Increased reactive oxygen species or decreased antioxidative potential causes oxidative stress in cells and tissues, thereby contributing to the pathology of numerous chronic diseases such as cancer, coronary heart diseases, cataract, diabetes, Alzheimer's disease and several other age-related ailments. Antioxidants are substances that eliminate potentially harming oxidizing agents in the body. Triticum aestivum, commonly called wheat grass, has the ability to detoxify toxic substances from the blood stream. The present study focussed on the evaluation of enzymic (superoxide dismutase, catalase and peroxidase) and non-enzymic (vitamin C, vitamin E and reduced glutathione) antioxidants status in the Drosophila (fruitfly) subjected to oxidative stress induced by CCl_4/H_2O_2 (low and high dose) in the presence and absence of Triticum aestivumleaf extracts in the male and female flies. The results show that there was a severe depletion in the level of the antioxidants in the flies as the concentration of the oxidants

increased. The co-administration of the aqueous extract of T. aestivumleaves significantly increased the activities of these enzymic and non-enzymic antioxidants, demonstrating the protective effect of wheat grass against oxidative stress.

KEYWORDS: *Triticum Aestivum, Oxidative Stress, Enzymic and Non-Enzymic Antioxidants.*

INTRODUCTION:

Free radicals can be defined as a chemical species that contains an odd number of electrons which makes it unstable, short lived and highly reactive. Therefore, it reacts quickly with other compounds in order to capture the needed electron to attain its stability (Kumar *et al.*, 2003). Free radical production in organisms with aerobic metabolism is a continuous and unavoidable process, since the reduction of molecular oxygen to water within the mitochondrial respiratory chain is not 100% efficient. In this way, the mitochondria are the main source of free radicals, due to electron leakage in the respiratory chain, with the resulting formation of reactive oxygen species (ROS) and reactive nitrogen species (RNS) (Arora *et al.*, 2002). Free radicals are prone to oxidize intracellular molecules, such as lipids, DNA and proteins, giving rise to alterations in the cell structure. ROS and RNS are not free radicals but can easily lead to free radical reactions in living organisms (Mavi*et al.*, 2003). The consequences of the damage initiated by these metabolic byproducts affect a large range of biological reactions. (Marnett*et al.*, 2003) Oxidative stress refers to the imbalance between the generation of ROS and the activity of the antioxidant defenses (Saito *et al.*, 2005). Oxidative stress can affect the individual molecules, and thus the entire organism leading to the risk of chronic diseases including Alzheimer's disease, autoimmune disease, cancer, cardiovascular diseases, diabetes, rheumatoid arthritis and myocardial infarction (Mohammed, 2002).

A number of important physiological antioxidant systems serve to oppose the effects of free radicals and oxidants on target substances. When ROS/RNS are generated *in vivo* their actions are opposed by intricate and coordinated antioxidant lines of defense systems (Waring, 2001). These include enzymic (superoxide dismutase, catalase and peroxidase) and non-enzymic antioxidants (vitamin C, vitamin E and reduced glutathione) that present or alleviate injuries from ROS.Co-operation among these components is essential for effective protection from ROS (Agarwal and Pandey, 2004).The endogenous antioxidants in medicinal herbs may play an important role in antioxidative defense against oxidative damage, possibly protecting the biological function of cells (Gunther, 2004).

Triticum aestivum, commonly called as wheat grass, can be effectively used for skin diseases and ulcerated wounds. It purifies the blood due to its vitamin and mineral contents (http:// www. Wheatgrass. Professional. Info/ letters/ letters/ letter_may04). The study of model invertebrates like *Drosophila melanogaster* (Fruit fly) has a long history of yielding valuable insights into both fundamental and pathobiology and alsohas become one of the most tractable multicellular organisms to study the developmental biology and genetic analysis (Wilson *et al.*, 2005). The present study is intended to analyze the antioxidant effect of *Triticum aestivum*using *Drosophila* as the model organism.

METHODOLOGY:

Collection of the *Drosophila* Stock

The Wild type *Drosophila melanogaster* stock was collected from the *Drosophila* Stock Centre, Manasagangotri, Mysore University.

Preparation of Medium

One litre of water was boiled; 100g of jaggery was added to it and cooked well. Then 100g of sooji was added, mixed and boiled well. Following this, 10g of agar and 7.5ml of propionic acid were added and cooked well. The mixture was cooled and transferred to bottles. Yeast granules were layered on the top of the medium and the bottles were plugged with cotton.

Culturing of *Drosophila*

Drosophila was cultured in the above media at 25˚C under 12 hours light and 12 hours darkness. They were maintained in the *Drosophila* colony laboratory in the University campus.

Preparation of the Homogenate

The male and female *Drosophila* were identified and separated as soon as they hatched. The virgin animals were maintained in the abovementioned diet and then divided randomly for the various treatments.

Preparation for the Plant Extract

Wheat seeds were collected from the local market at Coimbatore. They were soaked for 24 hours in tap water and sowed. The fresh leaves of the 4^{th} day plants were collected. They were washed in running tap water to remove the dirt particles and blotted gently between the folds of tissue paper to remove any water droplets. The leaves were then homogenized in water (1g/ml) using a micropestle. The homogenate was centrifuged at low speed to remove large particles and used for the treatment.

Treatment Groups

The following treatment groups were set up for each parameter for male and female flies respectively.

1. Untreated group
2. *Triticum aestivum*leaf extract treated group
3. H_2O_2 low dose (20 mM)
4. H_2O_2 low dose (20 mM) + *Triticum aestivum*leaf extract treated
5. H_2O_2 high dose (30 mM)
6. H_2O_2 high dose (30 mM) + *Triticum aestivum*leaf extract treated
7. CCl_4 low dose (125 mM)
8. CCl_4 low dose (125 mM) + *Triticum aestivum*leaf extract treated
9. CCl_4 high dose (195 mM)
10. CCl_4 high dose (195 mM) + *Triticum aestivum*leaf extract treated

The test agents (H_2O_2/$CCl_4$and leaf extract) were mixed with the diet. The exposure wasgiven for seven days. At the end of the treatment period, the flies were anaesthetized using diethyl ether and their wings were clipped off. They were then weighed, crushed and homogenized in ice-cold phosphate buffer (30mg of flies/ 300µl buffer) using a sonicator (Sonics, USA).

The homogenate was quickly aliquoted after clarification by centrifugation and frozen at -85˚C(Ilshin Ultra Deep Freezer, Korea) till analysis. All the analyses were performed in a short as duration as possible.

Parameters Analysed

As the volume of homogenate obtained was very less compared to the volume obtained in other traditional animal models, all the assays were performed using a nanospectrometerOptizen 3220 UV Bio (Korea), wherein the assay volume required ranges from 0.7 to 4µl.

ENZYMIC ANTIOXIDANTS

a) Superoxide Dismutase

Superoxide Dismutase, one of the most important cellular antioxidants, was assayed by the method of kakkar*et al.*(1984).

The assay mixture contained 240µl of sodium pyrophosphate buffer, 200µl of phenazine methosulphate, 60µl of nitroblue tetrazolium and appropriately diluted homogenate in a total volume of 600µl. The reaction was started by the addition of 40µl of NADH.After incubation at 30˚C for 90 seconds, the reaction was stopped by the addition of 200µl of glacial acetic acid. The reaction mixture was stirred vigorously and shaken with 8µl of n-butanol. The mixture was allowed to stand for 10 minutes and then centrifuged at 2000 rpm for 5 minutes. The intensity of chromogen in butanol layer was measured at 560nm against butanol as blank and the system devoid of enzyme served as control.

One unit of enzyme activity is defined as the enzyme reaction which gave 50% inhibition of NBT reduction in one minute under the assay conditions and was expressed as specific activity.

b) Catalase

Catalase activity in the homogenates was assayed by the method proposed by Luck (1974). The homogenate of *Drosophila* was employed for the assay. Read against a control cuvette but containing the homogenate as in experimental cuvette but containing H_2O_2 free phosphate buffer.

H_2O_2phosphate buffer (987 µl) was pipetted into the experimental cuvette. To this, 10µl of homogenate was mixed with a glass/plastic rod flattened at one end. The time ΔT required for a decrease in absorbance by 0.05 was noted. This value was used for calculation. If 't' was more than 60 seconds, then repeated the measurements with a more concentrated solution of the sample.

Calculation:

Calculated the concentration of H_2O_2 using the extinction coefficient 0.036 per ml.

c) Peroxidase

Peroxidase activity was estimated by the method of Reddy *et al.* (1995). The homogenate of the *Drosophila* was used as the source of enzyme. 750µl of 0.05M pyrogallol solution and 10µl homogenate was pipetted out in an Eppendorf tube. The spectrophotometer was adjusted to zero at 430nm. 125µl of 1% H_2O_2 was added in the test cuvette. The change in absorbance was recorded every 30 seconds upto 3 minutes.

Calculation:

Change in absorbance / minute at 430nm	=	X
Volume of homogenate taken for the assay	=	10µl
Change in absorbance for 10µl	=	X

Change in absorbance for 300µl homogenate = $\frac{X}{10}$ x 300 = Y

300µl homogenate is obtained from 30mg of flies

Peroxidase activity in 30mg of homogenate = Y

NON-ENZYMATIC ANTIOXIDANTS:

a) Ascorbic acid

Ascorbic acid was estimated by the method reported by Roe and Keuther (1943). 50µl and 80µl aliquots were taken for the assay. 40 to 200µl of the working standard solution containing 4-20µg of ascorbate respectively were pipetted into clean dry test tubes. The volumes were made upto 400µl with 4% TCA.

100µl of DNPH reagent, followed by two drops of 10% thiourea solution was set as a blank. The contents of the tubes were mixed thoroughly and incubated at 37˚C for 3 hours. After incubation, the orange red osazone crystals formed were dissolved by the addition of 500µl of 85% H_2SO_4, in cold, drop by drop, with no appreciable rise in temperature. To the blank alone, DNPH reagent and thiourea were added after the addition of H_2SO_4. After incubation for 30 minutes at room temperature, the absorbance was read at 540nm. The content of ascorbic acid in *Drosophila* homogenate was calculated using standard values.

b) Tocopherol

Vitamin E, a scavenger of free radical, was estimated by the method of Varley *et al.* (1981). 100µl of the homogenate of *Drosophila* was taken in 3 stoppered centrifuge tubes (test, standard and blank). 300µl of ethanol was added to the test and blank. 300µl of water was added to the standard. Then 300µl of xylene was added to all tubes, stoppered, mixed well and then centrifuged. 200µl of xylene layer was transferred into another stoppered tube, taking care not to include any protein or ethanol.

The extinction of test and standard against the blank was read at 460nm. 66µl of ferric chloride solution was added, mixed well and after exactly 15 minutes read the test and standard against the blank at 520nm. The amount of vitamin E can be calculated using the formula,

Amount of tocopherol in µl = $\frac{A_{450}}{A_{520}\text{ (Standard)}}$

c) Reduced Glutathione

The method proposed by Moron *et al.* (1979) was used for the estimation of reduced glutathione. The volume of the aliquot was made upto 250µl with 0.2M sodium phosphate buffer (pH 8.0). 500µl of freshly prepared DTNB solution was added to the above solution and the intensity of the yellow colour formed was read at 412nm in a spectrophotometer after 10 minutes.

A standard curve of GSH was prepared using concentration ranging from 2 to 10 moles of GSH in 5% TCA.

RESULTS AND DISCUSSION:

Superoxide Dismutase

SOD is the major attractive metalloprotein in the antioxidant family. The activity of SOD in the control and H_2O_2 / CCl_4 exposed flies co-treated with *Triticum aestivum*leaf extract is shown in Table 1.

The activity was decreased to a great extent when exposed to H_2O_2 than to CCl_4. As the concentration of the oxidants were increased, greater was the reduction in the activity of SOD. This effect was same in the males and females. There was a slight decline in the SOD activity in the plant extract treated group compared to the untreated control. Co-administration of the plant extract increased the activity of SOD in the groups exposed to CCl_4 and H_2O_2. The activity of SOD was reverted to near normal in the males exposed to lower dose of CCl_4 co-treated with the plant extract. There was a marked increase of activity in the groups exposed to higher doses of CCl_4 and H_2O_2 but the values were not restored to normal levels.

The males showed slightly higher activities of SOD compared to the females in all the groups including the controls. The results of the present study show that SOD responds to oxidative stress induced by CCl_4 and H_2O_2 in *Drosophila*. Oxidative stress significantly decreased SOD activity, which effect was efficiently counteracted by the co-administration of *Triticum aestivum*leaf extract.

Catalase

The results obtained for catalase activity in the *Drosophila* exposed to oxidative stress in the presence and absence of *Triticum aestivum*leaf extract is shown in Table 2.

The activity of catalase was found to be decreased in the H_2O_2 and CCl_4treated groups. Higher dose of the oxidants reduced the catalase activity to a greater extent, with the severe depletion in the female *Drosophila* treated with the higher dose of H_2O_2.There was a slight decline in the catalase activity in the plant extract treated group compared to the untreated control group. The table shows that the treatment of aqueous extract leads to significant enhancement in the activity of catalase in all the groups, but complete recovery was not obtained in any case.

The catalase activity in the male flies was in general lower than the female flies. The results of the present study show that catalase is a crucial determinant for evaluating the antioxidant level in the experimental studies. The decrease in the catalase activity by the oxidative stress induced was recovered by the administration of aqueous extract of *Triticum aestivum*leaf extract, indicating its antioxidant capacity.

Peroxidase

The activity of peroxidase in the oxidant treated flies in the presence and absence of *Triticum aestivum*leaf extract is shown in Table 3.

Treatment with H_2O_2 and CCl_4 caused a marked decrease in the activity of peroxidase. There was a greater reduction in the activity of peroxidase in the females exposed to H_2O_2 compared to CCl_4treated group.

The plant extract treated group showed a slight decrease in the peroxidase activity when compared to the control group unexposed to any oxidants. The co-treatment of the aqueous extract of *Triticum aestivum*increased the peroxidase activity in the H_2O_2 and CCl_4 treated groups. The activity was increased to a greater extent that the males exposed to the lower dose of CCl_4 recovered to near

normal levels after the co-administration of plant extract. A similar trend was seen in the males exposed to the lower dose of H_2O_2. Peroxidase activity was also found to be lower in the females than in the males.

The present study shows that the extract of *Triticum aestivum*was very effective in reverting back the changes in the status of peroxidase activity caused by oxidative stress induced by H_2O_2 and CCl_4.

Vitamin C

The results of the vitamin C level in *Drosophila* exposed to oxidative stress in the presence and absence of *Triticum aestivum*leaf extract is shown in Table 4. There was a significant decrease in the level of vitamin C in the H_2O_2 and CCl_4 treated groups. The lowest level of vitamin C was observed in H_2O_2 treated groups, specifically in the females.

Both the doses of oxidants caused a similar reduction in the level of vitamin C in females. However, a slight dose-response was observed in the males, especially with CCl_4. Untreated control and plant extract treated groups showed nearly the same level of vitamin C.Treatment with the aqueous extract of *Triticum aestivum* increased the level of vitamin C in both H_2O_2 and CCl_4 treated groups. Normal level was recovered in the group where the plant extract was co-treated with the lower dose of CCl_4.The level of vitamin C was reversed to near normal level in the female flies treated with the lower dose of CCl_4 and plant extract.The level of vitamin C were found to be slightly lower in the females than in the males. Reversal to normal level is more marked in males than in the females.

The result of the present study shows that vitamin C is sensitive to both the doses of the oxidants under study (H_2O_2 and CCl_4). The aqueous extract of *Triticum aestivum*counteracted the oxidative stress condition induced by both H_2O_2 and CCl_4.

Vitamin E

The results obtained in the present investigation is tabulated in Table 5. Both the oxidants (H_2O_2 and CCl_4) caused a decrease in the levels of vitamin E compared to the untreated control. In the flies exposed to H_2O_2, the level of vitamin E was found to be lower than the ones exposed to CCl_4. The decrease in the level of vitamin E was similar in the males and females exposed to the higher dose of H_2O_2.

The untreated control group showed a slightly elevated level of vitamin E than the group treated with the plant extract alone. The depletion of vitamin E was reverted to near normal levels by the co-treatment with the aqueous extract of *Triticum aestivum*leaves in the male flies exposed to the lower dose of H_2O_2 and CCl_4. There was a marked increase in the level of vitamin E in the CCl_4 treated group (at higher dose) but the levels did not reach the control values. The level of vitamin E was increased to some extent in the females exposed to the higher dose of H_2O_2, but were comparatively lower than the controls in the lower dose treated group. The level of vitamin E was in general higher in males than in the females.

Our study shows that the administration of *Triticum aestivum*leaf extract can restore the levels of vitamin E, which were depleted by the oxidant treatment.

Reduced Glutathione

The result obtained in the study is shown in Table 6. The level of reduced glutathione decreased in the flies exposed to H_2O_2 and CCl_4, compared to the control group. There was only a slight decrease in the GSH level in the male group treated with the lower dose of CCl_4. There was a marked decrease

in the level of reduced glutathione in the females exposed to both the doses of H_2O_2. The lowest level of GSH was observed in the female flies exposed to the higher dose CCl_4.

There was no significant difference in the levels of GSH in the plant extract treated group. The levels were found to be increased on co-administration of plant extract along with the oxidants H_2O_2 and CCl_4. Reversal to near normal level was obtained in the group exposed to the lower dose of CCl_4 in the presence of plant extract. There was a marked increase in GSH level in the males exposed to H_2O_2 upon co-administration of the plant extract. Females showed decreased levels of reduced glutathione when compared to males.

Thus, the study clearly demonstrates that the exposure to oxidants (H_2O_2 and CCl_4) causes a significant depletion of the major antioxidant components in *Drosophila melanogaster*. Administration of *Triticum aestivum*leaf extract exert a significant antioxidant action against oxidative stress induced by H_2O_2 and CCl_4 *in vivo*.

TABLE 1
EFFECT OF TRITICUM AESTIVUMLEAVES ON THE ACTIVITY OF SUPEROXIDE DISMUTASE IN THE CONTROL AND TREATED DROSOPHILA MELANOGASTER

SEX	GROUP	SUPEROXIDE DISMUTASE (Units/30 mg of flies)				
		WITHOUT OXIDANT	WITH H_2O_2		WITH CCl_4	
			LOW DOSE	HIGH DOSE	LOW DOSE	HIGH DOSE
Male	No extract	43.49 ± 0.76	28.03 ± 0.56	24.50 ± 0.96	29.05 ± 2.00	28.12 ±0.80
	Triticum aestivum	37.73 ± 0.80	37.50 ± 0.30	28.40 ± 0.00	40.55 ± 0.92	38.40 ± 0.10
Female	No extract	27.30 ± 0.53	19.10 ± 0.20	18.30 ± 0.38	23.43 ± 0.45	19.50 ± 0.87
	Triticum aestivum	24.50± 0.96	24.33± 0.67	23.20 ± 0.10	24.23 ± 0.76	21.13 ± 1.30

The values are means ± SD of triplicates

1 Unit = Amount of enzyme that causes 50% reduction in NBT oxidation

TABLE 2
EFFECT OF TRITICUM AESTIVUMLEAVES ON THE ACTIVITY OF CATALASE IN THE CONTROL AND TREATED DROSOPHILA MELANOGASTER

SEX	GROUP	CATALASE(Units/30 mg of flies)				
		WITHOUT OXIDANT	WITH H_2O_2		WITH CCl_4	
			LOW DOSE	HIGH DOSE	LOW DOSE	HIGH DOSE
Male	No extract	171.00 ± 1.00	39.17 ± 1.11	31.93 ± 1.00	56.37 ± 0.90	39.10 ± 0.53
	Triticum aestivum	143.10 ± 0.66	62.10 ± 1.94	44.86 ± 0.10	72.30 ± 0.53	56.30 ± 0.40
Female	No extract	104.50 ± 1.15	31.80 ± 0.50	24.38 ± 0.61	44.49 ± 0.96	34.89 ± 0.00
	Triticum aestivum	98.00 ± 1.00	44.86 ± 0.05	39.30 ± 1.92	62.11 ± 1.92	52.09 ± 0.25

The values are means ± SD of triplicates

1 Unit = Amount of enzyme required to decrease the absorbance at 240nm by 0.05 units

TABLE 3
EFFECT OF TRITICUM AESTIVUMLEAVES ON THE ACTIVITY OF PEROXIDASE IN THE CONTROL AND TREATED DROSOPHILA MELANOGASTER

SEX	GROUP	PEROXIDASE (Units/30 mg of flies)				
		WITHOUT OXIDANT	WITH H_2O_2		WITH CCl_4	
			LOW DOSE	HIGH DOSE	LOW DOSE	HIGH DOSE
Male	No extract	1.07 ± 0.05	0.75 ± 0.05	0.61 ± 0.07	0.84 ± 0.06	0.72 ± 0.10
	Triticum aestivum	0.83 ± 0.04	0.83 ± 0.04	0.63 ± 0.04	0.93 ± 0.01	0.81 ± 0.04
Female	No extract	0.56 ± 0.05	0.56 ± 0.05	0.32 ± 0.04	0.62 ± 0.03	0.52 ± 0.00
	Triticum aestivum	0.75 ± 0.05	0.64 ± 0.06	0.42 ± 0.06	0.72 ± 0.00	0.54 ± 0.06

The values are means ± SD of triplicates

1 Unit = Change in absorbance at 430 nm per minute

TABLE 4
EFFECT OF TRITICUM AESTIVUMLEAVES ON THE ACTIVITY OF VITAMIN C IN THE CONTROL AND TREATED DROSOPHILA MELANOGASTER

SEX	GROUP	VITAMIN C (µg / 30 mg of flies)				
		WITHOUT OXIDANT	WITH H_2O_2		WITH CCl_4	
			LOW DOSE	HIGH DOSE	LOW DOSE	HIGH DOSE
Male	No extract	4.13 ± 0.37	3.06 ± 0.14	2.36 ± 0.23	3.43 ± 0.50	3.16 ± 0.18
	Triticum aestivum	3.89 ± 0.24	3.55 ± 0.14	2.83 ± 0.60	3.67 ± 0.18	3.25 ± 0.10
Female	No extract	3.56 ± 0.18	2.23 ± 0.22	2.20 ± 0.20	3.06 ± 0.14	2.90 ± 0.00
	Triticum aestivum	3.32 ± 0.01	3.06 ± 0.15	2.97 ± 0.40	3.16 ± 0.05	3.07 ± 0.15

The values are means ± SD of triplicates

TABLE 5 EFFECT OF TRITICUM AESTIVUMLEAVES ON THE ACTIVITY OF VITAMIN E IN THE CONTROL AND TREATED DROSOPHILA MELANOGASTER

SEX	GROUP	VITAMIN E (µg / 30 mg of flies)				
		WITHOUT OXIDANT	WITH H_2O_2		WITH CCl_4	
			LOW DOSE	HIGH DOSE	LOW DOSE	HIGH DOSE
Male	No extract	6.50 ± 0.12	3.30 ± 0.10	1.30 ± 0.01	3.41 ± 0.10	2.90 ± 0.30
	Triticum aestivum	4.76 ± 0.13	4.20 ± 0.00	2.69 ± 0.04	4.30 ± 0.11	3.40 ± 0.02
Female	No extract	3.46 ± 0.18	2.40 ± 0.29	1.20 ± 0.09	2.62 ± 0.05	2.50 ± 0.00
	Triticum aestivum	3.30 ± 0.06	2.91 ± 0.08	1.69 ± 0.07	3.11 ± 0.11	2.91 ± 0.08

The values are means ± SD of triplicates

TABLE 6 EFFECT OF TRITICUM AESTIVUMLEAVES ON THE LEVELS OF REDUCED GLUTATHIONE IN THE CONTROL AND TREATED DROSOPHILA MELANOGASTER

SEX	GROUP	REDUCED GLUTATHIONE (nmoles / 30 mg of flies)				
		WITHOUT OXIDANT	WITH H_2O_2		WITH CCl_4	
			LOW DOSE	HIGH DOSE	LOW DOSE	HIGH DOSE
Male	No extract	3.47± 0.33	2.91 ± 0.14	2.64 ± 0.10	3.26 ± 0.24	3.06 ± 0.08
	Triticum aestivum	3.37± 0.21	3.18 ± 0.00	2.93 ± 0.00	3.35 ± 0.00	3.19 ± 0.00
Female	No extract	2.90 ± 0.20	2.19± 0.63	1.80 ± 0.00	2.41 ± 0.49	2.17 ± 0.06
	Triticum aestivum	2.63 ± 0.32	2.40 ± 0.00	1.90 ± 0.00	2.58 ± 0.00	2.39 ± 0.00

The values are means ± SD of triplicates

CONCLUSION:

Thus, the present study has confirmed the antioxidant potential of the *Triticum aestivum*leaf extracts under conditions of oxidative stress in *Drosophila melanogaster*. This observation strongly suggests that the *Triticum aestivum*leaves can be used in medicinal preparations to combat the disorders caused by oxidative stress.

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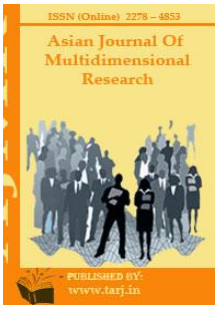

Asian Journal of Multidimensional Research (AJMR)

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EVALUATION OF RISK FACTORS AND IMPACT OF BODY MASS INDEX (BMI) ON METABOLIC SYNDROME IN POLYCYSTIC OVARIAN SYNDROME (PCOS) WOMEN OF SELECTED POPULATION

Velvizhi S*; Annapurani S**

*Department of Biochemistry,
Biotechnology and Bioinformatics,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: sri.velvizhi@gmail.com

**Department of Biochemistry,
Biotechnology and Bioinformatics,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

The aim of the present study is to evaluate the impact of the body mass index (BMI) on metabolic syndrome on polycystic ovarian syndrome women of selected population. Study was carried out at female fertility centre located in Coimbatore, Tamil Nadu, over a period of 2 years. 250 subjects were screened for the disease, among which 93 were shown to suffer from PCOS and 50 normal women of the same age group were included in the study. Institutional Ethics Committee clearance IHEC/16 – 17/BC – 02was obtained for the study. Out of 93 PCOS subjects the age groups of 19-32 were most affected with PCOS, than of 15-18 and the age group of 32 and above. The levels of total cholesterol, triglycerides, LDL- cholesterol were significantly elevated in PCOS women of both overweight and obese groups, whereas the HDL levels were found to be decreased in PCOS women of both the groups. Among all the risk factors, family history of PCOS, diabetes, lack of physical activity, fast food habits and BMI> 25 was strongly associated with the presence of metabolic syndrome in PCOS women.

KEYWORDS: *PCOS, Metabolic Syndrome, BMI, LDL And HDL.*

INTRODUCTION

Obesity has become an important health issue, because it affects human reproductive health and increases the risks of diabetes mellitus, and cardiovascular and cerebrovascular diseases. It has detrimental influences on pregnant women at the risks of abortion, gestational diabetes, gestational hypertension, premature birth and abdominal delivery. Polycystic ovary syndrome (PCOS) is a kind of ovulation failure disease. PCOS clinical manifestations are different, but 35% to 65% of PCOS patients have overweight or obesity (Wang *et al*., 2016).

The prevalence of obesity in PCOS is increased when compared to the general female population and, conversely, the prevalence of PCOS is increased in overweight and obese women when compared to their lean counterparts. Obesity exerts a major impact on the PCOS phenotype, particularly on the metabolic implications and complications of the syndrome. Presence of obesity increases the risk for the metabolic syndrome and its constellation of cardiovascular risk factors in these women (Bermejo *et al*., 2007).

PCOS aggravates insulin resistance and worsens the symptoms of an ovulation in these women. Obesity, especially central obesity, affects the clinical and biochemical presentation of the syndrome, contributing to insulin resistance, hyperandrogenism, reproductive disorders, diabetes and cardiovascular disease (Hart and Doherty, 2015).A recent survey showed that metabolic disorders, obesity, and Type 2 Diabetes mellitus were recognised as the most important long-term concerns related to PCOS.

Metabolic syndrome is another cluster of endocrine disturbances, including insulin resistance, dyslipidemia, obesity, and hypertension.It is associated with a twofold increased risk of cardiovascular disease and a five-fold increased risk of type 2 diabetes. This illustrates the importance of early detection of insulin resistance and metabolic syndrome with subsequent application of preventive measures in women with polycystic ovary syndrome (Grundy *et al* 2005).If the body mass index (BMI) equals to or is greater than 24.9 kg/m^2, it is considered overweight, whereas if the BMI equals to or is greater than 29.9 kg/m^2, it is considered obesity (WHO *et al.*, 1997). Because of the obesity epidemic worldwide and its association with infertility, the aim of this study was to evaluate the risk factors and the impact of BMI on metabolic syndrome in PCOS women of selected age group.

METHODOLOGY

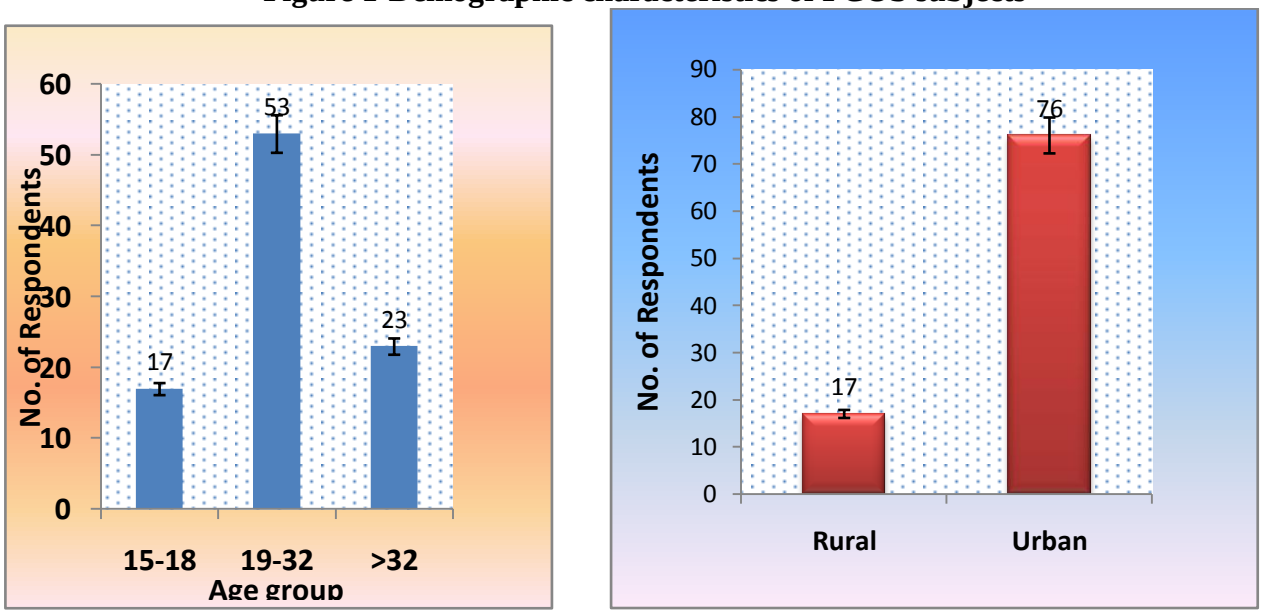
A prospective cross-sectional study was planned on women with PCOS who were being evaluated for infertility in an Infertility clinic of a tertiary care hospital between June 2015to August 2017. All consecutive women with PCOS who presented with infertility were invited to participate in the study. A total of 93 women with PCOS who presented with infertility were enrolled for the study. The diagnosis was based on the 2003 Rotterdam consensus with at least two of the following features: (i) oligo-ovulation or chronic an ovulation, (ii) clinical and/or biochemical hyper and rogenism, and (iii) ultrasound appearance of polycystic ovaries. A questionnaire was used to document length of menstrual cycles; personal, medical, and family history of diabetes; hypertension; obesity; and ischemic heart disease. Signs of androgen excess (hirsutism, acne, and alopecia) and insulin resistance were noted in the physical examination. Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters (kg/m^2). After screening PCOS, 21 PCOS and 10 non PCOS subjects were selected and fasting blood sample were collected from each individual. Biochemical parameters such as total cholesterol, triglycerides, HDL and LDL

of these patients were compared with normal women subjects. The study group and the control group were age matched.

RESULTS AND DISCUSSION

PCOS is of clinical and public health importance because it is affecting up to one in five women of reproductive age. It is an X-linked dominant condition and has diverse clinical implications such as psychological problems (anxiety, depression), reproductive problems (hirsutism and hyper and rogenism), and impaired glucose tolerance. It is widely dependent on environmental, genetic, ethnic factors including lifestyle and body weight (Qureshi*et al*., 2016).The demographic characteristics of the selected PCOS subjects are given in figure 1.

Figure 1-Demographic characteristics of PCOS subjects



According to our study, persons in the age group of 19-32 were most affected with PCOS, than of 15-18 and the age group of 32 and above. Elting*et al*. (2003) reported that PCOS is to be more prevalent in younger (<35 years) than older women. They propose that this possibly arises from a physiological decline in the follicular cohort leading to a normalized ovarian ultrasonic appearance with advancing age. Out of 93 PCOS subjects, 17 were from rural and 76 were from urban areas. Urban people were more affected with PCOS than rural from our study, clearly indicating that the prevalence in rural populationis less while compared to those from urban area. However, the reason for comparatively less PCOS cases among rural population may also be due to lack of awareness. Another reason for less PCOS prevalence among rural population may be their lifestyle. Minimized or nil exposure to junk foods, pollution and other endocrine disruptors are higher in rural areas. Subjects from rural areas also do not tend to depend on labour saving devices for household work or vehicles for transport, thus helping them maintain a good BMI.

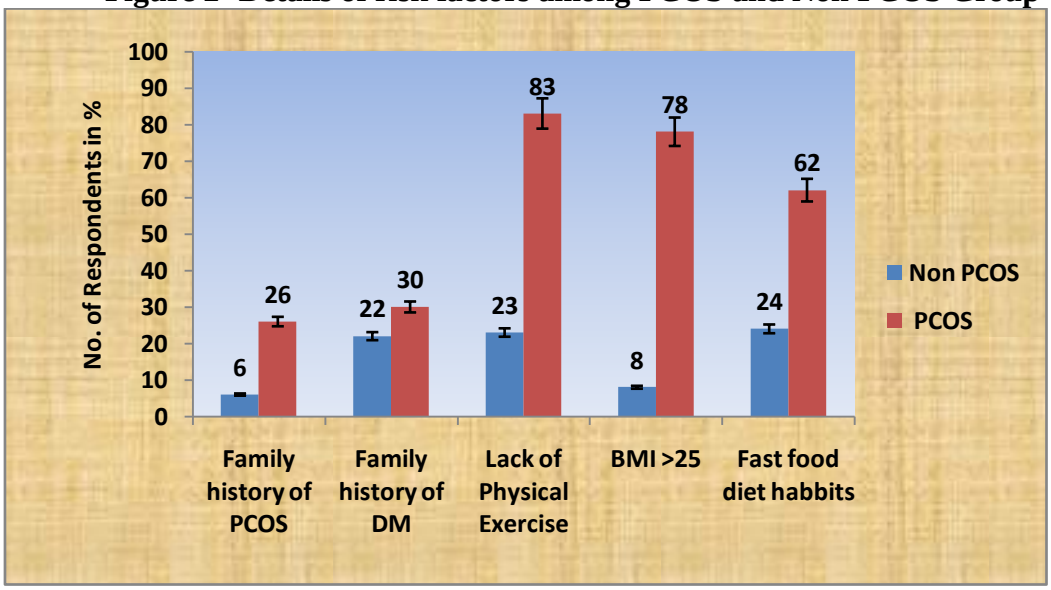
Similar studies conducted in India have shown that most of the doctors, medical practitioners and patients perceive PCOS as the consequence of lifestyle changes in modern middle class women. The prevalence of obesity, overweight and insulin resistance, which are all associated with PCOS pathogenesis, appear to be higher among members of higher socioeconomic strata living in urban areas; medical researchers have attributed this to more sedentary lifestyles and access to more

calorie dense foods and labour saving devices in urban and higher socioeconomic populations (Kalra and Unnikrishnan, 2012;)

II. RISK FACTORS FOR PCOS AND NON PCOS GROUP

The exact cause of PCOS is unknown but it is thought to be multifactorial. There could be more than one predisposing factors that can contribute for development of PCOS. However there is no literature that explained the association of common factors with PCOS, however it was observed that PCOS is genetic in nature and obesity was found to contribute for hyperinsulinemia there by predisposing individuals for PCOS. Figure 2 depicts the risk factors associated with PCOS and Non PCOS group.

Figure 2- Details of risk factors among PCOS and Non PCOS Group



The number of study participants who had a positive family history of PCOS in PCOS group and non-PCOS group are 26% and 6% respectively. PCOS is significantly more prevalent among family members of PCOS patients than in the general population. Family history, as a reflection of genetic risk, can also be considered a risk factor and we will present data to support the consensus that PCOS is an inherited disorder and, therefore, family history is important for determining an individual's risk of developing PCOS.

Family history of diabetes, a metabolic inherited disorder also poses significantly high risk for PCOS, Yildiz*et al.* (2012) detected diabetes and IGT in 16 % and 30 % of mothers and in 27 % and 31 % of fathers, respectively, of women with PCOS.Physical inactivity, leading to uneven distribution of body fat, is an important risk factor of centripetal obesity. Shan *et al* (2015) reported that proper diet and regular physical exercise to obese PCOS patients to achieve significant alleviation of symptoms like excessive hair and irregular menstruation, Physical activity levels in women with PCOS were lower compared to active women without PCOS. Exercise improves ovulation rates and is potentially more beneficial than dietary restriction in restoring reproductive function. Enhanced insulin sensitivity underpins restoration of reproductive function through hormonal improvements, including reduced androgens. This improves the ovarian hormonal environment allowing maturation of follicles thereby restoring ovulation.Majority of the participants in PCOS (62%) and non PCOS 24% groups were reported to be consuming fast food more than 3

days in a week. It was observed in our study that participants with more frequent consumption of fast food have greater risk of development of PCOS. Fast food usually contains high amounts of saturated fats and steroids frequent consumption of fast food and irregular eating habits leads to fluctuations in glucose levels, insulin resistance and increases hormonal imbalance such as hyperandrogenism adding to the risk for development of PCOS (Begum *et al.*, 2017).We observed that participants having BMI >30 are at more risk for development of PCOS compared to participants with normal BMI. This is probably because of aggregation of factors that were discussed earlier that is lack of physical exercise and unhealthy diet habits. Also it was observed that obesity augments the severity of hyperinsulinemia in women with PCOS.

In our study, family history of PCOS, obesity and fast food diet habits are found to be the predisposing factors for development of PCOS. The risk of PCOS increases with presence of one or more identified predisposing factors. Most of the factors tested as predisposing factors in our study are interlinked to each other and are mostly modifiable.

III.ASSESSMENT OF METABOLIC SYNDROME AMONG STUDIED GROUPS

TABLE 1- GROUPING OF NORMAL AND PCOS SUBJECTS ACCORDING TO THEIR BMI

Parameter	**G1Normal women with BMI18.5-24.99 n = 10**	**G2 PCOS women with BMI 25-29.9 n = 11**	**G 3PCOS women with BMI >29.9 n=10**	**G1 vs. G2 P value**	**G2 vs. G3 P value**	**G1 vs. G3 P value**
Age	24+4.3	26.09+4.60	24.72+4.43	.586	.141	0.056
Weight in Kg	51+4.18	61.36+4.37	72.4+3.13	.001	.000	0.001
Height in m^2	2.31+0.12	2.29+0.10	2.31+0.10	.619	.682	0.813
BMI	21.75+2.11	26.71+2.33	31.23+1.29	.001	.000	0.001

The BMI of study participants both in PCOS and non-PCOS groups was calculated and further categorized into normal (BMI 18.6 – 24.9 kg/m2), overweight (BMI 25-29.9 kg/m2) and obese (BMI 30 – 40 kg/m2) following World Health Organization criteria.Table – 1 indicates that the omen in Group 2 and group 3 showed highly significant difference in the mean values of weight, BMI, ($p < 0.01$). In this study, compared with normal subjects, PCOS subjects of both the groups showed a higher BMI.Obesity is associated with abnormal function of hypothalamic-pituitary-ovarian axis, and can affect the occurrence and progression of PCOS on multiple aspects. High BMI can affect both pathophysiology and clinical manifestations of POCS.Previous studies have suggested that PCOS manifested itself after a significant weight gain and that obesity was strongly associated with hyperandrogenemia already in adolescence with a higher risk of PCOS and infertility problems in later life (Gambineri*et al*., 2012).

We observed that obese participants are at more risk for development of PCOS compared to participants with normal BMI. This is probably because of aggregation of factors that were discussed earlier that is lack of physical exercise and unhealthy diet habits. Also it was observed that obesity augments the severity of hyperinsulinemia in women with PCOS. For this reason, exercise therapy is the mainstay of PCOS management.

Table 2- COMPARISON OF LIPID PROFILE IN STUDIED GROUP

Parameter	G 1 normal women with BMI 18.5-24.99 n = 10	G 2 PCOS women with BMI 25-29.9 n = 11	G 3 PCOS women with BMI >29.9 n=10	G1 vs. G2 p value	G2 vs. G3 p value	G1 vs. G3 p value
Cholestrol	158.80 ±9.90	196.20±26.05	232.10 ± 15.13	0.001	0.001	0.001
Triglycerides	103.50± .72	144.90±11.63	155.20±10.39	0.001	0.007	0.001
LDL	95.30± 9.03	119.70±11.96	134.60 ± 9.93	0.001	0.001	0.001
HDL	60.50±12.66	32.90 ± 6.12	26.20 ± 4.39	0.001	0.002	0.001

In the present study we found that the mean values of the lipid profile components and were significantly higher in the PCOS group as compared to healthy women except HDL which was lower in PCOS. The mean values of lipid profile parameters were raised in overweight-obese PCOS cases as compared to normal subjects except for HDL which was found to be even lower in overweight and obese PCOS.This clearly indicatesPCOS and metabolic syndrome shares some clinical features and their consequences. Because of that PCOS patients are at higher risk of cardiovascular disease. The metabolic syndrome occurs more frequently in PCOS women than among age-matched women in the general population It is estimated that the prevalence of metabolic syndrome among PCOS women is 43 % - 46 % (Ollila*et al*., 2017). According to Pasquali*et al* (2006) healthy women with normal body weight and preserved insulin sensitivity, the adipocytes release small amounts of free fatty acids (FFAs) and have a normal activity of the lipoprotein lipase (LPL). In obese women, there is an increased production of FFA and decreased activity of LPL as a result of the prominent insulin resistance. The high androgen levels additionally worsen the disturbances in the lipid metabolism The levels of triglycerides/ HDL-C ratio may be used as a simple metabolic marker to identify overweight individuals who are insulin-resistant.

Our results are consistent with those of other researchers who showed a positive correlation between BMI and the development of PCOS. According to Swetha*et al*. (2013) higher TC, TGs, LDL-cholesterol and very LDL cholesterol in PCOS women in comparison with control may confirm a positive association between BMI with dyslipidaemia in PCOS women.Silfen*et al* (2003) and Savic*et al* (2006) also showed that LDL and HDL levels in women with PCOS are affected by their weight so that, obese women had higher LDL and lower HDL levels than lean women. They argue although dyslipidemia is one of the problems in women with PCOS but cannot be considered as a manifestation of this syndrome. We found that the prevalence of metabolic syndrome increased with increasing BMI.The mean BMI in those with metabolic syndrome was significantly higher than those without metabolic syndrome. Earlier studies have suggested that certain phenotypes of PCOS women have a higher risk of developing metabolic syndrome and consequently long-term risk of cardiovascular disease/type 2 diabetes mellitus (**Shroff***et al*., 2007).

CONCLUSION

The results indicate that metabolic disorders in women with PCOS are worsened by concomitant obesity. Obesity, metabolic disorders and PCOS are associated. Obesity exacerbates metabolic disorders in women with PCOS. This study highlights the importance of preventing obesity during the management of PCOS. Therapeutic intervention combined with lifestyle modification may provide better treatment for PCOS.

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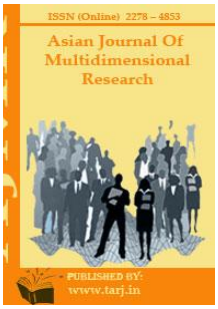

Asian Journal of Multidimensional Research (AJMR)

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FORMULATION AND STORAGE STABILITY OF RTS PUNCH BEVERAGES PREPARED WITH LACTOFERMENTED CARROT JUICE AND LIME JUICE

M.Mohanapriya*; Lalitha Ramaswamy**

*Guest Lecturer (Former),
Department of Home Science,
Mother Teresa Women's University Research & Extension Centre,
Coimbatore, Tamil Nadu, INDIA
Email id: priyatarun2010@gmail.com

**Associate Professor & Head (Retd),
Department of Nutrition & Dietetics,
PSG College of Arts & Science,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

*RTS beverages were prepared using fermented carrot juice and lime juice. Carrots were fermented with **Lactobacillus plantarum** at ambient temperature with 2 percent bacteria and 2.5 percent salt for 24-48 hours. Juice of the fermented carrots was combined with lime juice in 10:90 (C_1 and CV_1) and 20:80 (C_2 and CV_2) ratios. The beverages were prepared as per FPO specifications and organoleptically evaluated. The TSS value of RTS beverages ranged between 14^OB to 21^OB.An acidic pH was maintained throughout the study period which preserved the RTS beverages for 60 days. There was no microbial growth in control samples prepared with unfermented carrot juice up to 30days of storage, but microbial growth was observed thereafter. The total number of viable colonies in the RTS beverages prepared with fermented vegetables did not show marked difference. It also showed that the total colony count increased slightly with the increase of storage period. The RTS punch beverage prepared with lactic acid fermented vegetables have a good shelf life up to 60 days of storage in refrigerated conditions without the addition of artificial preservatives and can be a healthy alternative to the synthetic ones which are devoid of nutritional value.*

KEYWORDS: *RTS Beverages, Carrot, Fermentation, Lactic Acid, Shelf Life*

INTRODUCTION

RTS punch beverages have been increasingly gaining popularity throughout the country due to their health and nutritional benefits, apart from pleasant flavour and taste. Fruit based RTS punch beverages are not only rich in essential minerals, vitamins and other nutritive factors but also are delicious and have a universal appeal. Punches have been prepared with different combinations of fruit juices. However, the concept of preparation of punches with vegetable and fruit juice combination is not yet known. The acid content of vegetables is low. This can be increased by fermenting the vegetables using bacteria. It is also quite a challenge to prepare RTS beverage without the addition of chemical preservatives and colouring. Therefore preparation of RTS using fermentation as a method of preservation in which the high acid content of the carrot pulp replaces the need for additional citric acid has been studied.

The study was planned with following objectives:

• To study increase the acidity of carrots by fermentation with lactic acid bacteria.

• To formulate RTS punch using lime juice and lactic acid fermented carrot.

• To analyse the organoleptic acceptability of the products.

METHODOLOGY

Procurement of Raw Materials

The raw materials used in the preparation of RTS punch beverages were carrot and lime and other ingredients including sugar, water and salt. Species of lactic acid producing bacteria were used for fermentation. The bacterial species were obtained from MTCC (Microbial Type Culture Collecting Centre) Chandigarh, India. The bacterial species namely *Lactobacillus plantarum* (1407) were obtained in a lyophilized form. They were sub cultured in specific media and confirmed using standard microbiological and biochemical tests and used for the present study.

Preparation of MRS Broth and Activation of Bacteria

MRS (De Man, Rogosa and Sharpe) broth was prepared as per the standard procedure given by MTCC. The bacteria were grown in specific media and confirmed using standard microbiologial and biochemical tests. The MRS broth for ***Lactobacillus plantarum*** is shown in Plate 1.The procured cultures were first activated in MRS broth. The slants (Plate 2), stored under refrigerated conditions (4-8^{o}C) were first aseptically transferred to MRS broth and incubated for 24-48 hours at 32-37^{o}C (Sharma, Joshi and Lal, 2008). As per the procedure followed by Ray and Bhunia (2008), controlled or pure culture fermentation was carried out in the present study by growing the microbial species associated with this fermentation in large volume in the laboratory and then added to the raw material at a rate of 2%.

Fermentation of Carrots

Carrots were washed and cleaned thoroughly by scrubbing to remove the adhering sand/mud and washed in running water and finally immersed in warm sterilized water for 15 minutes to kill the soil bacteria if any. Then the external skin was peeled and carrots were shredded and mashed to speed up the fermentation. Most of the vegetables can be fermented naturally when kept in brine solution for sufficient time at appropriate temperature (Pederson, 1979) and (Vaughn, 1985). The mashed carrots were mixed with dry salt (2.5%), and inoculated with *Lactobacillus plantarum* at the rate of 2 percent ($6x10^{4}$CFU/ml). The fermentation was carried out in aerobic condition by covering the

vessel using a muslin cloth for 24-48 hours to produce the acidity (Figure 1).The acidity of the fermented carrots was checked after 24 hours using a pH meter. The desirable pH is 4.5 to 5.0. Acidity acts as a preservative here.

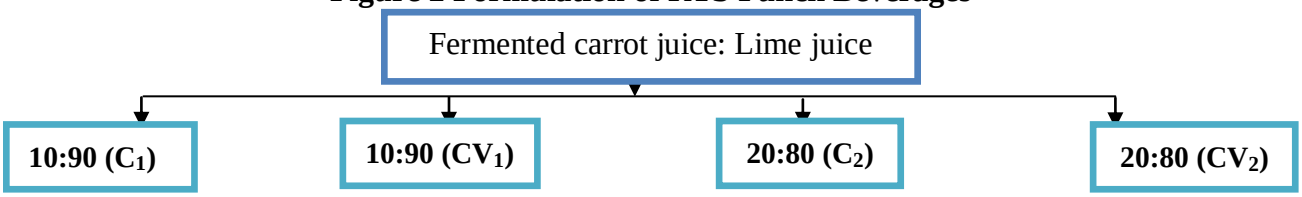
Formulation of RTS punch beverages

Fresh lime juice was prepared by cutting the lime into halves and the juice was extracted using a juice extractor similar to the study by Nagpal and Rajyalakshmi (2009)on Quality and Storage of RTS punch beverages from Bael and Citrus Fruit Blends. The RTS punch beverage was prepared by using lactic acid fermented carrot juice, freshly prepared lime juice, water, and sugar as per FPO specifications (Gridharelal *et al.*,1998).Fermented carrot juice and lime juices were mixed in 2 different proportions i.e., 10:90 and 20:80 respectively (Figure 2). The sugar syrup was prepared separately up to the boiling stage and strained through a muslin cloth and added after cooling to get the desired TSS of 14^{o}B to 20^{o}B. The quantity of the sugar syrup to be added was calculated previously to get the desired brix. The combined fermented vegetable juices and fruit juice were then mixed with the sugar syrup in the correct quantity to get the RTS beverage. Also a RTS beverage was prepared with unfermented carrot juice and lime juice with 10:90 and 20:80 combinations as a standard for comparison. Sharma *et al.*, (2008) reported in their study that the guava and papaya juice/pulp were blended in the ratios of 100:00, 90:10, 80:20, 73:30, 60:40 and 50:50 respectively and also Kausar *et al.*, (2012) in cucumber melon functional RTS beverage.

Bottling of RTS Punch Beverages

The beverages were filled in pre sterilized glass bottles of 200ml capacity by leaving one inch head space and crown corked and pasteurized for 30 minutes in boiling water bath followed by cooling. The bottles were stored under refrigerated conditions (Barwal *et al.*, 2006, Saravanakumar and Manimegalai, 2002 and Kaushal *et al.*, 2009)

Figure 2 Formulation of RTS Punch Beverages



(C_1) 10:90 – Unfermented Carrot Juice: Lime juice; (CV_1) 10:90 – Fermented Carrot Juice: Lime Juice

(C_2) 20:80 – Unfermented Carrot Juice: Lime Juice; (CV_2) 20:80 – Fermented Carrot Juice: Lime Juice

Analysis of RTS Punch Beverages

The pH and microbial analysis were determined in the prepared RTS punch beverages.

PH:

The pH is a measure of the active acidity which influences the flavour or palatability of a product and affects the processing requirements. The pH of the medium has a profound effect on the heat resistance bacterial spores which becomes maximum at pH values between 6 and 7 (Ranganna, 1986). Fruit products are being effectively preserved at low pH (Sidhu, 1998). pH was determined in a digital type pH meter (Hart and Fischer, 1971).

Microbial Analysis

Contamination of foods by mould or bacteria is common. Hence their presence in the finished product is considered unfit for consumption (Ranganna, 1986). The microorganisms in processed foods are sometimes inherent to the external environment condition. It is virtually impossible to process the foods to sterile products without altering the organoleptic changes in many cases. The food processing industries have to keep the number of microorganisms below or at the permissible level (Suvarna and Bobby, 2005).

Microbial analysis was carried out by total plate count (TPC). Standard plating in nutrient agar was carried out, which is called as total plate count method. The total microbial load (TPC) of RTS beverage was determined in nutrient agar media according to the method given by Harrigan and McCance (1966), soon after preparation (SAP) and at 60 days of storage.

RESULTS AND DISCUSSION

PH:

TABLE 1: PH VALUES OF RTS PUNCH BEVERAGES

RTS Punch Beverages	pH	
	SAP	60 Days
C_1	4.3	3.8
CV_1	4.2	3.6
C_2	4.2	3.6
CV_2	4.2	3.7

The acidity of the fermented carrots was checked after 24hours at 6 hour interval. Acidity acts as a preservative here. Pandey and Singh (1999) reported that high acidity in guava pulp is a desirable character as it provides better storage quality. On completion of fermentation (when no further increase in acidity was observed), carrot fermentation was stopped by extracting the juice from it (Sharma and Joshi, 2007).In the present study, when the acidity of the fermented carrots, reached pH 4.5 fermentation was terminated. The juice was strained and filtered through a muslin cloth to obtain clarified, clear juice as per the procedure followed by Nakadi *et al*.,(2000) and Harman and Amutha, (2007) in their study on RTS punch beverages and carbonated and sapota beverages respectively. The pH values of RTS punch beverages are given in Table 1.

An acidic pH was maintained throughout the study period which helped in the preservation of RTS punch beverages as the pH of all the RTS punch beverages decreased on60 days of storage. Decrease in pH might probably due to growth of microorganisms or conversion of lactose to lactic acid due to mild fermentation and formation of other organic acid by ascorbic acid inherently present in the fruit during the storage. Decrease in pH was also recorded by Hussain *et al.*, (2011) when apple and apricot blended juices preserved with sodium benzoate were stored at refrigeration temperature. According to them, decrease in pH may be due to conversion of pectin into pectinic acid, which increases acidity and decreases pH of the juice. Shakoor *et al.*, (2014) have recorded in their study on strawberry juice with a maximum decrease in pH content. Balaji and Prasad (2014) have stated that the pH has great importance to maintain shelf stability; pH can also influence the flavour and processing requirements of the kinnowaonla RTS. Jan *et al.*, (2012) have reported that there was a significant decrease in pH during storage**.**

There was a reduction in pH of all the RTS punch beverages on storage. The reduction was significant in both combinations of RTS punch beverages. This decrease in pH acted as a

preservative in the RTS punch beverages which have been prepared without the addition of citric acid or any artificial preservatives.

Microbial Analysis

TABLE 2: MICROBIAL ANALYSIS OF RTS PUNCHES BEVERAGES

RTS punch beverages	Microbial Colonies (CFU/ml)					
	SAP	15 Days	30 Days	45 Days	60 Days	75 Days
C_1	-	-	-	$0.11 X10^3$	$0.15 X10^3$	$10.9 X10^3$
CV_1	$0.03X10^3$	$0.07 X10^3$	$0.12X10^3$	$0.17 X10^3$	$0.19 X10^3$	$1.4X10^3$
C_2	-	-	-	$0.12 X10^3$	$0.17 X10^3$	$1.7X10^3$
CV_2	$0.09 X10^3$	$0.15 X10^3$	$0.17 X10^3$	$0.20 X10^3$	$0.21 X10^3$	$2.3 X10^3$

***CFU – Colonies Forming Unit**

The control samples did not have any microbial load up to 30 days of storage period. The microbial growth occurred there after upto 75 days of storage, although they were within the acceptable safe limits. In the samples prepared with fermented vegetables, the microbial load was observed from 0^{th} day (soon after preparation) which could be due to the probiotic microorganisms added during vegetable fermentation. The total number of viable colonies in the RTS punch beverages prepared with fermented vegetables did not show marked difference. It also showed that the total colony count increased slightly with the increase of storage period. The results are in concurrence with those of Yadav *et al.*, (2013). The increase in microbial load after 45 days of storage was negligible and safe for consumption, as also echoed by Nagpal and Rajyalakshmi (2009), in their study on RTS punch beverages from bael and citrus fruit blends. This shows that the acid environment that was maintained as a result of fermentation has reduced contamination by other microbial flora. Since in the present study all these safety precautions were taken care of, the increase was minimum in the RTS punch beverages upto 60 days.

However at 75 days of storage, a marked increase in microbial load was observed in control samples which could be due to the addition of unfermented carrot juices. This explains the reason for terminating the storage of the prepared RTS punch beverages on the 75^{th} day. The RTS punch beverage prepared with lactic acid fermented vegetables have a good shelf life upto 60 days of storage in refrigerated conditions without the addition of artificial preservatives.

CONCLUSION

The RTS punch beverages prepared with lime juice and lactic acid fermented carrots had a good shelf life without the addition of artificial preservatives and acid. Thus it can be used to replace the synthetic beverages which are devoid of nutritional value. Combination of fruit juices with probiotics make it complementary and alternative to health formulae.

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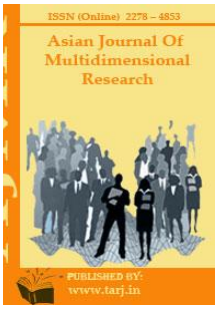

Asian Journal of Multidimensional Research (AJMR)

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EVALUATION OF NUTRIENT CONTENTS OF PUMPKIN SEED FLOUR INCORPORATED FLAVOURED DRINK

Mohanapriya Manraj*; Vidhya Muthusamy; Geethanjali Santhanam***; Saratha sathappan******

*Department of Home Science,
Mother Teresa Women's University,
Tamil Nadu, INDIA

**Department of Home Science,
Mother Teresa Women's University,
Tamil Nadu, INDIA

***Assistant Professor,
Department of Home Science,
Mother Teresa Women's University,
Tamil Nadu, INDIA
Email id: rsgeethanjali@gmail.com

****Department of Home Science,
Mother Teresa Women's University,
Tamil Nadu, INDIA

ABSTRACT

Pumpkin seeds also known as pepitas are small, flat, green, edible seeds. The pumpkin (Cucurbita moschata) is an annual dicotyledonous vegetable; belonging to the Cucurbitaceous family. The word "pepita" is consistent with this heritage, since it comes from Mexico where the Spanish pharse "pepita de calabaze "means "little seed of squash". Pumpkin seeds were a celebrated food among many Native American tribes, who treasured them both for their dietary and medicinal properties. The study was designed to formulate pumpkin seed flour incorporated flavoured drinks and to assess the nutrient content of the formulated flavoured drink by bio chemical methods. Nutrients such as moisture, protein, fat, total carbohydrate, phytic acid tannin were assessed by standard methods. The nutrient content of pumpkin seed flour incorporated flavoured drink contains results reveal that 100 ml of contains energy 149.2 kcal, 15g of carbohydrate, 13.3g of protein, 4g of fat, and 7g of moisture. The phyto chemical estimation was done by analysis which was carried out in phytic acid 3µg, tannin estimated analysed negative result.

KEYWORDS: *Pumpkin Seeds, Nutrient Content, Flavoured Drink*

INTRODUCTION

Pumpkins (*Curcurbit spp*) belonged to Cucurbitaceae family, widely cultivated fruit with good quality of nutrients and potential health benefits. Its rich in vitamin-A with low calorie and also provide flavonoids phenolic antioxidants such as lutein, xanthin, and carotenes. They vary in colour, shape, and size with different weights from 4-6 kg to over 25 kg. Golden nugget pumpkins are orange or yellow in colour, some varieties have pale green, white, and gray. Yellow-orange coloured pumpkins are rich source of carotenoids with fleshy nature.

The seeds of pumpkins are generally considered as a waste element and usually discarded. The seeds of pumpkins are discovered as a good source of proteins, minerals, fibres, poly unsaturated fatty acids and phytosterols. The nutrient content of pumpkin seeds revealed 33.48 per cent of proteins, 28.68 per cent of carbohydrate, 30.66 percent lipid, 3.07 percent fibre content, 3.98 per cent ash content and 524.58 kcal of energy. The seeds are beneficial effects on immunity function, blood glucose regulation, cholesterol regulation and other health benefits. Food incorporation will continue to be an important tool, not only to treat or prevent specific nutritional deficiencies , but also to promote a general state of well-being in different populations, and possibly to prevent certain chronic diseases. The identification and development of incorporation agents that will guarantee product quality and high bioavailability are technological and scientific challenges. The pumpkin seeds are considered as a waste material and also discarded in the food customs. This type of attitude may be occurring due to ignorance on nutrient potentiality of pumpkin seeds. Hence the present study aimed to value added flavour drink from Pumpkin seed, evaluation of physico chemical properties and organoleptic evaluation and the objectives of the study are to formulate pumpkin seed flour incorporated flavoured drinks, to assess the nutrient content of the formulated flavoured drink by bio chemical methods and to evaluate the acceptability of the formulated flavoured drink by organoleptic evaluation

MATERIALS AND METHODS

Collection of raw materials

The seeds of pumpkins are collected from the local market in Dindigul and Madurai region. The seeds were dissected from the vegetable, and foreign materials were removed. The pumpkin seed were extracted, washed, sundried, and roasted and then it was manually decorticated. The decorticated seeds were powdered by electric mixer. The flour was packaged in an air –tight plastic container and kept in refrigerator until used.

Development of pumpkin seed flour incorporated flavoured drink

The preparation method and ingredients for pumpkin seed incorporated flavoured drink as follow.

Raw Ingredients	Amount
Pumpkin Seed Flour	30 g
Cow's Milk	100 ml
Jaggery	60 g
Saffron	1g
Cardamon	1g

- Boiled whole milk and jaggery, pumpkin seed flour, safflower, cardomom powder was added.
- Next step flavoured added 2 gram cardamom powder, one drop of vanilla essence.

- The contents were blended thoroughly in a mixer.
- The pumpkin seed flour health drink was served chill.

Estimation of nutrient analysis

The nutrient estimation analysis was conducted to estimate the nutrient content of the incorporated flavoured drinks. The nutrients such as carbohydrate, protein, fat, moisture, tannin, phytic acid, were estimated.

S.NO	Parameter	Method	Reference
1.	Moisture	Oven drying	AOAC (1995)
2.	Protein	Lowry's method	Hart and Fisher (1971)
3.	Fat	Felican Equipment	Hart and Fisher (1971)
4.	Total Carbohydrate	Anthrone Method	Sadasivam and Manickam(1996)
5.	Phytic acid	Calorimeter	Sadasivam and Manickam(1996)
6.	Tannin	Price method	Price (1978)

Results

The nutrient value might be changed during processing. Heat processing techniques affects the heat sensible nutrients. The developed products such as sample analysed for its nutrient contents. The nutrients such as carbohydrate, protein, fat, moisture, phytic acid, tannin were estimated by various biochemical techniques. The results flavour drink the analysis were presented in the following Table

Estimated Value of Pumpkin seed flour incorporated flavoured drink

Nutrient	Amounts
Energy	149.2 Kcal
Carbohydrate	15 g
Protein	13.3 g
Fat	4 g
Moisture	7g

The above table results reveal that 100 ml flavoured drink (pumpkin seed flour incorporated flavoured drink) contains energy 149.2 kcal, 15g carbohydrate, 13.3g protein, 4g fat, and 7g moisture content present.

The results found that (pumpkin seed flour incorporated flavoured drink) contain excellent sources of energy 149.2 kcal, rich source of carbohydrate 15 g than other nutrient.

Phyto chemicals	Amount
Phytic acid µg	3
Tannin mg	Negative

The tannin result was negative in developed product (pumpkin seed flour incorporated flavoured drink). 3µg of phytic acid present in pumpkin seed flour flavoured drink.

According to the study Glew (2006) on a dry weight basis, pumpkin seed contained 58.8% protein and 29.8% fat. However, the lysine score of the protein was only 65% relative to the FAO/WHO protein standard. The pumpkin seed contained useful amounts of linoleic (92 µg/g dry weight) and the following elements (on a µg per g dry weight basis): potassium (5,790), magnesium (5,690), manganese (49.3), zinc (113), selenium (1.29), copper (15.4), chromium (2.84), and molybdenum (0.81), but low amounts of calcium and iron. Except for potassium (5,573 µg/g dry weight) and chromium (2.88 µg/g dry weight).

Murkovic (1996) stated that Pumpkin (*Cucurbita pepo* L.) seed oil is a common salad oil which is produced in Slovenia, Hungary and the southern parts of Austria. It is dark green and has a high content of free fatty acids. The seed itself can be eaten. Due to its colour and the foam formation, the oil cannot be used for cooking. The content of vitamin E, especially-tocopherol is very high. The oil content of the pumpkin seed is about 50%. The variability in the oil content is very high resulting from a broad genetic diversity. Thus a breeding programme for increasing the oil productivity is very promising. The four dominant fatty acids are palmitic, stearic, oleic and linoleic acids. These four fatty acids make up 98±0.13% of the total amount of fatty acids, others being found at levels well below 0.5%.

The concentrations of α-tocopherol and γ-tocopherol in the fresh dried seeds are 37.5 and 383 μg/g, respectively. The concentration of the tocotrienols is about one third of the corresponding tocopherols. The initial concentration of the total sterols (1710 μg/g) increases to 1930 μg/g (Siegmund, 2004).

CONCLUSION

The present study concluded that the pumpkin seed flour incorporated flavoured drink contain richest source of carbohydrate, protein, fat. The nutrient content and sensory acceptance was higher in pumpkin seed flour incorporated flavoured drink than the compared other commercial flavoured drink. The study revealed that processed pumpkin seed flour incorporated drink improve the nutrient content of the flavoured drink.

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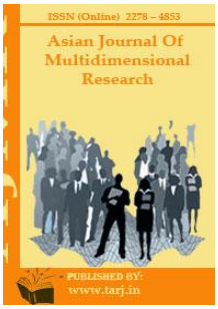

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EVALUATION OF NUTRITIONAL AND MICROBIOLOGICAL QUALITY OF STREET FOODS IN COIMBATORE DISTRICT

Janani Tamilvanan*; Anandhi Narain**

*Department of Nutrition and Dietetics,
PSG College of Arts and Science,
Coimbatore, Tamil Nadu, INDIA
Email id: janani@geneobe.com

**Department of Nutrition and Dietetics,
PSG College of Arts and Science,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Street foods have significant nutritional implications for consumers, as eating a combination of street foods do provide the consumer adequate opportunity to meet his or her daily nutritional requirements at an affordable price. The present study was undertaken to evaluate the safety, nutritional and microbial quality aspects of street foods. Various ingredients ad he food samples at different stages of preparation were analysed microbially. Results revealed that water and the food samples had high microbial counts. Fried mushrooms kept for long hours on storage or display showed more bacterial growth with time. In contrast the samples collected immediately after frying showed low bacterial counts. Raw mushroom and chopped onions showed significant bacterial load. Ten commonly consumed street foods were subjected to microbial examination. Total plate count, fungal count, presence of salmonella and E.coli were determined. Highest bacterial load was recorded in fish fry (9.1 X 10 cfu/g) and chilly mushroom (8.4 X 10 cfu/g). Salmonella was identified in egg bonda and E. coli in kuska rice, fish fry and tandoor chicken.

KEYWORDS: *Street Foods, Nutritional and Microbiological Quality, Food Safety, Bacterial Load*

INTRODUCTION:

Street foods are defined as "ready to eat foods" and beverages prepared and sold by vendors and hawkers especially in streets and other public places (FAO, 2002). In India, where street foods are gaining overwhelming momentum, equally strong efforts with broader dimensions are needed to explore the safety of street food establishments (Chandrasekar *et* al.2003). These foods mostly satisfy the people serving specially to the taste of the consumer, with little attention bestowed on hygiene, food safety or nutritional aspects (Bhat, 2003).

Studies on street food in developing countries have shown a high microbial count and are commonly contaminated with pathogens such as E.coli, Salmonella, Shigella, vibriocholerae and staphylococci which are responsible for serious food poisoning outbreaks (Bryan et al. 1992). It is only through training and subsequent monitoring of the situation that street food vendors could be integrated into and considered a responsible part of city's food supply system. The objectives of the study were to determine the nutritive value of the selected street foods and to assess the microbiological quality and safety of street foods.

METHODOLOGY:

Five busy areas of Coimbatore were selected. Number of outlets in each area varied from a minimum of five to a maximum of fifteen totalling up to fifty. The study population selected comprised of food vendors and the street food consumers. A pilot study was conducted randomly to collect base line information about the vendor's lifestyle, vending operations and consumption pattern of the consumers visiting the outlets. This was done to standardize the interview schedule and also to structure the conduct of the final study. Ten different food items sold in the outlets were collected for their nutritive value and microbial analysis. Two samples from each selected outlet were collected based on the different method of cooking/ preparation. One portion of all the samples selected were analysed for their energy, protein and fat content using standard procedures (NIN, 1983).

Microbiological Examination of the selected food items:

Being ubiquitous in distribution, micro-organism can enter the food chain from various sources during different stages of their processing, storage and serving. Besides by providing a suitable nutritional and physical environment for growth and multiplication of micro- organisms, the food possesses the inherent capacity to sustain them in rare numbers (Rath, 2001).

- **Total plate count:** This test is used for determining the total number of viable bacteria in street foods which is indicative of the sanitary conditions in which these foods are prepared.
- **Identification and counting of coliform bacteria:** This test was done for assessing the adequacy of sanitation. E. coli is the only valid index organism, which indicates processing and/ or post process contamination by raw materials, dirty equipment or poor hygienic handling.
- **Fungal count:** The presence of yeasts and moulds is indicative of improper storage of foods.
- **Salmonella count:** This was used to determine the salmonella group of bacteria which at levels of $10^{5/g}$ is highly suggestive of food poisoning to occur.

RESULTS AND DISCUSSION:

Microbiological quality of Street foods

Food can become microbiologically hazardous to the consumer when the principles of hygiene and sanitation are not met or when it becomes contaminated by pathogens from humans or from the environment during production, processing or preparation (Bryan et al, 1992).

Routine examination of foods for a range of pathogenic microorganisms is impractical. In order to assess the microbiological safety from food borne pathogens, indicator organisms are used. The following indicator organisms have been used in the present study to determine the conditions to which the food stuffs were exposed to during handling.

- Total plate count
- Enteric Indicator bacteria
- E.coli
- Salmonella
- Yeasts and moulds

TABLE.1 BACTERIAL COUNTS OF DIFFERENT STREET FOODS

S.No	Food Sample	Standard Plate Count (Cfu/g)
1.	Bhel Puri	1.4×10^5
2.	Chilly Mushroom	8.4×10^5
3.	Tandoori chicken	4.8×10^5
4	Idiyappam	2.5×10^5
5.	Idly	1.3×10^5
6.	Panipuri	1.8×10^5
7.	Fish fry	9.1×10^5
8.	Kuska rice	6.4×10^5
9.	Egg bonda	2.1×10^5
10.	Vegetable noodles	2.3×10^5

The highest plate count for different products were as follows, chilly mushroom (8.4×10^5), fish fry (9.1×10^5), Kuska rice (6.4×10^5). Average standard plate count is 4.0×10^5 cfu/gm. High counts in foods indicate contaminated raw materials and also indicate unsuitable time/ temperature storage conditions.

Test for pathogens:

TABLE.2 TEST FOR PATHOGENS

S.No	Food Sample	E.coli	Salmonella	Fungus
1.	Bhel Puri	-	-	+
2.	Chilly Mushroom	-	-	-
3.	Tandoori chicken	+	-	+
4	Idiyappam	-	-	-
5.	Idly	-	-	-
6.	Panipuri	-	-	+
7.	Fish fry	+	-	-
8.	Kuska rice	+	-	+
9.	Egg bonda	-	+	-
10.	Vegetable noodles	-	-	-

It can be interpreted that E. Coli have been widely accepted as indicators of faecal contamination, its presence indicates the possible presence of pathogens of enteric origin. However substantial numbers of E.coli in foods such as Tandoor chicken, fish fry and kusa rice suggested lack of hygiene and cleanliness in handling and improper storage.

The presence of Enterobacteriaceae or coliforms indicate inadequate processing and/or post process recontamination due to cross contamination by raw materials, dirty equipment or poor hygienic handling, microbial proliferation, which could have allowed multiplication of a wide range of pathogenic and toxigenic organisms.

TABLE 3 MICROBIAL LOAD IN DIFFERENT TYPES OF STREET FOODS

S.No	Food Sample	Standard Plate Count (cfu/g)	E.coli (cfu/g)	Salmonellacount (cfu/g)	Fungal Count (cfu/g
1.	Bhel Puri	1.4×10^5	-	-	0.5×10^5
2.	Chilly Mushroom	8.4×10^5	-	-	
3.	Tandoori chicken	4.8×10^5	1×10^5	-	0.8×10^5
4	Idiyappam	2.5×10^5	-	-	-
5.	Idly	1.3×10^5	-	-	-
6.	Panipuri	1.8×10^5	-	-	0.1×10^5
7.	Fish fry	9.1×10^5	1×10^5	-	-
8.	Kuska rice	6.4×10^5	4×10^5	-	1.2×10^5
9.	Egg bonda	2.1×10^5	-	5×10^5	-
10.	Vegetable noodles	2.3×10^5	-	-	-

By comparing the bacterial counts in the street foods to the specifications, we could infer that fish fry was the poorest item from microbiological point of view, indicating inadequate cleaning during preparation and unhygienic conditions in which these foods were prepared and they kept open for a long time. Tandoori chicken was also poorest in microbial quality. The vendors dipped their hands in the vessel for rolling the chicken in the batter, thus contaminating food.

CONCLUSION:

Street foods are a source of inexpensive, convenient and nutritious food, providing significant amount of calories, protein and fat. But they raise concern with respect to the potential of causing hazards due to microbiological contamination, adulterants and poor environmental sanitation and hygiene. The hazardous behaviour identified in the present study included poor handling practices, poor cleaning practices of stalls and utensils, unhygienic environmental condition and personal hygiene of the food handlers and microbial contamination of the selected food samples.

Simple precautions like keeping cooked food and raw food separate and covered, minimizing handling especially with bare hands, keeping the surrounding of the stall clean, holding foods at appropriate temperatures can ensure safe food delivery to the consumers. Thus, food handlers need to understand the importance of personal hygiene, cross contamination and environmental sanitation.

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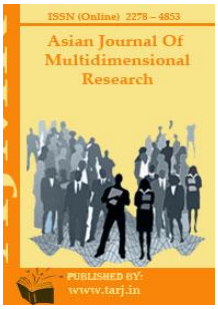

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EVALUATING THE EFFICACY OF FOOD RECORDING METHOD IN COMPARISON WITH INSTAGRAM VISUAL FOOD DIARY AMONG YOUNG ADULTS

Yashetha. P; Kalpana.C A****

*PG Scholar,
Dept. of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: yashetha.p @gmail.com

**Associate Professor,
Dept. of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Smartphone technology, given its widespread uptake and pervasiveness, has provided new opportunities for Nutrition Research including dietary management, intervention tools. To date, applying technology in dietary assessment has tended to focus on introducing improvements relating to data entry and mode of administration (e.g. mobile and web-based tools), improvements relating to coding and analysing food intake and augmentation of data collection (e.g. use of wearable devices/cameras). Image-based dietary records are emerging as a novel method for dietary assessment, and may be able to address some of the participant burden associated with traditional prospective methods such as weighed records. The current spread of mobile phone–embedded cameras offers new opportunities for recording food intake. Moreover, the act of taking pictures of food consumed may enhance visual consciousness of food choice, quantity and dietary habits. Instagram is a photo-sharing mobile application that allows users to take pictures, apply filters to them, and share them on the platform itself, as well as other platforms like Facebook and Twitter. Logging meals on Instagram – a visually driven social media platform is not only a more enjoyable way to document a diet, it also keeps people honest and opens up an opportunity for positive reinforcement from other. A picture is worth a thousand words and can be much accurate.

KEYWORDS: *Smartphone Technology, Food Intake, Instagram, Visual Consciousness.*

1. INTRODUCTION

Image-based dietary records are emerging as a novel method for dietary assessment, and may be able to address some of the participant burden associated with traditional prospective methods such as weighed records [1]. Their use involves capturing images of food and drinks consumed in order to support paper dietary records, or to act as standalone dietary records. Smartphone features such as internet connectivity and built-in cameras support the use of this platform for collection of image-based dietary records [2].

The benefit of photos is that it's more fun to do than writing in a journal or typing words of description in an app. It's also easier to snap a photo of their plate when the people are dining out. A visual account of everything one eats in a day both in terms of volume and quality can help people spot trouble [3]. Instagram is a great tool because it is free and easy to sign up, visual, quick and mobile and is personal [4].

Instagram has captured the attention of people looking to share and find healthy living inspirations through photos and captions [5]. Hence, this relatively new social network has been growing in users everyday and novel ways of using the application have emerged. Posting the photos of food on social media, participants are likely to meet healthy eating and weight loss goals, as the platform makes dieters feel accountable and also allows them to track their consumption [6].

Individuals can record the time, location and whether they consumed meals alone or with others for each eating occasion, providing information on eating patterns and the eating environment [7].The current spread of Smart phone–embedded cameras offers new opportunities for recording food intake. Moreover, the well-documented increases in obesity and unhealthy dietary practices substantiate the need for evidence-based tools that can help people improve their dietary habits [8]. With this in view, the study was conducted to assess the socio economic and lifestyle pattern of young women (18-21 years), collect data regarding their food intake using Food Recording Method, observe their Instagram photos on food intake, calculate the actual and virtual food and nutrient intake using the Food Recording method and Instagram Visual Food Diary and evaluate the efficacy of Food Recording Method in comparison with Instagram Visual Food Diary.

2. MATERIALS AND METHODS

2.1 Formulation of questionnaire and conduct of survey

The questionnaire consists of general questions related to adolescent nutrition structured and reviewed questionnaire was used to collect the background information and to access the usage of smart phones status of the target population. Primary data on socio economic status, health status, dietary pattern, food consumption pattern and lifestyle pattern was collected using close ended questionnaire. For the purpose of primary data collection, young adults between the age group of 18-21 years were selected from the various departments of Avinashilingam Institute for Home Science and Higher Education for Women.

2.2 Data collection from food recording method and Instagram

The food record consisted of food consumed during early morning, breakfast, lunch, evening and dinner for the consecutive three days. Nutrients such as Energy, Carbohydrate, Protein, Fat, Calcium, Iron and Folic acid were calculated and compared with the RDA (Recommended Dietary

Allowances) according to ICMR guidelines 2010 to find out whether the nutrients the subjects consume is deficit or excess when compared with the RDA.

The participants selected on the basis of using smart phones (N=30) were requested to consistently record and share what they eat on Instagram instead of keeping a paper food diary. The Nutrients such as Energy, Carbohydrates, Protein, Fat, Calcium, Iron and Folic acid were calculated and compared with the RDA (Recommended Dietary Allowances) according to ICMR guidelines 2010 to find out whether the nutrients which they consume is deficit or excess when compared with the RDA. This method can encourage the participants to reflect on their food habits, which can initiate positive behavior changes [10]. In addition, the selected subjects provided feedback on the acceptability and usability of smart phones for recording the food intake.

2.3 Statistical analysis and Interpretation of data

The collected data were consolidated, tabulated and analyzed statistically using the software SPSS of version 17.0. t- Test was performed to assess the efficacy of Instagram Visual Food Diary in comparison with the food recording method on the selected participants and for the future research work. Paired t test was performed to know the difference in food and nutrient intake between Food Recording method and Instagram Visual Food Diary.

3. RESULTS AND DISCUSSION

The results of the study are discussed under the following headings

3.1 Evaluation of the efficacy of Food recording method in comparison with Instagram Visual Food Diary

3.1.1 Mean Food Intake

TABLE 1 COMPARISON OF MEAN FOOD INTAKE BETWEEN FOOD RECORDING METHOD AND INSTAGRAM VISUAL FOOD DIARY (N=30)

S.No	Food stuffs	Food Recording method	Instagram Visual Food Diary	Mean Difference	't' value * P=<0.01
		Excess or Deficit %	Excess or Deficit %		
1	Cereals	-12.27	+6.0	6.27	4.95**
2	Pulses	-42.9	+29.6	13.3	8.51**
3	Green leafy vegetables	-77.25	-67.2	10.05	16.612**
4	Roots and tubers	-16.1	-19.35	3.25	6.944**
5	Other vegetables	-19.4	-10.7	8.7	12.65**
6	Fruits	-46	-43	3	4.83**
7	Milk and milk products	-21.4	-16.51	4.89	3.34*
8	Sugars	+25.4	+16	9.4	3.94**
9	Fats and oils	+23.42	+13.31	10.11	7.94**

** - Significance at 1% level; * - Significant at 5% level

There are significant differences in the mean food intake calculation using Food Recording Method and Instagram Visual Food Diary and hence this study can be conducted in the large samples to improve the dietary intake and achieve health goals among the young adults.

3.1.2 Mean Nutrient Intake

TABLE II COMPARISON OF MEAN NUTRIENT INTAKE BETWEEN FOOD RECORDING METHOD AND INSTAGRAM VISUAL FOOD DIARY (N=30)

S.No	Food stuffs	Food Recording method	Instagram Visual Food Diary	Mean Difference	't' value
		Excess or Deficit %	Excess or Deficit %		
1.	Energy (K Cal)	+12.10	+46.61	34.51	7.073**
2.	Carbohydrates (g)	+17.24	+66.94	49.7	12.29**
3	Protein(g)	+10.18	-3.61	6.57	2.56*
4.	Fat(g)	+36.9	+34.55	2.4	0.070^{NS}
5.	Calcium (mg)	-6.10	-10.85	4.75	1.289^{NS}
6.	Iron(mg)	-7.33	-5.76	1.57	0.260^{NS}
7.	Folic acid (µg)	-25.91	-19.2	6.71	1.920^{NS}

*Significance at 5% level; **Significance at 1% level; NS-Not Significant

The findings indicated that Instagram Visual Food Diary may not present the accurate nutrient intake or nutritive value of the foods but this method will definitely help in the weight loss management programme among young adults using smart phone technology.

4. CONCLUSION

The application of Visual Food Diary may lead to greater improvement in food choices and to achieve health goals. The selected subjects reported that this method of sharing food photos helped them keep accountable towards their goals, honest about their dietary intake and encourage them to extend support to other users. The shared food photos may be an effective portable tool to help recording diet when aiming at improved dietary intake and weight loss. Accordingly, the participants stated that having a visual account of what they eat each day was helpful in managing their diet, maintain their desired behaviors and to continue to be mindful about their health. Thus it can be concluded that, accountability can be key to attain the health goals for the participants, and Instagram Visual Food Diary provides an easy portal to accomplish that.

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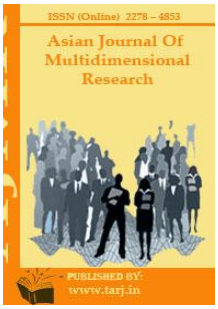

Asian Journal of Multidimensional Research (AJMR)

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EVALUATION OF FOOD AND NUTRITION SECURITY IN DIETARY SERVICES OF THE SELECTED HOSPITAL, COIMBATORE

N. Deepa Sathish*; Dr.A.Thirumani Devi**

*Assistant professor,
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

**Professor and HOD,
Department of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA

ABSTRACT

Hospital diet is an essential part of modern therapy, one among the most important supporting services in all medical treatment strategies, with the main focus on food safety and nutrition security in a hospital set up where at most care is taken in maintaining food security at the individual level in terms of providing adequate, safe, hygienic and nutritious meal to meet their nutrient demands in concern with patient's food preferences and diagnosis to prevent consequences of health problems and to lead an active and healthy life. Hence, the present study was conducted in the selected hospital which was the small footstep towards improving the dietary services and quality health care through nutrition security. It considers as the care, health, and hygiene practices in addition to understand the patients perception towards the need of food security. This study was conducted among 50 selected patients between the age group of 30-50 years of both genders and hospitalized for more than a week and taking routine hospital diet. The data regarding food security in terms food quality and quantity, food service, meal time and taste were identified by means of a questionnaire. Feedback on dietitian consultation and counseling were also given.The results showed that 59 per cent of the patients remarked the quality of solid and liquid diet served, was excellent while 20 per cent of the patients expressed that it was not upto their preference. Considering the food safety with respect to food handling and service at proper time,75.5 per cent of the patients have reported that meals were served at regular time, where as nearly 12 per cent of the patients reported that interval between meals and meal timings are not proper. It was also deduced

that 94 per cent of the patients were satisfied with the provision of adequate quantity of food and nutrients (requirements explained through dietitians) and meal served. Thirty two per cent expected the communication of dietitians should be based on the correlation between the biochemical investigations and food intake on regular basis. Though food security in terms of availing adequate quantity of food was maintained at individual level, the expectation on the food presentation and food safety in handling practices of service personnel was higher among the patients. Therefore not only the nutritional screening and follow up nutritional assessment by dietitian satisfies the patient but also the nutrition security in terms of food selection, preference and good handling practices plays a vital role in providing a good quality hospital food services with adequate education and training of food handlers.

KEYWORDS: *Nutrition security, Hospital diet, Food safety, Food handlers, Handling practices,*

INTRODUCTION

Food service in hospitals is an essential part of patient care and a fundamental factor which is an aiding recoverment. Hospital diet is an essential part of modern therapy, one among the most important supporting services in all medical treatment strategies, with the main focus on food safety and nutrition security in a hospital set up.At most care is taken in maintaining food security at the individual level in terms of providing adequate, safe, hygienic and nutritious meal to meet their nutrient demands in concern with patient's food preferences and diagnosis to prevent consequences of health problems and to lead an active and healthy life.Especially provision of preferred meals according to their diagnosis and health condition are often the highlight of a patient's day

As the health care industry is becoming more competitive and patients are becoming more discriminating about quality, the health care industry has redefined patients, recognizing them as customers (Lau and Greogire, 1998). Hospital administrator's focus on excellent services to the clients in all aspects of health care facilities especially on food as it has great impact compared to other medical treatment strategies and it has gained extra importance among the hospitalized persons. The competitive environment has forced dietitians to provide higher-quality foodservice with limited resources. Parasuraman et al (1998). Stated that, quality is "an elusive and indistinct construct" and is not an easy one to define. The American Society for Quality defines quality in two ways: "*the characteristics of a product or service that bear on its ability to satisfy stated or implied needs and a product or service that is free of defects.*" In service marketing literature, service quality is conceptualized as service meeting customers' expectations (Parasuraman et al, 1998).Considering these definitions of quality and the goals of hospital foodservice departments, hospital foodservice quality can be defined as *foodservice that meets nutritional requirements of in-patients.*

Accurate data on the dietary intakes of individuals and representative groups is needed for many reasons. Hospital food intake data facilitates analysis of a food supply, identification of food security issues and the development of hospital food policy and special food programs. Large nutrition studies need good estimates of dietary intake for ranking individuals according to their nutrient intake to ensure erroneous conclusions regarding the relationship between diet and disease are not drawn. On a smaller scale, measures of dietary intake are required for nutrition and dietetic studies linking dietary components to particular outcomes.With this view the present study is carried out with the following specific objectives in the selected private hospital which was the small footstep

towards nutrition security that considers care, health, and hygiene practices in addition to understand the patients perception towards the need of food security.

OBJECTIVES

- To provide a nutritionally balanced diet that fulfils both their physiological and psychological requirements
- To evaluate the dietary services and nutritional counselling provided to the hospitalised subjects

METHODOLOGY

a) Selection of area

A private specialty hospital in Coimbatore was selected for the study where the regular hospital diet was prepared predominantly and highest subjects receives the same along with other therapeutic diets according to their diagnosis and treatment

b) Selection of sample

Purposive sampling method was chosen to select. The data were collected among the fifty selected participants (patients) between the age group of 30-50 years of both genders who were hospitalized for more than a week and taking routine hospital diet.

c) Collection of Data

The interview method of collecting data was adopted using a questionnaire with five main category and covered the following key areas of food and nutrition security namely, (1) Food Quality and Quantity; (2) Food Service; (3) Meal Time and Taste; (4) Nutrition Counseling; and (5) Food presentation.

The data regarding food security in terms of provision of required quantity of nutrients diet with at most care and were identified by means of a questionnaire. Feedback on regular consultation of dietitian and counseling were also collected

d) Evaluation of dietary services and nutrition counseling

Nutrition counseling using educational pamphlets focusing on nutrition security according to the health and disease condition was given on admission and at discharge from the hospital. Counseling soon after admission enabled them to assess the nutrition therapy provided to them and helped in the understanding the importance of diet therapy and to assess the dietary service and diet counseling through the provided questionnaire after five days of admission in the hospital.Knowledge, attitude and self supported behaviours of food safety among the food handlers was also assessed to evaluate the impact of whole process. (Angelillo et al, 2000).

RESULTS AND DISCUSSION

(ii). Response of subjects on food quality

TABLE 1-RESPONSE ON FOOD QUALITY PARAMETERS

Criteria	Excellent (per cent)	Good (per cent)	Fair (per cent)
Food Taste	18	75	7
Food Quality	59	21	20
Food Quantity	**More quantity**	**Adequate**	
	6	94	

The results from above Table 1 showed that 59 per cent of the patients remarked the quality of solid and liquid diet served, was excellent while 20 per cent of the patients expressed that it was not upto their preference. It was also deduced that 94 per cent of the patients were satisfied with the provision of adequate quantity of food and nutrients (requirements explained through dietitians) and meal served.

(ii). Response of subjects on food handing and service

TABLE 2-RESPONSE ON FOOD FOOD HANDING AND SERVICE

Food Service (per cent)	Regular time	Delay time	Early service
	75.5	16.5	8

Meal Timings (per cent)	Adequate interval	Improper interval	Change in meal timings
	88	9	3

Food Presentation (per cent)	Very good	Good	Need improvement
	52	16	32

As evident from the above Table 2.food service at proper time 75.5 per cent of the patients have reported that meals were served at regular time, where as nearly 12 per cent of the patients reported that interval between meals and meal timings are not proper

Though food security in terms of availing adequate quantity of food was maintained at individual level, the expectation on the food presentation and food safety in handling practices of service personnel was higher among the patients.

On the other hand the patients in budget room expected to serve like suite rooms, patients in general ward were in need of more quantity and the patients in suite room were demand of still more variety while the dietitian suggests on dietary modification, with the high expectation of special care like special nurse (provision of single nurse to take care an individual patient on demand by the attendees, at times) showing their sophistication even during hospitalisation and also under treatment

(iii). Response of subjects on diet counseling and visit

TABLE 3-RESPONSE ON DIET COUNSELING AND VISIT

Criteria	Dietitian Visit (per cent)	Diet Counseling (per cent)
Satisfied	68	73
High Expectation	32	27

From the Table 3 thirty two per cent expected the communication of dietitians should be based on the correlation between the biochemical investigations and food intake on regular basis. Surprisingly the expectations of the subjects from the dietitian was more on food, myths – facts that rolls around in social media compared to their clarifications towards the present treatment and also on diet counselling for at least two times. Request was also higher among the patients on extra visit of dietitian to their rooms apart from Regular visit for rechecking of their food requirement

(iii). Response on food safety practices

TABLE 4-FOOD SAFETY PRACTICES OF FOOD HANDLERS

S.no	Criteria	Mean	SD
1	Washing Hands before and after touching unwrapped foods	4.6	0.8
2	Wearing of Gloves to distribute foods	4.4	0.9
3	Use of personal protective equipments (PPE) or clothing (apron) to serve foods	4.3	1.2
4	Use of mask and cap to serve foods	3.8	0.8
5	Washing and sanitising the working clothes	4.2	0.6
6	Use clean and washed plate for ready-to-eat foods	4.7	0.3
7	Working during sick (flu, cold, diarrhoea, coughing, etc.)	4.1	0.9

Considering the food safety with respect to food handling and service,from the Table 4 the hygienic practices are mostly adapted by food handlers and reported that they frequently practised safe handling during food presentation and service, scoring an average of 53.2 ± 5.5 of the total score of 60. An interesting factor was found that those who had not received any formal education performed better than those who had educated at minimum level(Schooling alone).

CONCLUSION

The present study showed that, not only the nutritional screening and follow up nutritional assessment by dietitian satisfies the patient but also the nutrition security in terms of food selection, preference and good handling practices plays a vital role in providing a good quality hospital food services with adequate education and training of food handlers

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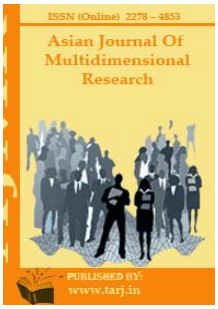

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EXTRACTION, CHARACTERIZATION AND UTILIZATION OF PASSION FRUIT PEEL PECTIN

N. Saiharini*; A.Padmaja**

*;**Dept. of Food and Nutritional Sciences,
Sri SathyaSai Institute of Higher Learning,
Anantapur, Andhra Pradesh, INDIA
Email id: ambatipadmaja@sssihl.edu.in

ABSTRACT

Passion (Passiflora edulis Sims) fruit, which is seasonal, is a source of valuable components. Peel and seeds are the by-products of passion fruit processing industries. Peel which is a major by-product is a good source of pectin, fibre and phytochemicals. The objectives of present study were to assess the effect of different chemicals on extraction of pectin, to characterize and study the utilisation of extracted pectin in preparation of preserve like jelly. Pectin was extracted from purple passion fruit peel and it was compared with the citrus peel pectin and commercial pectin. Scanning Electron Microscopy (SEM) analysis was carried out to study the morphology of extracted passion fruit peel pectin. Results showed that citric acid extraction along with ethanol gave the highest yield of pectin than SHMP. The pectin content ranged between 15-30% which was in accordance with citrus peel pectin. The quality of extracted pectin was comparable with that of the commercial pectin. Low methoxyl content of passion fruit pectin showed that it was a good gelating agent. Passion fruit pectin was compared with agar agar in preparation of jelly, which showed that passion fruit pectin could be an alternate source of commercial jellying agent in foods. The extracted pectin also proved to be good thickening in jam.

KEYWORDS: *Passion Fruit, Pectin, Peel, Extraction, Gelating Agent.*

INTRODUCTION

India's diverse climate ensures availability of all varieties of fresh fruits & vegetables. It ranks second in fruits and vegetables production in the world, after China. As per National Horticulture Database published by National Horticulture Board (2014-15) .

The potential use of tropical fruits and their by-products to isolate phytochemicals for application in nutraceutical supplements, dietary additives, new food and pharmaceutical products contributes the recovery of agro-industrial process waste with the major industrial, environmental and economic impact. Therefore, the identification and quantification of tropical fruits and by-products is of utmost importance to substantiate their potential health benefits in human nutrition (Larissa Morais Ribeiro da silver et al., 2014).

As the peels have good antioxidant potential, phenoliccontent and pigments such as β-carotene, anthocyanins and lycopene, an economically and technologically feasible alternative would be the usage of peels to produce either new ingredients or partially replace other ingredients to improve the products nutritional quality (Oliveria et al., 2011). Pectin which belongs to a class of complex polysaccharides is found in the cell walls of higher plants andit is one such ingredient which is commercially extracted from apple pomace, citrus peels, sugar beet and the seed heads of sunflower residues (Braddock, R.J. 1999). Pectin is recommended by the joint FAO/WHO committee on food additives that pectin is a safe additive with no limit on acceptable daily intake except as dictated by good manufacturing practices. Pectin is used as a gelling agent, thickener, emulsifier, texturizer and stabilizer in number of foods. Passion fruit (*Passiflora edulis)* is commercially important edible fruit which is widely grown in many tropical and subtropical areas of the world. It is known for its unique flavor, aroma and also for its nutritional and medicinal properties.In India, it is grown in many parts of Niligiris, Kodaikanal, Manipur, Nagaland and Mizoram. Two commercial varieties are:Purple passion fruit (*Passiflora edulis Sims) and* Yellow passion fruit (*Passiflora edulis Flavicarpa*). Only few works that address the recovery of bioactive compounds from purple passion fruit industrial by-products were found. Therefore, the main objectives of the present investigation was to study the effect of extraction conditions on pectin yield, chemical characterization of pectin from purple passion fruit peel and also to study the its application in preserves.

MATERIALS AND METHODS

Procurement of raw materials

Purple passion fruits (*Passiflora edulis Sims*) were procured from Ooty and Kerala and botanical identification was confirmed by Dr. Suresh Narayana, Rtd. Botany lecturer, SSBN college, Anantapur. Edible grade citric acid was obtained from the local market of Anantapur, Andhra Pradesh. Chemicals of Analytical grade were procured from SRL, SD fine and Sigma companies.

Preparation of peel powder

Passion fruits were washed thoroughly and cut into half and the pulp was scooped out from the fruits. The fruit peels were weighed and cut into small pieces and were dried in the tray drier. After drying, they were powdered in a laboratory mixer and powder was stored in an air tight container for the further analysis.

VARIABLES OF EXTRACTING PECTIN

Extracting media: Citric acid and SHMP were used toextract pectin from peels in different concentrations. Extracting media of different pH i.e., 1.0, 2.0 and 2.5 were prepared and were used for extraction of pectin from the dried passion fruit peel powder (PFPP).

Extraction time: The time of extraction of pectin was varied for 30, 60 and 90 minutes to determine the time of extraction required for maximum yield of pectin from the dried peel powder.

Extraction temperature: Peel powder and extractant solution were weighed in a 250ml Borosil conical flask. They were kept on a thermostatically controlled water bath at the required temperature. The temperature of the water bath during extraction was maintained at 70, 80, 90 and 100˚C.

Pectin extraction using SHMP

Pectin was extracted using PFPP and the extractant SHMP solution corresponding to different pH by refluxing for 2hrs. The mixture was centrifuged at 2000 rpm for 15min. To the supernatant equal amounts of ethanol was added with continuous stirring and kept aside for incubation. It was filtered through whatman paper and the precipitate was washed with ethanol to remove the impurities. The pectin was dried and stored in an air tight pouch under refrigerated conditions.

Pectin extraction using citric acid

Peel powder and citric acid solution were treated at different pH and pectin was precipitated with ethanol and then filtered .The pectin thus obtained was further dried and stored in air tight conditions for further analysis and application studies.

CHARACTERIZATION OF PECTIN

Qualitative analysis of pectin

The extracted pectin was analyzed for its quality aspects like color of the sample was measured using a colour reader (Konica MINOLTA CR -10), using the Hunter L, a and b units, where L indicates luminosity or brightness, ‘a’ corresponds to greenness (-) / redness (+) and ‘b’ corresponds to blueness (-) / yellowness (+). Solubility in hot and cold water (Fishman et al., 2003) and solubility in hot and cold alkali (Joslyn M.N.et al., 1980).

CHEMICAL CHARACTERIZATION OF PECTIN

The extracted pectin was estimated for its ash content, equivalent weight, methoxyl content and aceyl value by using the methods as per Ranganna (1986). Anhudrouronic acid content and degree of esterification was estimated as per ErmiasGirma and Mr. TeshomeWorku (2016). Total soluble solids were determined by using a digital refractometer (ATAGO PR-1, Japan). Results were expressed in ^{0}Brix according to Ranganna (1986).

SCANNING ELECTRON MICROSCOPY (SEM)

Passion fruit peel pectin was subjected to SEM analysis to determine the morphology. It was carried out using Environmental scanning electron microscope of Joel Company Japan, JSM – IT – 300 model. SEM with energy dispersive X-ray analysis (SEM-EDX) is a near surface technique, as it measures the electrons produced by an electron gun which strikes the specimen being irradiated. Pectin samples were mounted on platinum studs after sputtering (for wet) and were observed under SEM (Shan Qin *et.al*. 2014).

APPLICATION OF PASSION FRUIT PEEL PECTIN IN PRESERVES

Preparation of jelly: Papaya jelly was prepared as per a standard procedure and passion fruit peel pectin was used in different concentrations (0.5%, 1% and 2%) in the standard recipe. Agar agar was taken as commercial jellying agent for comparing with passion fruit peel pectin. Jelly was made without any gelling agent which was taken as a control.

Preparation of jam: Papaya jam was prepared by using a standard recipe. TSS of jam was measured by using digital refractometer (Abdel Moneim.et.al.,2013)Pectin was incorporated in the basic recipe to test its effect as thickening agent.

Sensory evaluation: A twelve member panelists were selected for sensory evaluation. Evaluation was based on color, flavor, taste, texture, appearance and overall acceptability. Scoring was based on nine point hedonic scale of 1- 9 (1 = dislike extremely and 9 = like extremely).

Statistical analysis: The analysis of samples was carried out in triplicates. Values were expressed as means of three independent samples analyzed in triplicate± standard error of means (SEM).

RESULTS AND DISCUSSION

Standardization of pectin extraction methods from passion fruit peel

Different extracting media such as Citric acid and Sodium hexameta phosphate, solvents like ethanol, acetone and isopropanol were used as precipitating solvents to standardize the extraction method. Results showed that the citric acid along with the ethanol gave the highest yield than SHMP and other solvents. The average pectin content was 30% which was in the range of citrus peel pectin content (15-30%).

Variables of pectin extraction

Citric acid at 2.0 pH,when compared with different pH i.e., 1.0, 2.0 and 2.5 and extraction time of 60 minuteswere efficient in extracting and isolating pectin. At the beginning of extraction, the pectin yield increased with time it is because longer times provide more opportunity for reaction time. However, pectin yield decreased after the peak point 60 minutes possibly by the effect of acid, which would have destroyed the glycoside bond and ester bond of pectin which lead to lower yield.

The total yield of pectin was significantly less at 70-80℃ and as the temperature increased the yield of pectin was also increased being maximum at 100℃ and further increase in the temperature resulted in less yield which could be due to the partial degradation of pectin. Hence, the optimum temperature for pectin extraction was found to be 100℃.

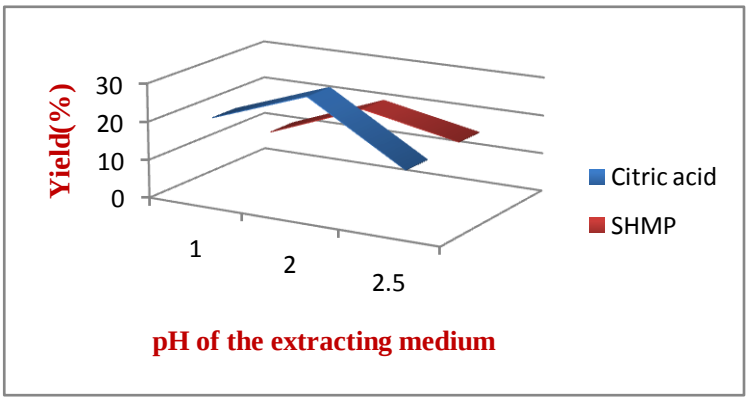

Fig.No.2.Effect of pH on extraction of pectin

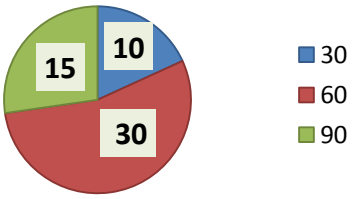

Fig.No.3.Effect of extraction time(min.) on pectin yield(%)

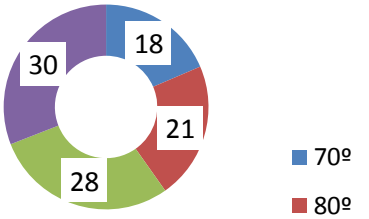

Fig.No.4.Effect of temperature(°C) on pectin yield (%)

CHARACTERIZATION OF PECTIN- QUALITATIVE ANALYSIS

Colour of pectin: The colour of the dried pectin was brown in colour and values were L=33, a=7.0 and b= 4.7. Colour of the pectin is one of the crucial parameters which could affect the appearance of the products. The coloured pectin might contain water soluble pigments and polyphenols trapped in the pectin during extraction (A.N. Crassino *et al.*, 2016).

Solubility of pectin: The dried passion fruit peel pectin and citrus peel pectin were tested for its solubility in hot and cold water and the results are given in table No. Similar results were observed in study on citrus peel pectin (P. Kanmani *et al.*, 2014).

TABLE NO.1.QUALITATIVE ANANLYSIS OF PECTIN

Parameter	Passion fruit pectin	Citrus pectin
Color	Light brown	Yellow
Solubility in cold water	Insoluble	Insoluble
Solubility in hot water (85-90˚C)	Mixture dissolves	Mixture dissolves
Solubility in cold alkali	Pale yellow precipitate	Yellow precipitate
Solubility in hot alkali (85-90˚C)	Soluble, formation of pale yellow solution	Soluble, formation of yellow solution

CHEMICAL CHARACTERIZATION OF PECTIN: Passion fruit peel pectin, citrus peel pectin and commercial pectin were tested for their chemical components and the results are given in table No.2.

TABLE.NO.2.CHEMICAL CHARACTERIZATION OF EXTRACTED PECTIN

Parameters	Passion fruit peel pectin	Citrus peel pectin	Commercial pectin
Ash(%)	1.16 ± 0.28	1.16 ± 0.28	1.28 ± 0.02
Methoxyl content (%)	6.85 ± 0.03	9.32 ± 0.02	15.73 ± 0.20
Equivalent weight (g/ml)	624.66 ± 0.57	500.66 ± 1.15	417.05 ± 1.29
AUA (%)	66.31 ± 0.72	87± 1.00	130.74 ± 0.66
DE (%)	57.56 ± 0.49	60 ± 0.57	67.71 ± 0.24
Acetyl value (%)	0.32 ± 0.001	0.45 ± 0.01	0.61 ± 0.01

The inorganic impurities in pectin are indicated by the ash content and the upper limit of ash content is considered to be as 10% for good quality pectin. (Ermias Girma and Mr. Teshome Worku, 2016). Lower ash content of pectin in present study indicates the good quality of pectin.

Methoxyl content is an important factor for controlling the setting time of pectin and the ability to form gels. The degree of esterification which is expressed as a percentage of the esterified carboxyl groups, is an important factor to classify pectin (Ermias Girma and Theshome Worku 2016). If 50% of carboxyl groups are methylated it is said to be high methoxyl pectin and less than 50% is called low methoxyl pectin (Beli R. Thakur *et.al*., 1997). Hence this study indicates that passion fruit peel pectin can be categorized as high methoxyl pectin.

Estimation of anhydrouronic acid is important to determine its purity and degree of esterification and also to evaluate the physical properties (Ranganna, 1986). Its value should not be less than 65% possibly may be due to the presence of proteins, sugars and starch (Ermias Girma *et al.*, 2016).Anhydrouronic acid content of pectin in present study were higher than 65% which indicates their purity. Jelly formation will be inhibited by high amount of acetyl group. The higher the degree of acetylation lower the lower the gelling capacity (Ranganna, 1986). The pectin of present study had a low acetyl value which indicates their good gellying capacity.

3.8. Scanning Electron Microscope (SEM)

Morphology of passion fruit pectin samples was characterized by using SEM and the micrographs are shown in figure No.4.13.The wet pectin showed a continuous nanostructure and flaky in shape with little wrinkle on surface. The micrograph of dried pectin showed a destruction of continuity and swelling effects.

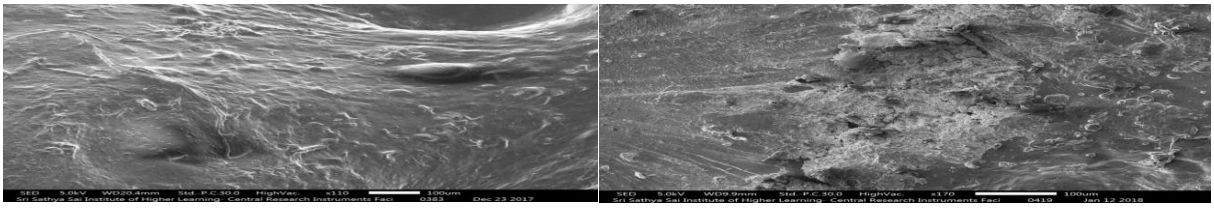

Fig.No.5. Micrograph of passion fruit wet and dry pectin

APPLICATIONS OF EXTRACTED PECTIN

Analysis of pectin extracted from purple passion fruit under optimal conditions, showed that it could be used effectively in preparation of processed foods. Passion fruit pectin at 1% and 2% showed the highest sensory acceptability in terms of overall acceptability. Commercial jellying agent i.e., agar was used at 2% concentration for making jelly. Papaya jelly without jellying agent which was taken as control did not set correctly. Maintenance of temperature and total soluble solids i.e., Brix at 68° is very important for good jelly. Jelly with 1% and 2% of passion fruit peel pectin settled efficiently than the jelly with agar 2% and control jelly. Control jelly had very poor setting quality which indicates that the presence of pectin is important for good jelly making. The developed jellies along with control jelly were subjected to sensory evaluation to know the acceptability. Twelve semi trained panellists evaluated the jellies by using 9 point hedonic scale. Jelly with 2% of passion fruit pectin had highest score and sensory acceptability. There was a significant colour difference in the jelly made by passion fruit pectin than other jellies. It could be due to the colour of passion fruit pectin which added colour to the jelly. There was minute difference in the taste of passion fruit pectin based jelly when compared with other jellies. Sour taste was observed when passion fruit

pectin was added more than 2%. Apart from differences in taste and colour there was a difference between textures also which could be due to pectin addition. Hence the results show that passion fruit peel pectin was efficient as jellying at a low concentration than commercial jellying agent.

Jam developed by adding pectin had good consistency than jam made without addition of it i.e., control jam. There was a slight difference in the taste when compared with that of the control jam but at higher concentrations, a significant taste difference was observed which could be due to the sour taste of the added pectin. Passion fruit peel pectin exhibited good jellying and thickening properties which enables them to be used as alternate to commercial synthetic pectin.

CONCLUSION

It could be concluded from the above investigation that good quality pectin can be extracted from the purple passion fruit peel using citric acid as an extracting media and ethanol as a precipitating solvent. Recovery of valuable by product pectin from fruit peel not only reduces the waste disposal and environmental pollution but also offers great scope for utilization in development of many functional foods.

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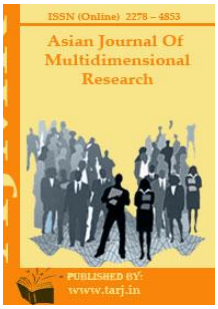

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FOOD CONSUMPTION PATTERN OF ADULTS IN URBAN AND RURAL AREAS OF COIMBATORE, TAMIL NADU

A.Swarnalatha*; M.Amirthaveni**

*Associate Professor,
Dept. of Food Science and Nutrition,
Nehru Arts and Science College,
Coimbatore, Tamil Nadu, INDIA

**Professor and Head (retd),
Dept. of Food Science and Nutrition,
Avinashilingam Institute for Home Science and,
Higher Education for Women,
Coimbatore, Tamil Nadu, INDIA
Email id: naschodfsn@nehrucolleges.com

ABSTRACT

Food consumed by an individual has a lot to do with the nutritional and health status of that individual. One major risk factor for NCDs is poor dietary intake, in addition to alcohol, tobacco and physical activity. There is also a positive relationship between dietary diversity and the three pillars of food security, viz., availability, access and utilization. Hence, the study was taken to understand the heterogeneity in food habits among the selected adults in rural and urban areas. 513 adults from rural and urban areas of Coimbatore district was selected for the study. A well structured questionnaire was developed to elicit information regarding demographic details and food consumption pattern of adult men and women from rural and urban areas. The study observed that majority of the selected rural (74 per cent of men and women) and urban (78 per cent men and 79 per cent women) followed non vegetarian diet and frequency of consumption of meat, poultry and its products was more among urban adults when compared to rural adults and bakery product was consumed frequently by both the rural and urban adults. The study concludes that the diet of most of the adults in rural and urban areas was rich in fat and salt but poor in other essential food groups.

KEYWORDS: *Food Consumption, Adults, Urban, Rural, Food Habits*

INTRODUCTION

Food consumed by an individual has a lot to do with the nutritional and health status of that individual. One major risk factor for NCDs is poor dietary intake, in addition to alcohol, tobacco and physical activity. India has a rich and highly varied cuisine, and its various diets are strongly related to social identity, religion and other cultural factors as well as local agricultural practices and availability of diverse foods. The 'average diet' in a country as large and geographically diverse as India is therefore likely to be of little relevance from a public health nutrition perspective. (Green et al., 2016). The level of diversity in household diets is an indirect measure of diet quality and the extent to which nutritional needs of households are being met. There is also a positive relationship between dietary diversity and the three pillars of food security, viz., availability, access and utilization. In the light of these statements, this present study was taken to understand the heterogeneity in food habits among the selected adults in rural and urban areas.

METHODOLOGY

Since last two decades, population food consumption pattern has been changes a lot due to industrialization and urbanization. Tamil Nadu is one among the most urbanized largest state in India. The recently released 2011 censes date on urban agglomerations showed that, in the last decade, about half of the increase in urban population had occurred in four urban agglomerations. Coimbatore was one among the four places (Srivatsan, 2013). Based on the above criteria, urban areas and rural areas form Coimbatore district were selected for the study.

A well structured questionnaire was formulated and validated to elicit the demographic profile and food consumption pattern of rural and urban adults. The questionnaire was given to 513 adults including 256 rural and 257 urban and the information were collected and tabulated.

RESULTS AND DISCUSSION

The results and discussions of the present study is given below.

A. Age

The Table-I states the age wise distribution of the selected adults from rural and urban areas

TABLE - I AGE WISE DISTRIBUTION OF THE SELECTED ADULTS

Age (yrs)	Rural						Urban					
	Men		Women		Total		Men		Women		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
20-29	11	9	3	2	**14**	**5**	20	16	10	8	**30**	**12**
30-39	37	29	24	19	**61**	**24**	43	34	32	25	**75**	**29**
40-49	53	42	55	43	**108**	**42**	53	41	56	43	**109**	**42**
50-59	26	20	47	36	**73**	**29**	12	19	31	24	**43**	**17**
Total	**127**	**100**	**129**	**100**	**256**	**100**	**128**	**100**	**129**	**100**	**257**	**100**

Table -I clearly states that, the most (42 per cent) of the selected men and women in both rural and urban areas were in the age group of 40-49 years. This was followed by 30-39 years in both rural (29 per cent) and urban (34 per cent) men and 50-59 years in both rural (36 per cent) and urban (24 per cent) women.

B. Family type

Table –II gives the family type of the selected adults in rural and urban areas.

TABLE –II FAMILY TYPE OF THE SELECTED ADULTS

Family Type	Rural						Urban					
	Men		Women		Total		Men		Women		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Nuclear family	89	70	93	72	**182**	**71**	111	87	107	83	**218**	**85**
Joint family	38	30	36	28	**74**	**29**	17	13	22	17	**39**	**15**
Total	**127**	**100**	**129**	**100**	**256**	**100**	**128**	**100**	**129**	**100**	**257**	**100**

Ministry of Statistics and Programme Implementation (2011) stated that the traditional Indian society and the age-old joint family system had been instrumental in safeguarding the social and economic security of the people in the country. However, with the rapid changes in the social scenario stimulated the prevalence of nuclear family set-ups in India in recent years and it is also reflected in the present study. Greatest percent of the selected rural men (70 per cent) and women (72 per cent) and urban men (87 per cent) and women (83 per cent) followed nuclear family system.

Joint family system still existed in more rural areas when compared to urban areas. Joint family system was practiced in more than one quarter of rural adults where as only 13 per cent of urban men and 17 per cent of urban women followed the joint family systems.

C. Religion

Table -III illustrates the religion wise distribution of the selected adults

TABLE -III RELIGION WISE DISTRIBUTION OF SELCTED ADULTS

Religion	Rural						Urban					
	Men		Women		Total		Men		Women		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Hindu	**98**	**77**	**99**	**77**	**197**	**77**	**95**	**74**	**96**	**74**	**191**	**74**
Christian	**29**	**23**	**22**	**17**	**51**	**20**	**25**	**20**	**19**	**15**	**44**	**17**
Muslim	**Nil**	**Nil**	**8**	**6**	**8**	**3**	**8**	**6**	**14**	**11**	**22**	**9**
Total	**127**	**100**	**129**	**100**	**256**	**100**	**128**	**100**	**129**	**100**	**257**	**100**

According to figures of the religion census of 2011 of India, Hindus comprised greatest per cent of the total population (Ghosh and Singh, 2015) and likewise the present study also had similar religious distribution with more per cent (74-77) of Hindus and 6-17 per cent of minorities. Among the minority communities 17 – 23 per cent was Christians and less than 12 per cent were Muslims in both rural and urban.

D. Occupational status

Table -IV presents the occupational status of the selected adults

TABLE –IV OCCUPATION STATUS OF THE SELECTED ADULTS

Occupation	Rural						Urban					
	Men		Women		Total		Men		Women		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Senior officials	Nil	Nil	Nil	Nil	**Nil**	**NIL**	12	9	5	4	**17**	**7**
Professionals	10	8	21	16	**31**	**12**	28	22	27	21	**55**	**21**
Clerks	16	13	10	8	**26**	**10**	17	13	29	23	**46**	**18**
Service and sales	28	22	15	12	**43**	**17**	32	25	21	16	**53**	**21**
Machinery operators	29	23	Nil	Nil	**29**	**11**	23	18	Nil	Nil	**23**	**9**
Agriculture workers	17	13	21	16	**38**	**15**	Nil	Nil	Nil	Nil	**Nil**	**Nil**
Other labours	27	21	18	14	**45**	**18**	16	13	8	6	**24**	**9**
House wife	Nil	Nil	44	34	**44**	**17**	Nil	Nil	39	30	**39**	**15**
Total	**127**	**100**	**129**	**100**	**256**	**100**	**128**	**100**	**129**	**100**	**257**	**100**

Table -IV clearly shows that 23 per cent of selected rural men were working as a machinery operators followed by service and sales (22 per cent) which demanded more working hours. About 21 per cent of rural men were other skilled labours, 13 per cent were engaged in agriculture and clerical work and only eight per cent were professionals. Greatest per cent of the rural women were working women and only 34 per cent were house wives. Among working women 16 per cent were professionals and skilled agriculture workers. It was true with respect to urban men in whom maximum per cent (25 per cent) of selected adults were in sales and service followed by professionals (22 per cent) and plant and machinery operators (18 per cent). Thirteen per cent were in clerical job and nine per cent were senior officials and managers and 13 per cent were other skilled labours. About three fourth of selected women in urban areas were working women and among them highest per cent (23 per cent) of women were in clerical job followed by professionals (21 per cent).

E. Income level

Figure -1 depicts that about 58 per cent and 28 per cent of the selected adults in rural and urban areas belonged to low income group..

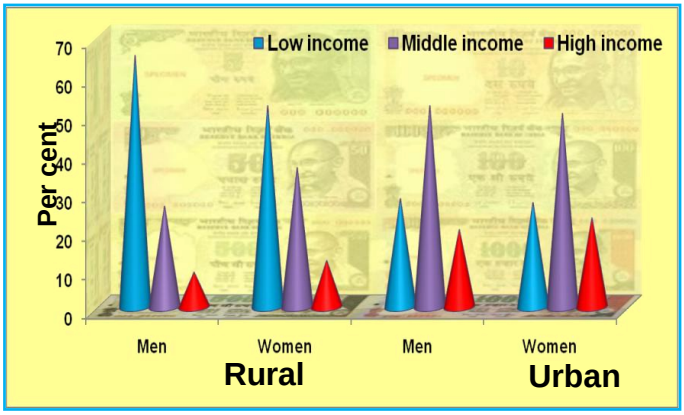

FIGURE - 1 INCOME LEVEL

In rural areas more than one half of the men (65 per cent) and women (52 per cent) belonged to low income group and in urban one half of the men (52 per cent) and women (50 per cent) belonged to middle income group. About nine to twelve per cent of rural belonged to high income group while it was found to be nearly one fourth in their

F. Dietary habits

Table –V shows the dietary habit of selected adults

TABLE –V DIETARY HABITS OF THE SELECTED ADULTS

Food habits	Rural						Urban					
	Men		Women		Total		Men		Women		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Vegetarian	18	14	19	15	37	15	17	13	21	16	38	15
Non-vegetarian	94	74	96	74	190	74	100	78	102	79	202	79
Ova vegetarian	15	12	14	11	29	11	11	9	6	5	17	6
Total	127	100	129	100	256	100	128	100	129	100	257	100

From the above Table-V it was clear that majority of the selected rural (74 per cent of men and women) and urban (78 per cent men and 79 per cent women) followed non vegetarian diet where as less than 17 per cent followed vegetarian diet. Only five to twelve per cent were found to be ova vegetarians. The dietary habit was found to be similar in both rural and urban areas.

G. Meal pattern

Table -VI displays the meal pattern of the selected adults

TABLE –VI MEAL PATTERN

Meal pattern	Rural			Urban		
	Men	Women	Total	Men	Women	Total
	%	%	%	%	%	%
3 meals with snacks	56	50	53	65	57	61
3 meals without snacks	18	18	18	12	15	13
<3 meals with snacks	18	16	17	17	16	17
Irregular eating pattern	8	16	12	6	12	9
Total	100	100	100	100	100	100

Meal pattern was the clear marker of diet quality and nutrient intake. The table-VI stated that more than 50 per cent of the selected subjects were having three meals with snacks every day. The percentage was 56 per cent, 50 per cent, 65 per cent and 57 per cent in rural and urban men and women respectively. The present study agreed the results stated by Omidvar and Begum (2014) which observed that the frequency of regular consumption of three meals was high among south Indians.Three meals without snacks intake was similar (18 per cent) in both rural men and women and it was found to be less in urban men (12 per cent) and women (15 per cent). Less than 3 meals with snacks consumption was noticed in 18 per cent of rural men, 17 per cent of urban men and equal per cent (16 per cent) of women in both rural and urban. It might be due to their nature of work. The results were on par with the study in four cities of India which stated that more than a quarter (27 per cent) people skip breakfast, 9 per cent skip lunch and as little as 5 per cent claim to skip dinner (Malathi and Kamath,2013). Irregular eating pattern was noticed more among rural women (16 per cent) followed by urban women (12 per cent).It was quite low in both rural men (eight per cent) and urban men (six per cent). This result was similar to the result given by Tharani and Amirthaveni (2014) which stated that about 8.1 and 13 per cent of male and female respectively had irregular eating pattern due to heavy work load and were not time conscious with regard to the

food intake. Over all, irregular eating pattern was seen more in rural areas (12 per cent) and three meals with snacks was observed higher in urban areas (61 per cent) than their counter parts.

H. Consumption pattern of flesh foods

Table VII provides the consumption pattern of flesh foods among the selected adults

TABLE –VII CONSUMPTION PATTERN OF FLESH FOODS AMONG THE SELECTED ADULTS

Frequency	Rural						Urban					
	Men		Women		Total		Men		Women		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Weekly once	57	45	70	54	127	50	19	15	14	11	33	13
Weekly twice	31	24	29	22	60	23	29	23	32	25	61	24
Weekly thrice	21	17	11	9	32	13	54	42	56	43	110	42
Monthly twice	Nil	Nil	Nil	Nil	Nil	Nil	9	7	6	5	15	6
Nil	18	14	19	15	37	14	17	13	21	16	38	15
Total	127	100	129	100	256	100	128	100	129	100	257	100

According to above table majority of the selected adults from both rural and urban areas consumed chicken, mutton, fish, pork, beef and crab commonly. Among this chicken and meat were consumed more often in both rural and urban areas. In rural areas, weekly once consumption of flesh foods was found to be more by 45-54 per cent followed by weekly twice by 22-24 per cent. Even weekly thrice was seen in 17 per cent of men and nine per cent of selected women in rural areas.In urban areas, weekly thrice consumption was seen among greatest per cent of men (42 per cent) and women (43 per cent). Nearly one fourth consumed weekly twice and 11-15 per cent consumed weekly once. About five - seven per cent consumed the meat and meat products monthly twice. Even though consumption of meat and meat products were more common in both urban and rural adults, the frequency was not similar. Most of the urban men and women consumed weekly twice whereas it was once in a week among the rural.

I. Consumption pattern of bakery products

Consumption pattern of bakery products is illustrated in Table-XXIV.

TABLE –XXIV CONSUMPTION PATTERN OF BAKERY PRODUCTS

Frequency	Rural						Urban					
	Men		Women		Total		Men		Women		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Daily	32	25	25	19	57	22	43	34	46	36	89	34
Weekly twice	58	46	55	43	113	44	53	41	41	32	94	37
Weekly once	27	21	41	32	68	27	25	20	29	22	54	21
Monthly twice	10	8	8	6	18	7	7	5	13	10	20	8
Total	127	100	129	100	256	100	128	100	129	100	257	100

Bakery products were packed with salted saturated fats, sodium rich leavening agents (baking powder, soda bicarb). Consumption of bakery product was found to be more common among both

rural and urban adults. Nearly one half of the rural men consumed bakery products weekly twice and one fourth had it daily. Only meager per cent (eight per cent) included the bakery products only in monthly twice. In rural women, about 43 per cent consumed the bakery products weekly twice followed by weekly once (32 per cent). Around 19 per cent's frequency of consumption was found to be daily and barely six per cent consumed monthly twice.

In urban, more than one quarter (34-36 per cent) consumed the bakery products daily. It might be due to their working nature and mushrooming of bakeries in nook and corner of urban areas in recent decade. About 41 per cent men and 32 per cent women consumed the bakery products twice in a week and 20-22 per cent included the bakery products once in a week. Only five per cent and 10 per cent of men and women respectively were not taking the bakery products frequently and consumed only monthly twice. Regardless of area, bakery products consumption was found to be more frequent among the selected adults. Nowadays, the bakery products became one of the major snacks items with numerous varieties and different brand names. The extensive availability and taste of the foods might be the reason for this high consumption among selected adults

J. Fast foods eating pattern

Fast foods eating pattern is shown in Table -XXV.

TABLE –XXV FAST FOODS EATING PATTERN

Frequency	Rural						Urban					
	Men		Women		Total		Men		Women		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Daily	5	4	Nil	Nil	5	2	10	8	3	2	13	5
Weekly twice	27	21	13	10	40	16	51	40	25	19	76	29
Weekly once	28	22	29	22	57	22	35	27	50	39	85	33
Monthly twice	54	43	60	47	114	44	29	23	39	31	68	27
Rarely	13	10	28	21	41	16	3	2	12	9	15	6
Total	127	100	129	100	256	100	128	100	129	100	257	100

Fast food referred to food that could be served quickly. In many cases, that means foods were highly processed and contained large amounts of carbohydrates, added sugar, unhealthy fats, and salt (sodium). These foods generally contained a high number of calories but offered little or no nutritional value (Krucik, 2014).In the present study, both the rural and urban adults consumed this unhealthy food more commonly. In rural areas, 43 per cent of men and 47 per cent of women ate fast foods monthly twice. There was not much difference was noted in weekly once (22 per cent) and weekly twice (21 per cent) frequency in men. Twenty two per cent of rural women consumed weekly once and 10 per cent had fast foods twice in a week. Compared to all others, least frequency of consumption (21 per cent) was observed in rural women.

When compared to rural adults, consumption frequency was found to be greater in urban subjects. Frequency of consuming fast foods was more in urban men compared to all other subjects and about 40 per cent ate weekly twice followed by weekly once (27 per cent). Greatest per cent of urban women ate fast foods once in a week (39 per cent) succeeded by monthly twice (31 per cent). Rare consumption of fast foods were observed on only two per cent men and less than 10 per cent of women in urban.The present study observed more frequent consumption of fast foods among the

rural and urban adults and paralel with the study done by Steyn and Marais (2010). They showed that 11 per cent of the participants ate fast food daily, 27.6 per cent ate two to three times a week and 20.8 per cent ate fast food at least once a week. Only 3.8 per cent of the participants had fast food less than once per month. Also on par with the study by Prabhavathi *et al.*, (2014) which stated that 45 per cent of the sample respondents were consumed fast food three times in a month, 34 per cent of them were consumed fast food for about once in a month and 13 per cent of the respondents consumed fast food occasionally i.e. once in two months or less. Working professionals and well educated persons forms major consumer segment in fast food sector. In both areas, men consumed this salt and fat rich fast foods more frequently than their counter parts.

CONCLUSION

This present study revealed that food consumption pattern of most of the selected rural and urban adults diet are rich in fat and salt and micronutrients rich sources (pulses, other vegetables, fruits, nuts, oilseeds and animal foods) are generally consumed less frequently irrespective of the area.

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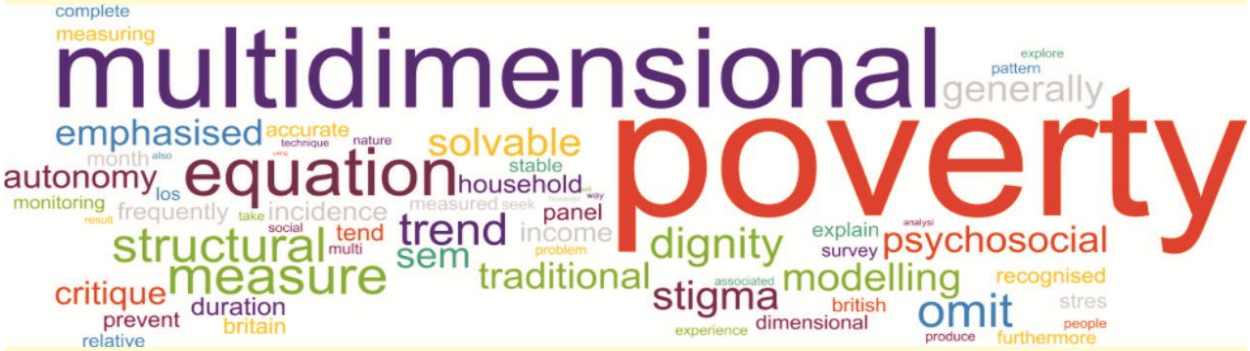

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