PROMOTING CONSUMPTION OF GREEN LEAFY VEGETABLES AMONG RURAL WOMEN THROUGH PARTICIPATORY APPROACH

by

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THESIS

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DECLARATION

I hereby declare that this thesis entitled **"Promoting consumption of green leafy vegetables among rural women through participatory approach"** is a bonafide record of research done by me during the course of research and that the thesis has not previously formed the basis for the award of any degree, diploma, associate ship, fellowship or other similar title, of any other university or society.

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Dedicated To My Parents

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LIST OF ABBREVATIONS

CDPO - Child Development Programme Officer

GLVs - Green Leafy vegetables

ICDS - Integrated Child Development Services

ICMR - Indian Council of Medical Research

LBW - Low Birth Weight

NFHS - National Family Health Survey

NIN - National Institute of Nutrition

NNMB - National Nutrition Monitoring Bureau

RDA - Recommended Dietary Allowances

UNICEF - United Nations International Childrens Emergency fund

Introduction

1. INTRODUCTION

Green leafy vegetables represent an excellent component of the habitual diet in the tropical and temperate countries. Green leafy vegetables abound in our country and are known to be the most inexpensive source of several vital nutrients (ICMR, 1999). A daily intake of at least 100g of fresh green leafy vegetable is recommended by ICMR. India's flora comprises of 6000 species of plants used for consumption, one third of which are green leafy vegetables. Leafy vegetables are appreciated because they not only supply the protective nutrients and add variety to a monotonous diet, but also have an alternative taste, pleasing appearance and aroma.

The commonly consumed green leafy vegetables in India such as amaranth, drumstick, spinach, etc., are termed as poor man's luxury due to their unassuming way of production, response to basic health needs, their wide range of choices and essential cheapness. The severity of micronutrient malnutrition widely prevalent in India can be easily reduced, if the consumption of green leafy vegetables is actively promoted especially among the low income groups of population (Saxena, 1999). Green leafy vegetables are the "micronutrient wealth of India". No other source of food including animal food can compare with these in micronutrient composition especially β-carotene and iron.

Greens form an important component of balanced diet or adequate diet, which yields all the nutrients in the proper proportions and amounts that the body requires. Greens are considered as precious as gold because of their nutritional qualities .Green leafy vegetables play a prominent role in balancing diet by their virtue of providing a larger amount of micronutrients in a single bowl. They are very important for the functioning of eyes, skin and liver and also for the formation of blood cells.

Green leafy vegetables are predominant sources of micronutrients for poor people but their contribution to alleviate micronutrient deficiencies is greatly under- appreciated. Strategies to minimize micronutrient deficiency include supplementation, fortification and promotion of dietary changes. Dietary diversification provides a sustainable, equitable solution to malnutrition since it is cheap and promotes intake of a whole range of micronutrients rather than singling out and tackling just one. It also fosters community and individual involvement, and can help to stimulate local food economy (Verma et al., 2001).

Dietary surveys conducted among different segments of the population revealed that consumption of green leafy vegetables is either nil or very much below the recommended dietary allowances of 100g/day. Incorporation of green leafy vegetables in the diet will help to prevent micronutrient deficiencies (Gopalan, 2000).

Green leafy vegetables are also inexpensive and locally available and studies proved that their consumption can be effected on a sustainable basis if people are convinced of the necessity for including them in diet through nutrition communication. Hence, the present study of "Promoting consumption of green leafy vegetables among rural women through participatory approach" was attempted with the following objectives.

1) To promote consumption of green leafy vegetables among rural women through an intensive educational programme employing participatory techniques.
2) To assess the impact of the nutrition communication through change in knowledge and attitude and increased consumption of green leafy vegetables.

Review of Literature

2. REVIEW OF LITERATURE

Literature available on different aspects related to the present study entitled "Promoting consumption of green leafy vegetables among rural women through participatory approach" is reviewed under following headings.

2.1 Importance of leafy vegetables in human nutrition
2.2 Antioxidant property of leafy vegetables
2.3 Medicinal value of leafy vegetables
2.4 Processing and preservation of leafy vegetables
2.5 Antinutritional factors in leafy vegetables
2.6 Bioavailability of nutrients from leafy vegetables
2.7 Nutrition intervention for enhancing consumption of leafy vegetables through various methods and its impact.

2.1 Importance of leafy vegetables in human nutrition

Dietary surveys conducted among different segments of the population revealed that consumption of green leafy vegetables is much lower than the recommended dietary allowance of 100g/day.

National Nutrition Monitoring Bureau (2000) Survey of Kerala also revealed that consumption of green leafy vegetables was grossly inadequate particularly among preschool children.

Surveys carried out by Brahmam (2003) in the state of Kerala along with other states viz., Andhra Pradesh, Karnataka, Tamil Nadu, Maharashtra, Madhya Pradesh, Gujarat, Orissa, and West Bengal have revealed that the average

consumption of leafy vegetables is observed to be grossly inadequate, particularly among preschool children.

Dietary surveys conducted by Department of Home Science, KAU pointed out that the consumption of leafy vegetables is highly inadequate (Archana, 2003; Krishnaroopa, 2003; Shiny, 2004; Sheela, 2004).

Tucker (2005) in a study on older adults found that folate, a B complex vitamin found in foods like green leafy vegetables may protect against cognitive decline in older adults.

Leafy vegetables are rich sources of minerals like iron, calcium, potassium and magnesium, and vitamins like A, C, E and K and many of the B vitamins and when consumed regularly they can substantially improve micronutrient status of the Indian population (Gupta and Tripathi, 2009).

Table 1: The recommended dietary allowances for green leafy vegetables for different age groups are given below

Adult man	100g/day
Adult women	100g/day
Preschool children(4-6 years)	40g/day
Boys and Girls(beyond 10 years)	50g/day

Source: (NIN, 1991)

Green leafy vegetables are also good source of dietary fibre, particularly soluble fibre and have hypocholesterolaemic and hypotriglyceridaemic effect in humans. Dietary fibre helps to reduce cholesterol level, lower blood glucose level, increase the transit time, reduce time of release of ingested food in the colon and prevents constipation (Dolson, 2008).

Subbulakshmi and Rajeswari (2001) stated that green leafy vegetables being rich in vitamins and minerals have been termed as protective foods that are responsible for

a. Promoting immunity.
b. Utilization of macronutrients in the body.
c. Carrying out bodies vital functions like circulation and respiration.
d. Forming parts of body's structural component.
e. Activating large number of enzymes system in the body.

Leafy vegetables are rich in vitamin C, which is required to keep the gums in a healthy condition (Gopalan , 2004).

Mohandas and Kowsalya (1999) indicated that cauliflower leaves are rich in macro and micro nutrients. The leaves are an excellent source of anti-oxidants like beta-carotene, ascorbic acid and minerals like iron, selenium, copper and zinc.

Reddy (2004) analysed the carotenoid content of seventeen commonly consumed and twenty one less familiar leafy vegetables and found that drumstick and agathi leaves had higher concentration of beta carotene(15-20mg in 100g) than others.

Drumstick leaves are reported to be richer in ascorbic acid (220 mg in 100 g) than tomato, radish, carrot and peas (Nambiar and Seshadri, 2001).

Haskell et al. (2004) found that daily consumption of Indian Spinach (Basella Alba) had a positive effect on total body vitamin A stores in Bangladeshi men.

Tucker (2005) in a study on older adults found that folate, a B complex vitamin found in foods like green leafy vegetables may protect against cognitive decline in older adults.

Table 2: The different types of leafy vegetables and their nutritive value in 100g (NIN, 1995)

Leafy Vegetables	Protein (g)	Fibre (g)	Ca (mg)	Fe (mg)	Beta carotene (µg)	Vit C (mg)
Amaranthus	5.2	1.0	397	25.5	9900-10900	120
Alternanthera	5.0	2.8	510	21.3	1026.5	51.7
Basella	1.2	1.55	13.42	1.63	9571.5	112.9
Chekkurmanis	6.8	1.4	570	28.6	5706.0	247
Chenopodium	3.7	0.80	150	4.20	1740.0	35
Water leaf	3.13	0.92	30.06	6.88	9982.61	102.09
Water convolvulus	6.7	1.49	29.96	34.76	22147.13	76.34
Drumstick leaf	6.7	0.9	440	0.8	6780	22
Agathi	8.4	2.2	1130	3.9	5400	169

Lettuce	3.6	0.2	170	3.6	NA	NA
Curry leaf	6.1	6.4	830	0.9	7560	4
Coriander leaf	3.3	1.2	184	1.4	6918	135
Ponnaviram	19.86	22.21	-	-	-	-
Mint	4.8	2.0	200	15.6	1620	27
Cabbage	1.8	1.0	49	0.5	120	50
Spinach	2.0	0.6	73	1.1	7045	28
Colocasia leaf	6.8	1.8	460	0.98	10278	12
Cow pea leaf	3.4	1.2	290	20.1	6072	4
Pumpkin leaf	4.6	2.1	392	NA	NA	NA

2.2 Antioxidant property of leafy vegetables

Leafy vegetables besides being the store house of useful minerals and vitamins at the cheapest price are nowadays considered as the corner stone of health care system due to presence of many helpful phytochemicals or phytofactors in scavenging the dreadful free radicals generated as metabolic byproducts in alleviating many serious diseases (Kaur and Maini, 2001).

According to Prakash et al. (2002) there are numerous compounds in leafy vegetables that function as antioxidants.

Beta- carotene has been called nature's most potent naturally occurring antioxidant. Recent research suggested that beta carotene may work best in concert with other antioxidants. Leafy vegetables like spinach and broccoli are good sources of beta-carotene (Mohandas and Kowsalya, 1999).

Ascorbic acid or vitamin C is a monosaccharide antioxidant found in leafy vegetables. As it cannot be synthesized in humans, it must be obtained from the diet.

Vitamin C being water soluble enters tissues easily and acts to neutralise the toxic free radicals generated by metabolic process (Nambiar and Sheshadri, 2000).

According to Lakin et al. (2003) vitamin E is the antioxidant that prevents cancer promoting chemicals from accumulating in the body. Flavanoids present in green leafy vegetables helps to reduce the risk of heart disease, lowering blood pressure and reduce cholesterol (Saxena, 1999).

Antioxidants delay initial immune disorders by extending the period between HIV infection and appearance of clinical symptoms of AIDS (Bestone, 2010).

Green leafy vegetables also provide a variety of phytochemicals like beta carotene, lutein, quercetin, zeaxanthin, indoles, and isothiocynates, which helps to reduce the risk of chronic age related neurological degenerative diseases (FAO, 1997).

Carotenoids, lutein, zeaxanthin present in leafy vegetables are concentrated in the eye lens and macula region of the retina and they play a protective role in the eye against cataract and age related macular degeneration and also zeaxanthin to prevent the risk of cancers, heart disease and stroke (Mini and Krishnakumari, 2004).

2.3 Medicinal value of leafy vegetables

Leafy vegetables are intimately related to Indian system and culture and have been used both for their nutritive as well as medicinal value (Jana and Das, 2007). Leafy vegetables have been used in the indigenous system of medicine since ancient times and referred by the three great scholars of Ayurvedic system, the Charaka, Sushrut and Vagbhatt.

Siddique et al. (2004) carried out a study on collection of indigenous knowledge and identification of endangered medicinal plants by questionnaire survey in Barind tract of Bangladesh. A total of hundred plant species were reported to be used by the people to cure major ailments, including diarrhoea, rheumatism, fever, headache, asthma, eye disease and wounds. In majority of cases a decoction of leaves, stems, fruits, roots, tubers and rhizomes are drunk or rubbed on the body to cure ailments.

Corke et al. (1999) extracted a red dye from different amaranth varieties could be used as a natural food additive. It could be a very valuable source for combating undernutrition and malnutrition.

Prajapati et al. (2004) pointed out that the basella leaves are used as a cooling medicine in digestive disorders and is also to be beneficial in fistulae, pustlaes, gonorrhea and inflammatory tumours.

Mini and Krishnakumari (2004) observed that chekkurmanis leaves pounded with roots of pomegranate and leaves of jasmine are used against eye trouble. The plant is reputed for its high nutritive and medicinal value and therefore it

is popularly known as "multivitamin green "and multi mineral packed leafy vegetable.

Phanikumar (2010) found that daily consumption of moringa leaf powder which is high in vitamin C can prevent eye disease, skin disease, heart ailments, is also high in calcium, which is good for strong teeth and prevention of osteoporosis.

The daily consumption of fresh drumstick leaves reduce the blood pressure and the blood glucose level (Kurian et al., 2007).

Agathi leaves are useful for curing sore mouth. Because of its vitamin A rich nature, regular inclusion of agathi leaves and flowers in food would help to avoid eye defects like night blindness (Jana and Das, 2007).

Underwood (2000) observed that the use of ponnaviram leaves helps to cure sore eyes, rheumatism, typhoid, asthama and leprosy. The herb forms an ingredient of the patented indigenous herbal drug "Liv 52".

The leaves of mint are coolent, antipyritic, carminative, antiplasmodic and are used against diarrhoea, vomiting and other stomach disorders (Lakin et al., 2003). The fresh or dried fenugreek leaves prevent constipation, removes indigestion, stimulates spleen and liver and is appetizing and diuretic (Smolin et al., 2000).

Cabbage has anti-cancer property it protects against bowel cancer due to the presence of indol-3-carbinol and is also said to help in prevention of Alzheimer's, which is believed to be caused by oxidative stress in brain cells. The leaves of cabbage provides silicon in the form of silicic acid which interferes with the absorption of aluminium (Lee, 2010).

2.4 Processing and preservation of leafy vegetables

Green leafy vegetables are mainly preserved by drying and dehydration. Certain processed products like powders, chutneys, soups, beverages are prepared from leafy vegetables. Owing to high moisture content of leafy vegetables, they are highly perishable and result in heavy loss to the growers due to non availability of sufficient storage, transport and proper processing facilities at the production point (Pande et al., 2000).

Mohandas and Kowsalya (1999) conducted a study on beta-carotene retention of selected green leafy vegetables using different methods and concluded that freeze drying and microwave drying could be considered as the best methods of dehydration as 90 per cent carotene retention was obtained in these methods.

Verma (2001) developed a number of recipes in which dehydrated leafy vegetables were incorporated .These have been tried on various rural population groups for combating iron and vitamin A deficiency.

Kumari and Singh (2004) incorporated amaranth to enrich the iron content of maize based ladoos and concluded that if such supplementation trials with locally available nutritious foods be continued to pregnant women ,the health status of women can be improved to a great extent leading to reduction in number of LBW babies.

Fuglie (2005) reported that 8g servings of dried moringa leaf powder will provide a child within 1-3 years with 14 per cent of protein, 40 per cent of calcium, 23 per cent of iron and nearly all the vitamin A the child needs in a day.

Shenoy et al. (2000) studied the possibility of incorporating dried curry leaf powder in common dishes and found higher levels of beta-carotene, iron, calcium and dietary fiber in the product.

Fatima et al. (2001**)** conducted a study on microwave drying of selected greens and their sensory characteristics. They concluded that the microwave drying was highly suitable for greens such as amaranth; moderately suitable for soya and fenugreek and less suitable for coriander and mint.

Chandershekar (2003) suggested that based on the traditional food habits of the communities, weaning foods using local technology namely roasting, malting and drying and incorporating locally used millet, ragi and green leafy vegetables like amaranthus and drumstick leaves have been formulated and efficacy tried out on infants and preschool children.

Kushwaha et al. (2003) observed significant increase in serum retinol level of experimental group indicating the effectiveness of spinach leaves powder incorporated food products in raising serum retinol levels.

Rekha et al. (2000) formulated soup mixes from Indian dill and palak and found that they were highly acceptable at 5 per cent level of incorporation.

The procedure for the preparation of instant chutneys with mint and gogu was standardized by Satyanarayan et al. (2001) using shade dried leaves.

2.5 Antinutritional factors in leafy vegetables

A major factor which is restricting the utilization of leafy vegetables in nutrition is the presence of a diverse array of antinutritional factors. Anti nutritional factors found in leafy vegetables are cholicesterase inhibitor, nitrates, alkaloids, glucosinolates, oxalates, phytates, tannins and saponins (Jana and Das, 2007).

The oxalates present in leafy vegetables are of concern because free oxalates bind essential dietary divalent minerals, primarily calcium and make them nutritionally unavailable (Mini and Krishnakumari, 2004).

Accumulation of oxalates was higher in leaves than in stem and among seasons, higher content was noticed in summer than rainy season Krishnakumary (2000).

Drying and storage had no significant effect on the antinutrient content of leafy vegetables, while blanching and cooking resulted in significant reduction in oxalic acid, phytic acid and polyphenol content. (Shashikala et al., 2003).

The most obvious method of reducing the risk of oxalate poisoning is to cook the leaves. Blanching is commonly used for spinach and other vegetables and the effect is to reduce the level of water soluble oxalates (Mini and Krishnakumari, 2004).

Gupta and Wagle (1998) studied antinutritional factors in cauliflower (Brassica oleracea) chenopodium (Chenopodium album), chickpea (Cicer arietinum) ,mustard (Brassica compestris) and spinach (Spinacea oleracea) and found that the

maximum amount of nitrate (5.35%) saponin (2.45%) and oxalate (8.69) were noticed in spinach .No tryptic activity was noted in chick pea.

2.6 Bioavailability of nutrients from leafy vegetables

Bioavailability is defined as the fraction of an ingested nutrient that is available to the body for the utilisation in normal physiological functions or for storage (Jackson, 1997).

According to Nambiar and Seshadri (2001) sautéing of green leafy vegetables retains a good amount of beta carotene. Holf et al. (1998) suggested that addition of fat or oil during processing increases the bioavailability of beta carotene.

Purushothaman and Paul (2000) found that mild cooking can enhance the bioavailability by releasing the free carotenoids from carotenoid protein complexes of green leafy vegetables.

A study conducted by Agte et al. (2002) to assess the micronutrient content and bioavailability of iron, zinc, and copper in 24 leafy vegetables based meals and meals based on cereals and legumes revealed that average bioavailable density in leafy vegetables based diet was 3.6 times higher than the value for cereal legume based meals indicating leafy vegetables as promising fortificant iron for vegetarians. It was also founds that there was highly significant rise in beta carotene ,folic acid ,and riboflavin in leafy vegetables meals as compared to the other meal indicating the potential for increasing these three vitamin levels using leafy vegetables.

A study conducted by Kumari and Singh (2004) found that cooking in iron utensils increased total as well as available Fe content of greens.

The bioavailability of carrot from green leafy vegetables is low because of their entrapment and complexing to proteins in chloroplasts and within cell structures (Holf et al., 1998). Reddy (1999) stated that carotene absorption was higher from papaya than from green leafy vegetables, because of difference in fibre content.

Green leafy vegetables, eventhough the richest source of beta carotene, showed lower values for bioavailability and this is due to their high fibre and pectin content which interferes with its release and absorption (Deming et al., 2000).

2.7 Nutrition intervention for enhancing consumption of leafy vegetables through various methods and its impact

Evaluation of a multi media package on value addition of green leafy vegetables among rural women in Pantnagar showed more gain in their knowledge when electronic media was used along with training and literature (Rani and Singh, 2006).

According to Gopalan (2000) it is important to harness the imaginative use of appropriate channel of communication to convey essential health and nutrition messages to the crucial segments of our population.

An awareness creation programme for women on nutrition through green leafy vegetables conducted by Hemalatha and Prakash (2002) showed a definite increase in the frequency of consumption of leafy greens.

Yagammi et al. (2002) concluded that the pre and post natal education to the mothers created much awareness on feeding practices of the infants and resulted in better growth pattern of infants in experimental group than the control group.

Pandian et al. (2002) in their study on video education, a tool for knowledge gain concluded that there is ample scope for communication of farm technologies capsulated in the form of video lessons and it is imperative for extension machinery to make effective use of video for changing the attitude of farmers including farm women. They also carried out a study on video education (related to squash preparation) and concluded that knowledge retention of farm women respondents on the selected video enterprise viz., squash preparation was a function of farm size, farming experience, economic motivation and extension agency contact, involvement in decision making, level of aspiration, innovativeness and information processing behavior.

Joshi and Singh (2002**)** developed and evaluated educational booklet for nutrition education and concluded that the structured dissemination of knowledge in form of educational booklet did have a positive impact in raising the levels of knowledge in the area of health and nutrition. The study demonstrated that the nutrition and health related messages incorporated into educational material (booklet) were successfully transmitted and received by the target groups of women as there existed a felt need in this area.

Deshpande et al. (2003) in their study on the nutritional profile of farm women of Madhya Pradesh and impact of nutrition education on the inclusion of soy bean products concluded that only a few women had rudimentary knowledge about nutrition which could help the family to consume a low cost balanced diet. Nutrition

education has a paramount role in the improvement of nutritional status of the rural population.

Meenambigar and Seetharaman (2003) in their study on role of media in rural communication concluded that an appropriate combination of communication media can make people apply knowledge as well and motivate them to seek more information, for this mass media and communication channels have to be utilized effectively.

In a study conducted by Razeena (2000) it has been proven that the actual impact of educational programme was the adoption of the gained knowledge and it was found that teaching hasd significance effect on the adoption of practices.

Cicil (2000) in her study reported that the impact of educational programmes had significant positive role at all level in terms of nutritional knowledge gained and change in attitude towards the consumption of mushroom.

Kumar (2003) has reported that video filim was an effective material for imparting nutrition education pertaining to vitamin A to middle school children which resulted in improving their knowledge.

The results of the Nutrition Education Programme imparted to a group of rural women by Deshpande and Bargale (2006) indicated that the women in the study area improved their dietary habits after the participationin the nutrition education programme. Analysis carried out for observing the frequency of soya based food intake before and after the education programme indicated that the intake is increased in the daily diet.

Materials and Methods

3. MATERIALS AND METHODS

This chapter deals with the methodology followed in this study entitled" Promoting consumption of green leafy vegetables among rural women through participatory approach".

The methodology is discussed under the following headings.

3.1 Locale of the study

3.2 Selection of the respondents

3.3 Variables selected for the study

3.4 Research instruments used for the study

3.5 Development of nutrition education materials

3.6 Conduct of nutrition education and distribution of planting material

3.7 Impact assessment of the programme

3.8 Data processing and analysis

3.1 LOCALE OF THE STUDY

The study was conducted in five Anganwadi centers selected at random from hundred Anganwadi centers of Athiyannoor ICDS Block in Thiruvananthapuram district. The five Anganwadi centers were from Aralummoodu, Athiyannoor, Kaithottukonam, Pathamkallu and Vazhimukku of Athiyannoor Block.

3.2 SELECTION OF RESPONDENTS

One hundred rural women who are participants of the ICDS programme were selected from the five Anganwadi centers formed the study sample. The services of

ICDS functionaries like CDPO,Supervisors and Anganwadi workers were also utilized for the study.

3.3 VARIABLES SELECTED FOR THE STUDY

Based on the objectives, review of literature, discussions with experts and observations made the researcher, the following dependent and independent variables were selected for the study**.**

3.3.1 Dependent Variables

In this study knowledge and attitude about green leafy vegetables formed the dependent variables. Knowledge and attitude have been measure using the knowledge test and attitude scale developed for the purpose.

3.3.1 Knowledge on green leafy vegetables and their importance

For the present study in order to measure gain in knowledge, a simple teacher made test was constructed following the procedure adopted by Santhoshkumar (1990) with slight modifications. A set of twenty closed ended questions were developed. This was also approved by a panel of experts in the field of Home Science. Care was taken to ensure that the questions covered a wide range of subject matter selected for the study.

3.3.1.2 Attitude towards green leafy vegetables

Attitude of the respondents towards green leafy vegetables was measured by developing an attitude scale using Edward method (1957).After discussion with

experts, fifteen statements were selected. Eleven positive and four negative statements were included in the attitude scale. Responses for each item were obtained in a five point scale ranging from 'strongly agree' to' strongly disagree'.

3.3.2 Independent Variables

Based on the review of literature and discussions with experts selected independent variables that were expected to be related with the dependent variables were identified. The independent variables selected for the study are given below.

3.3.2.1 Age

It refers to the number of calendar years completed by the respondents at the time of interview. This variable was measured by directly asking the respondent the number of years she had completed at the time of investigation. Then the responses were categorized as below for statistical analysis.

Category	Age	Score
Young	$\leq$ 35 years	1
Middle	36-55 years	2
Old	>55 years	3

Scoring pattern suggested by Sindhudevi (1994) was adopted with slight modification in the study.

3.3.2.2 Caste

The categorization followed in the Census Report of India (1991) was adopted in this study. All the respondents in the study population were classified into following category and scores were assigned as indicated against each other for the purpose of classification.

Category	Score
Forward caste	3
OBC	2
SC/ST	1

3.3.2.3 Family Size

In the present study family size was measured by taking in to consideration the specific number of members in the family of the respondents.

Category	Number of family members	Score
Small	1-4	1
Medium	5-7	2
Large	Above 7	3

3.3.2.4 Type of Family

In this study family type means nuclear family or joint family. Nuclear family consists of husband, wife and their unmarried children whereas joint family is composed of grand parents and married sons and daughters with their spouses. The

respondents were asked to indicate the type of family whether nuclear or joint type. A nuclear family was given the score as 'one' and joint family score as 'two'.

Supe and Singh (1968) in their study on dynamics of rational behavior of Indian farmers, nuclear family was given the score of 'one' and joint family a score of 'two'. The same procedure was followed in this study also.

Category	Score
Nuclear	1
Joint	2

3.3.2.5 Educational Status

It is defined as the formal education attained by the respondent (Jayalekshmi, 2001). Educational status of the respondents was measured using a scoring system developed by NationalFamilyHealthSurvey-2 (2001) as listed below.

Educational status	Score
Illiterate	0
Upper primary	1
High school	2
Pre-degree	3
Degree/Diploma/Professional courses	4
PG and above	5

3.3.2.6 Occupational Status

The occupation is defined as the position of the respondent, which acts as a source of income in which he spends major part of his time and attention. The occupational status of the different family members was assessed and grouped as follows.

Occupational status	Score
Unemployed	0
Government sector	1
Private sector	2
Casual labourer	3
Farmer	4

3.3.2.7 Family income

Monthly family income from all sources was taken into account for measuring this variable. The scoring procedure was adopted from Kuppuswamy's modified socio-economic status scale (2006).

Family income(Rupees)	Score
>= 979	0
980-2935	1
2936-4893	2
4894-7322	3
7323-9787	4
9788-19574	5
<=19575	6

3.3.2.8 Land holdings

The total land holdings of the respondents was assessed and grouped as follows.

Land holding size	score
Nil	0
Upto 0 .1 acre	1
0.1-0.25 acre	2
0.25-0.50 acre	3
0.50-1 acre	4
Above 1 acre	5

3.3.2.9 Livestock

The respondents were asked about the possession of their livestock. A score of one was given for animal rearing, two for poultry rearing and three for both animal and poultry rearing. A score of zero was assigned for non possession of livestock.

Livestock possessed	Score
Nil	0
Animal rearing	1
Poultry rearing	2
Both	3

3.3.2.10 Type of house

Type of house of the respondents was assessed and grouped as follows.

Type of house	Score
Own	1
Rented	2
Leased	3

3.3.2.11 Source of drinking water

The source of drinking water of the respondent was assessed and scores were allotted as shown below.

Source of drinking water	Score
Own pipe	1
Own well	2
Common well	3
Common pipe	4

3.4RESEARCH INSTRUMENTS USED FOR THE STUDY

3.4.1 The investigator collected general information by personally interviewing the subjects using an interview schedule. The interview schedule helped to elicit information on the socio-economic background of the selected families, as well as personal characteristics, dietary habits with special reference to consumption of green leafy vegetables and collection of traditional recipes from leafy vegetables from the respondent.

3.4.2 A knowledge test to determine the knowledge level of the rural women about green leafy vegetables and their nutritional significance.

3.4.3 An attitude scale to assess the attitude of the rural women towards green leafy vegetables and their consumption practices.

3.4.4 Sensory evaluation of the products developed was done using five point scale as suggested by Amerine et al. (1965).

3.4.1 Interview Schedule

Interviewing is considered as one of the reliable methods of collecting data (Rangaswamy, 1989).Besides, this technique also permits exchange of ideas and information (Sindhu, 1984).

An interview schedule was constructed to collect information about the personal variables like age, sex, family type, family size, family income, and educational status of the rspondents. Also information was collected about the socio-economic variables like occupational status, monthly income, size of land holding, type of house, source of drinking water, and cultivation details from the respondents. The interview schedule constructed is given in Appendix I.

Data on the dietary habits and nutrition related practices of the respondents was assessed using a questionnaire. The questionnaire was pre-tested and standardized before administering among the respondents (Appendix II).

Frequency of use of different leafy vegetables in the dietaries of respondents was also assessed. In this study frequency of use of leafy vegetable was measured using a 5 point rating scale. The locally popular leafy vegetables were listed and the respondents were asked to indicate the frequency of use of the leafy vegetables. The rating scale was prepared, pretested and standardized before administering among the respondents.

The percentage of total score of each leafy vegetable used by respondents was calculated separately using the formula suggested by Reaburn et al. (1979).

Plate: 1. Collection of personal and socio economic characteristics from the respondents

Plate2: Products selected for demonstration after acceptability test

Percentage of total score for each green leafy vegetable

$$\frac{R_1S_1+R_2S_2+R_3S_3+\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots R_nS_n}{n}$$

S_1: Scale of rating given for frequency of use of a green leafy vegetable (i=1, 2, 3, …….5)

R_1: Per centage of respondents coming under each frequency group (i=1, 2, 3,……5)

n: Maximum scale rating (n = 6)

The mean value calculated using the formula given below

Mean score for each green leafy vegetable

$$=\frac{R_1S_1+R_2S_2+R_3S_3+\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots R_nS_n}{100}$$

The percentage of respondents using each green leafy vegetable and also their preference were thus ascertained.

3.4.2 Construction of Nutrition Knowledge Test

Knowledge is a body of understood information possessed by an individual or by culture, which is in accordance with established facts (Henersons et al., 1987). In order to measure the knowledge level of the rural women regarding green leafy vegetables, a nutrition knowledge test was developed by means of a simple teacher made objective type test constructed following the procedure adopted by Santhosh Kumar (1990) with slight modifications. Care was taken to ensure that the questions covered the entire range of subject matter selected for the study. An item pool of 35 statements relevant to green leafy vegetables on selected areas such as nutritive needs, nutritive value, medicinal importance, bioavailability and antinutrient factors was prepared. These statements were prepared from relevant literature. Both positive and negative statements were formed. Care was taken to use simple and clear statements with no ambiguity in language or idea to avoid confusion and doubts. A jury of subject experts analysed the statements. In light of the suggestions made by experts, 25 statements were selected and were pre-tested. Based on the result of the pre-test five statements were discarded and remaining 20 items were selected for constructing the knowledge test.

The responses were collected in a dichotomous pattern i.e., Yes or No. Each correct response was given a score of one and the incorrect response was given a score of zero. Finally the scores were added up to get the knowledge score for each respondent. The maximum score for the test developed was 20 and the minimum score was 0.The constructed knowledge test administered is given in Appendix III.

3.4.3 Measuring Attitude of the Respondents towards green leafy vegetables

Thurstone (1946) defined attitude as the degree of positive or negative effect associated with some psychological object towards which people can differ in varying degrees. As attitude cannot be directly measured and have to be inferred from the opinion and expression of the individual, it is imperative to have as many as clear and simple statements as to provide opportunity to the respondents to reveal the extremes of his or her attitude (Bagchi, 1999).

Attitude of the respondents towards consumption of green leafy vegetables was measured by developing an attitude scale using Edward method (1957). For measuring the attitude of the respondents towards consumption of green leafy vegetables an attitude scale was constructed. For these 25 statements showing both positive and negative attitude towards consumption of green leafy vegetables were collected from available literature. These were later circulated among the faculty members and students for selecting the most appropriate statements for the scale. Finally fifteen statements, eleven positive and four negative statements were selected for the attitude scale. Responses for each item were obtained on a five point scale ranging from 'strongly agree' to' strongly disagree'.

The scores assigned were "strongly agree-5", "Agree-4", "Undecided-3", "Disagree-2", "Strongly disagree-1".Negative statements were scored in the reverse manner. The attitude score of the respondents was obtained by adding up the score corresponding to their response pattern for each statement. There was thus a possibility for a respondent receiving a maximum score of 75 and a minimum score of 0.The attitude scale developed is presented in AppendixIV. The attitude scale developed was administered to the respondents.

3.4.4 Collection of recipes out of green leafy vegetables from the respondents

As part of the study a number of recipes of green leafy vegetables were collected from the respondents. The ingredients and method of preparation of the recipes are given in AppendixV.

3.4.5 Product formulation

Out of the recipes collected five recipes, this can be prepared easily and were selected based on factors like cost, local availability and adaptability to the supplementary feeding programme of ICDS. The five recipes selected were

1. Amaranth Squash
2. Drumstick leaves with Scrambled egg
3 Chekkurmanis Cutlet
4 Weaning food
5. Wheat Rawa Kichadi

3.4.6 Sensory evaluation of products by expert panel

In order to carry out sensory evaluation of the products formulated by incorporating the green leafy vegetables, the five point scale performa as suggested by Amerine et al., (1965) was utilized. Five products namely amaranth squash, drumstick leaves with scrambled egg, chekkurmanis cutlet, weaning mix and wheat rawa kichdi were prepared and served to 15 judges. After serving small quantities to the judges, their views were taken on the Five Point Rating Score Card. The score of 1 indicated poor acceptability category, 2 for satisfactory, 3 for good, 4 for very good and 5 for excellent acceptability category. The 5- point scale is given in AppendixVI.

The evaluation was based on color, texture, flavour, taste and overall acceptability with five as excellent in all respects and one for poor acceptability. Sensory evaluation was done once a day for three consecutive days in order to check the consistency of results obtained.

3.4.7. Selection of products for demonstration

Based on the results of the sensory evaluation conducted, three recipes namely chekkurmanis cutlet, drumstick leaves with scrambled egg, wheat rawa kichdi were selected for the conduct of the nutrition intervention programme later.

3.5 DEVELOPMENT OF NUTRITION EDUCATION MATERIAL

3.5.1 Leaflet

A leaflet entitled "*Elakkarikal bhashiku Aarogyam samrakshiku"* was prepared in Malayalam. The leaflet contains the nutritional importance, medicinal values and some suggestions for the preparation of green leafy vegetables without losing their nutritive quality. A copy of the leaflet is appended in Appendix VII.

3.5.2 Video show

For the purpose of nutrition education related to the use of green leafy vegetables a video film was also produced under the present study. The title of the film was"*Elakkarikal bhashiku Aarogyam samrakshiku".*

Script

Script refers to a general planning followed for producing media or to a specific model for sequencing visuals and narration that will be produced later. It makes clear how shot sequences are interrelated and reveals continuity (Millerson, 1995). A theme for the programme has been developed which included explanation on the need for including green leafy vegetables in the diet, different types of locally available green leafy vegetables and their nutritive value, and process of preparation of drumstick leaf powder.

Shooting

This was done with the help of a camera. Shooting was carried out in different places at different times. The whole shooting was completed within one week. Shooting of each item was done shot by shot according to the scenes of the script

Editing

After the shooting of video film, editing was done by the expert team of Media Center. Through editing raw material was arranged in proper sequence, extra scenes and distracting sounds were removed and continuity was brought in the scenes according to the preplanned script. Thus the whole film came out in a smooth flow. The editing procedure was done in the Media Center of Neyyattinkara.

Dubbing of commentary and background music

After editing, a commentary was recorded and fed in order to maintain continuity in the film. The commentary was recorded by the investigator with the help of a head phone and sound recording system of the computer.

Background music

As an important part of the visual display an instrumental music was incorporated as per the demands of the scenes as well as to fill up gaps, thereby maintaining the continuity of the film. A copy of the video disc is appended in Appendix VIII.

3.6 Conduct of the nutrition education programme

The nutrition education programme was conducted for the selected hundred rural women who are participants of the ICDS programme. The nutrition education programme was carried out by the method as suggested by Sheth et al. (2006) with some modifications in the following manner.

Session 1: In this session first the respondents were given a brief introduction of the nutriton education programme. This session included a lecture on the importance of the green leafy vegetables in human nutrition and their role in preventing degenerative diseases. A video show on green leafy vegetables was also included in this session. Several types of green leafy vegetables, their cultivation methods, medicinal value, nutritional importance, and good cooking methods of green leafy vegetables without nutrient loss and preparation of drumstick leaf powder were

Plate3:Conduct of nutrition education programme

Plate4: Nutrition education with help of video show

incorporated in the video show. At the end of the session the leaflet prepared was given to the trainees.

Session 2: Selected five recipes incorporating green leafy vegetables were demonstrated in the training. The participants were told the names of the recipes and were asked if they had any practical knowledge about the ingredients or the recipes. They were encouraged for verbal feedback. Care was taken to see that there was good participation of the respondents in the session.

Session 3: In this session the information imparted in the previous two sessions were summarized. As part of the nutrition education programme, the investigator collected recipes incorporating green leafy vegetables from the respondents. A recipe contest on dishes out of green leafy vegetables was also carried out in this session. The best two products were selected from that and prizes given for those two participants. These activities were under taken so as to involve the respondents in the programme for ensuring their participation.

The feeding programme in the five selected anganwadi centers for a week was studied to find out the use of green leafy vegetables before the conduct of the nutrition education programme. After the conduct of the nutrition education programme the menu followed in the anganwadi was again studied to find out the change if any in the feeding pattern whether any leafy vegetable being included in the feeding programme.

Session 4 : At the end of the nutrition education programme planting materials of selected leafy vegetables like drumstick (*Moringa oleifera),* Amaranthus (*Amaranthus tricolor*) , Basella (*Basella alba*), Agathi (*Sesbania grandiflora*) and water leaf (*Talinum triangulare*) ,were distributed and a green leafy vegetable garden

Plate5: Planting material given for cultivation

Plate6: Conduct of recipe contest of green leafy vegetable dishes

was raised with the help of a skilled labourer in the selected five anganwadis. The leafy vegetable garden was raised at the five anganwadi centers with the active involvement of the Anganwadi workers as well as beneficiaries of the anganwadies.The soil mixture was prepared using coir pith compost, cow dung, neem cake and red loam soil.

3.7 Impact assessment of the programme

In order to evaluate the impact of nutrition education, change in knowledge and attitude of the respondents was assessed after a gap of three months. The knowledge test and attitude scale was once again administered to the respondents as for a post test and the scores were calculated as done earlier. The maintenance of the leafy vegetable garden in the anganwadis was monitored and the inclusion of green leafy vegetables in the diets of the respondents and the supplementary feeding programme of the Anganwadies was also assessed after three months.

3.8 Data processing and analysis

The data collected were scored, coded, consolidated and subjected to statistical analysis and interpretations. The statistical procedures used in the present study were:-

(a) Frequency: It was calculated to find out the number of respondents in a particular cell.

(b) Percentage: Percentage was used for simple comparison and was calculated by dividing the frequency of a particular cell by total number of respondents and multiplying by 100.

Plate7: Plants raised in anganwadi centers

Plate7: Plants raised in anganwadi centers

$P = n/N \times 100$

Where: n= frequency of a particular cell

N= total number of respondents in that particular cell

P = Percentage

(c) Mean Score: Mean score was calculated by dividing the sum of observations by the total number of observations.

$$X = \frac{\Sigma xi}{n}$$

Where: X= Mean Score

Σxi = Sum of all observations

i= 1, 2, 3,4, …….N

N= number of observations in a group

(d) Paired T-test: In order to compare observations in respect of each respondent before and after exposure to nutrition education, paired t-test was applied.

Formula used: $t = \frac{d}{S/\sqrt{n}}$ $d \sim t$ with (n-1) degrees of freedom

Where: d= difference of two exposure levels and

n= total number of respondents in a group.

$$S^2 = \Sigma \frac{(di - d)^2}{n-1}$$

This tcal was compared with the table value of't'at (n-1) degrees of freedom and α level of significance.

(e) Kruskal Wallis test: In order to find out the overall acceptability of the products.

Results

4. RESULTS

The present study emphasizes on the utilization of green leafy vegetables as a source of micro-nutrients and a home based remedy and preventive measure for widely prevalent deficiency diseases. A group of women were given nutrition education through participatory approach by means of discussions, demonstrations, video show and leaflet to improve their own as well as their families' nutritional status through consumption of micronutrient rich green leafy vegetables. The results obtained are presented under the following headings.

4.1 Personal characteristics of the respondents
4.2 Socio-economic characteristics of the respondents
4.3 Food consumption practices with special reference to green leafy vegetables
4.4 Existing weekly menu in the selected Anganwadi centers
4.5 Collection of traditional recipes of green leafy vegetables
4.6 Acceptability of green leafy vegetable recipes
4.7 Impact evaluation of nutrition education programme

4.1 Personal characteristics of the respondents

Personal characteristics of selected one hundred respondents with reference to age, caste, family size, family type and educational status, were assessed.

4.1.1 Age of the respondents

Table 3, reveals that majority of the respondents (56 per cent) belonged to the young age group (less than or equal to thirty five years), forty one per cent of the

respondents belonged to the middle age group (36-55 years) and three per cent constituted those in the old age group above fifty five years.

4.1.2 Caste of the respondents

The caste wise distribution of the respondents as depicted in Table 3 proved that majority of the respondents (60 per cent) belonged to Other Backward Communities and thirty two per cent were from forward communities. Only eight per cent respondents belonged to Scheduled Caste groups.

4.1.3 Family size

Table 3 indicated that majority ie, eighty six per cent of the respondents belonged to small family category with one to four members. Eight per cent of the respondents belonged to the medium sized families with five to seven members and six percent belonged to large families with more than seven members.

4.1.4 Family type

Table 3 depicted that majority of the respondents (90 per cent) belonged to nuclear family and ten percent belonged to joint family.

4.1.5 Educational status of the respondents

The educational status of the respondents when assessed was seen to range from upper primary to post graduation and above. The educational status of the respondents revealed that 35 per cent had studied upto pre-degree and 20 per cent had studied upto high school. Twenty per cent had studied upto upper primary level, 9

per cent had studied upto degree level and 16 per cent had studied upto post graduation and above.

Table3: Distribution of respondents based on their personal characteristics (n=100)

Variables	Category	Score	Number	Percentage
Age of the respondent	Young (≤ 35 years)	1	56	56
	Middle (36-55 years)	2	41	41
	Old (>55 years)	3	3	3
Caste of the respondent	Forward caste	1	32	32
	OBC	2	60	60
	SC/ST	3	8	8
Family type	Nuclear family	1	90	90
	Joint family	2	10	10
Family size	Small(1-4 members)	1	86	86
	Medium(5-7 members)	2	8	8
	Large(above 7 members)	3	6	6
Educational status	Upper primary	1	20	20
	High school	2	20	20
	Pre-degree	3	35	35
	Degree/Diploma	4	9	9
	PG and above	5	16	16

4.2 Socio-economic characteristics of the respondents

Socio-economic characteristics of selected one hundred respondents with reference to employment status, monthly income, type of house, availability of

drinking water, land possession, livestock possessed and details of cultivation were assessed.

4.2.1 Employment status of the respondents

Employment status of the respondents revealed that 57 per cent of the respondents were unemployed. It was also observed that 20 per cent were having government jobs and 7 per cent were engaged in private sector. Only 9 per cent of the respondents were engaged in agriculture and 7 per cent were labourers.

4.2.2 Monthly family income of the respondents

Table 4 revealed that a considerable percentage (ie., 24 per cent) of the respondents had a monthly income within the range of Rs 7323-9787; 23 per cent of the respondents had an income ranging from Rs 4894-7322; 18 per cent of the respondents belonged to a low income category with a monthly income ranging from Rs 2936-4893; 11 per cent of the respondents belonged to the very low income range of Rs 980-2935 while 17 per cent of the respondents belonged to high income ranging from Rs 9788-19574 and 7 per cent of the respondents belonged to very high income group.

4.2.3 Type of house

Majority of the respondents (80 per cent) lived in their own house and 13 per cent respondents lived in rented house and seven per cent in leased buildings.

4.2.4 Source of drinking water

From Table 4 it is clear that most of the respondents (54 per cent) were using their own tap and 32 per cent of the respondents were having their own well. Common well used by 8 per cent of the respondents and common tap was used by 6 per cent of the respondents.

4.2.5 Size of land holdings

Information related to the distribution of respondents with respect to land holdings given in Table 4 revealed that 74 per cent of the respondents had their own land upto o.1 acre and 5 per cent of the respondents were having land ranging in between 0.1-0.25 acre. Only 7 per cent of the respondents had land holding size in between 0.25-1 acre. Among this 6 per cent of the respondents possessed more than hundred cents. Only 8 per cent respondents were landless.

4.2.6 Possession of livestock

Sixty four per cent of the respondents were not engaged in any livestock rearing. Only 3 per cent of the respondents were engaged in animal rearing and 19 per cent were engaged in poultry rearing. Fourteen per cent of the respondents were engaged in both poultry and animal rearing (Table 4).

Table4: Distribution of respondents based on their socio-economic characteristics (n=100)

Variables	Category	Score	Number	Percentage
Employment status	Unemployed	0	57	57
	Government sector	1	20	20
	Private sector	2	7	7
	Casual labourer	3	7	7
	Farmer	4	9	9
Monthly income	980-2935	1	11	11
	2936-4893	2	18	18
	4894-7322	3	23	23
	7323-9787	4	24	24
	9788-19574	5	17	17
	<= 19575	6	7	7
Type of house	Own	1	80	80
	Rented	2	13	13
	Leased	3	7	7
Source of drinking water	Own tap	1	54	54
	Own well	2	32	32
	Common well	3	8	8
	Common pipe	4	6	6
Land holding size	Nil	0	8	8
	Upto 0.1 acre	1	74	74
	0.1-0.25 acre	2	5	5
	0.25-1acre	3	7	7
	Above 1 acre	4	6	6
Livestock possessed	Nil	0	64	64
	Animal rearing	1	3	3
	Poultry rearing	2	19	19
	Both	3	14	14

Table 5: Distribution of respondents based on cultivation of green leafy vegetables (n=100)

Sl. No.	Green leafy vegetables	Cultivated by the respondents	
		Number	Percentage
1	Drumstick leaves	18	18
2	Red amaranth	22	22
3	Curry leaves	38	38
4	Water leaf(Sambar cheera)	6	6
5	Chekkurmanis	16	16
6	Nil	46	46

As per Table 5 it was observed that 46 per cent of the study population did not grow leafy vegetables at all, while 38 per cent of the respondents cultivated curry leaves and 22 per cent cultivated red amaranthus in their homes. Drumstick leaves was cultivated by 18 per cent of the respondents and chekkurmanis by 16 per cent. Only 6 per cent cultivated water leaf (Sambar cheera) in their house holds.

4.3 Food consumption practices with special reference to green leafy vegetables

Diet survey was conducted as a primary step to determine the dietary profile of the respondents. The diet survey revealed information regarding food habits, food preference and frequency of use of green leafy vegetables.

4.3.1 Food habits of the subjects

Dietary habits of the respondents indicated that majority of respondents were non-vegetarians ie., about 90 per cent and vegetarians constituted only about ten per cent.

Table 6: Distribution of respondents based on their dietary habit (n=100)

Dietary habit of respondents	Distribution of respondents	
	Number	Percentage
Vegetarians	10	10
Non-vegetarians	90	90
Total	100	100

Table 7: Distribution of respondents based on their frequency of dining outside home (n=100)

Frequency of dining outside home	Distribution of respondents	
	Number	Percentage
Daily	11	11
Frequently	36	36
Occasionally	53	53
Total	100	100

Results of Table 7 revealed that majority of the respondents (53 per cent) took food outside home only occasionally while thirty six per cent of the respondents

were found to dine out frequently and eleven per cent of the respondents were found to take food outside home at least once daily.

Table 8: Distribution of families based on use of green leafy vegetable preparations (n=100)

Method of preparation of green leafy vegetables	Distribution of respondents	
	Number	Percentage
Thoran	80	80
Fried form (Ulath)	43	43
Curries	23	23
Aviyal	8	8
Weaning food	3	3

From Table 8 it is clear that most of the families (80 per cent) were using green leafy vegetables in the form of thoran (using coconut) and forty three percent used them in the fried form (using oil). Twenty three per cent of families were including green leafy vegetables in curries whereas eight per cent included leafy vegetables in aviyal, which is a mixed vegetable preparation of Kerala. A very low (3 per cent) were including green leafy vegetables in preparing weaning food for their children.

4.3.4 Frequency of use of green leafy vegetables by the respondents

Frequency of use of various green leafy vegetables among the respondents was assessed using the Reburn's scale. Data showing the frequency of use of green leafy vegetables in the daily diet thus ascertained is shown in the Table 9.

Table 9: Frequency score on consumption of green leafy vegetables by the respondents (n=100)

Green leafy vegetables	Daily (%)	Thrice a week (%)	Twice a week (%)	Once a week (%)	Occasionally (%)	Never (%)	Total	Frequency score
Red amaranthus	0	10	22	18	50	0	100	58.4
Green amaranth	0	5	10	25	60	0	100	52.0
Drumstick leaf	0	8	16	10	66	0	100	53.2
Agathi	0	0	0	0	27	73	100	25.4
Water leaf	0	0	0	3	16	81	100	24.4
Cowpea leaf	0	0	0	0	12	88	100	22.4
Cabbage	0	16	21	13	50	0	100	60.6
Basella	0	0	0	0	6	94	100	21.2
Cauliflower	0	0	8	16	76	0	100	46.4
Chekkurmanis	0	3	6	4	87	0	100	45.0
Coriander	46	34	18	2	0	0	100	82.4
Curry leaves	70	30	0	0	0	0	100	94.0

From Table 9 it can be seen that coriander and curry leaves were the only leaves that were used by the respondents even though these cannot be considered as leafy vegetables. Cabbage and amaranthus were found to be consumed thrice a week by 16 and 15 per cent respectively. Red and green amarantus, drumstick leaves and cabbage were consumed twice a week by 22, 10, 16 and 21 per cent respectively. Cauliflower was consumed once a week by 16 per cent. Agathi and chekkurmanis

were consumed occasionally, 27 and 77 per centof respectively by the respondents. Basella (Valli cheera) which is a locally available leafy vegetable was not consumed at all by 94 per cent of the respondents. Cowpea leaf, water leaf (Sambar cheera) and agathi were never used by 88, 81 and 73 per cent of the respondents. From the table 9 it can also be seen that the highest food frequency score were obtained by coriander and curry leaves (82.4 and 94) . Cabbbage obtained the next highest score of 60.6 followed by red amaranthus (58.4), drumstick leaf (53.2), green amaranth (52.0), cauliflower (46.4), chekkurmanis (45.0), agathi (25.4), water leaf (24. 4), cowpea leaf (22.4) and Basella 21.2 respectively.

4.4 Existing feeding programmes in the selected Anganwadi centers

In the present study existing supplementary feeding programme in five selected anganwadi centers were studied in order to find out the use of green leafy vegetables in the supplementary feeding programme.

Table10: Existing weekly menu in selected anganwadies

Name of anganwadi centre	Weekly menu in each days						
	Time	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
Kaithottukonam	11.00	Rice flake with jaggery	Rice flake with jaggery	Rice flake with jaggery	Rice flake with jaggery	Rice flake with jaggery	Rice flake with jaggery
	12.30	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram
	3.00	Wheat uppuma	Wheat uppuma	Milk and Egg	Banana and Bread	Rawa uppuma	Greengram
Aralummoodu	11.00	Rice flake with jaggery	Rice flake with jaggery	Rice flake with jaggery	Rice flake with jaggery	Groundnut	Groundnut
	12.30	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram
	3.00	Wheat uppuma	Wheat uppuma	Milk and Egg	Banana and Bread	Rawa uppuma	Greengram with jaggery

Pathamkallu	11.00	Rice flake with jaggery	Rice flake with jaggery	Rice flake with coconut	Rice flake with coconut	Groundnut	Groundnut
	12.30	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram
	3.00	Wheat uppuma	Rawa uppuma	Milk and Egg	Banana and Bread	Rawa uppuma	Greengram with coconut
Athiyannoor	11.00	Rice flake with jaggery	Rice flake with coconut	Rice flake with jaggery	Rice flake with coconut	Rice flake with jaggery	Rice flake with jaggery
	12.30	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram
	3.00	Wheat uppuma	Rawa uppuma	Milk and Egg	Banana and Bread	Wheat uppuma	Greengram with coconut
Vazhimukku	11.00	Rice flake with coconut	Rice flake with coconut	Rice flake with jaggery	Rice flake with jaggery	Rice flake with jaggery	Groundnut
	12.30	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram	Kanjee with greengram
	3.00	Wheat uppuma	Rawa uppuma	Milk and Egg	Banana and Bread	Wheat uppuma	Greengram with jaggery

From the above table 10, it is evident that green leafy vegetables are not being included in the supplementary feeding programme in the selected five anganwadi centers.

4.5 Collection of traditional recipes of green leafy vegetables

As part of the study traditional recipes and uses of green leafy vegetables were collected. This was done so as to collect and document the various ways of using leafy vegetables so that they can be reviewed in future. Twenty recipes were collected and repetitions were rejected and finally ten number of recipes were selected. The ingredients and method of preparation of the recipes are given in Appendix V.

4. 6 Acceptability of green leafy vegetable recipes

Five green leafy vegetable recipes namely amaranth squash, drumstick leaves with scrambled egg, chekkurmanis cutlet, weaning food and wheat rawa kichdi were selected from the recipes collected for the study. There were selected on the basis that they can be included in the supplementary feeding programme of the state. These dishes were prepared and subjected to organoleptic evaluation by a panel of judges and the acceptance score in terms of organoleptic qualities like appearance, flavour, colour, taste, texture and over all acceptability score for each recipe were assessed. The results are given in Table 11.

From table 11 it is evident that means scores of appearance, flavour, colour, taste and texture, over all acceptability of each recipe significantly differs from each other. All the five products namely amaranth squash, drumstick leaves with scrambled egg, chekkurmanis cutlet, weaning food and wheat rawa kichdi were selected by the panel of experienced judges. Each of the products was different in

their colour, flavor, taste, appearance and texture. The result showed that any of the products is not too bad in their sensory qualities like colour, flavor, appearrnce taste and texure.

Table11: Acceptability scores of green leafy vegetable recipes

Recipes	Appearance	Flavour	Colour	Texture	Taste	Overall acceptability
Amaranth squah	55.0	34.0	48.0	41.0	36.0	83.2
Drumstick leaves with scrambled egg	55.1	53.0	54.0	57.0	54.1	122.0
Chekkurmanis cutlet	57.1	52.0	57.1	55.1	56.0	126.4
Weaning food	50.0	38.1	50.0	40.0	32.1	92.0
Wheat rawa kichadi	53.0	55.0	46.0	53.1	55.1	119.1
(Chi square)	16.87**	49.0**	53.0**	23.2**	46.1**	33.21**
Critical value	15.598					

(1)Acceptance score

Acceptance score was determined in terms of organoleptic qualities like appearance, flavour, colour, taste and texture of green leafy vegetable preparations.

Appearance

In the case of appearance chekkurmanis cutlet was found to be the best followed by drumstick leaves with scrambled egg, amaranth squash, wheat rawa kichdi and weaning food.

The mean score of appearance when compared with critical value obtained as observed from table revealed that chekkurmanis cutlet, drumstick leaves with scrambled egg, amaranth squash, and wheat rawa kichdi were not significantly different from each other while chekkurmanis cutlet and weaning food showed very slight significance difference between each other.

Flavour

The scores for flavour revealed that wheat rawa kichdi has got highest score followed by drumstick leaves with scrambled egg, chekkurmanis cutlet, weaning food, amaranth squash. When mean scores of flavour was compared with critical value, it was found that the mean scores of wheat rawa kichdi, drumstick leaves with scrambled egg, chekkurmanis cutlet; were not significantly different from each other while significant difference was noticed between wheat rawa kichdi and weaning food, wheat rawa kichdi and amaranth squash; drumstick leaves with scrambled egg and weaning food, drumstick leaves with scrambled egg and amaranth squash; chekkurmanis cutlet and weaning food, chekkurmanis cutlet and amaranth squash.

Colour

The highest score for colour was obtained by chekkurmanis cutlet followed by drumstick leaves with scrambled egg, weaning food, amaranth squash and wheat rawa kichdi.

The mean scores of colour when compared with critical value revealed that mean scores of chekkurmanis cutlet, drumstick leaves with scrambled egg,

weaning food, amaranth squash, and wheat rawa kichdi have no significant difference.

Texture

In the case of texture drumstick leaves with scrambled egg was found to be the best followed by chekkurmanis cutlet, wheat rawa kichdi, amaranth squash and weaning food.

When mean scores of texture was compared with critical value it was found that the of drumstick leaves with scrambled egg, chekkurmanis cutlet and wheat rawa kichdi have no significant difference while significant difference was noticed between drumstick leaves with scrambled egg and amaranth squash, drumstick leaves with scrambled egg and weaning food.

Taste

The taste of chekkurmanis cutlet was seen to be best followed by wheat rawa kichdi, drumstick leaves with scrambled egg, amaranth squash and weaning food.

The mean scores of taste between chekkurmanis cutlet and amaranth squash, chekkurmanis cutlet and weaning food; wheat rawa kichdi and amaranth squash, wheat rawa kichdi and weaning food; drumstick leaves with scrambled egg and amaranth squash, drumstick leaves with scrambled egg and weaning food showed significant difference. When compared with mean scores between chekkurmanis cutlet, wheat rawa kichdi and drumstick leaves with scrambled egg showed no significant difference when compared critical value.

Over all acceptability

The over all acceptability scores / pooled scores of recipes (ie, pooled up scores of different quality attributes such as appearance, flavour, colour, taste and texture of each green leafy vegetable recipe) depicted that highest mean score was for chekkurmanis cutlet followed by drumstick leaves with scrambled egg, wheat rawa kichdi, weaning food and amaranth squash.

In comparison to critical value the rank mean scores between chekkurmanis cutlet and weaning food, chekkurmanis cutlet and amaranth squash; drumstick leaves with scrambled egg and weaning food, drumstick leaves with scrambled egg and amaranth squash; wheat rawa kichdi and weaning mix, wheat rawa kichdi and amaranth squash revealed significant difference where as chekkurmanis cutlet, drumstick leaves with scrambled egg, and wheat rawa kichdi; weaning food and amaranth squash were not showing any significant difference.

4.7 Impact evaluation of nutrition education programme

4.6.1 Distribution of subjects based on their knowledge score

Knowledge gain of respondents was assessed by using a set of 20 closed ended questions on use of green leafy vegetables before and after the education programme. Each question was given a unit score of one for correct answer and zero for wrong answer. The difference between pre and post test score was taken as knowledge gain of an individual. The possible knowledge gain was between 0 and 20.

Table12: Gain in knowledge of the respondents (n=100)

Group	Mean score	Gain in knowledge
Pre test	14.81	18.27**
Post test	18.69	

From table 12 it can be seen that the mean score for knowledge for pre test was 14.81 while for the post test it increased to 18.69. Result of the paired t- test shows that the gain in knowledge was significant at 1 per cent level.

4.6.2 Distribution of respondents based on their attitude score

Change in attitude was measured using a check list of fifteen statements before and after the training programme.

Table13: Change in attitude of the respondents (n=100)

Group	Mean score	't' value
Before nutrition education	50.26	26.32**
After nutrition education	63.78	

From table 13 it can be seen that the mean score of attitude for pre test was 50.26 while for the post test it has to increase upto 63.78. Result of the paired t- test shows that the change in attitude was significant at 1 per cent level. An estimated't' value of 26.32 shows that training programme has a significant effect on the attitude of respondents.

4.6.3 Changes in Frequency of use of green leafy vegetables

Summative evaluation was conducted to find out the change in green leafy vegetable consumption of the respondents after the participation in the nutrition education programme. Pre and post education scores of the frequency of use per centage of leafy vegetables consumption given in the table 14 revealed that there was an increase in the frequency of use of green leafy vegetables.

Table14: Frequency score of use of green leafy vegetables by the respondents before and after the intervention (n= 100)

Green leafy vegetable	Frequency use				't' value
	Before intervention		After intervention		
	Frequency score	Mean score	Frequency score	Mean score	
Red amaranth	58.4	2.920	63.4	3.170	4.890**
Green amaranth	52	2.580	57.4	2.770	2.374*
Drumstick leaf	53.2	2.660	64.6	3.220	5.668**
Agathi leaves	25.4	1.270	32	1.600	6.193**
Water leaf	24.4	1.220	35	1.750	9.192**
Cowpea leaf	22.4	1.120	26.2	1.310	4.533**
Chekkurmanis	45	2.250	47.6	2.380	2.802**
Cabbage	60.6	3.030	59.4	3.140	1.521**
Basella	21.2	1.060	23	1.250	4.533**
Cauliflower	46.4	2.320	45.2	1.260	1.179**
Coriander leaf	82.4	4.120	86.6	4.310	2.802
Curry leaf	94	4.700	100	5.000	2.730**

****** Significant at 1 per cent level ; ***** Significant at 5 per cent level

From the table 14, it can be seen that coriander leaves and curry leaves were used by most of the respondents followed by cabbage, red amaranth, drumstick leaf, cauliflower and chekkurmanis. Frequency scores of other leafy vegetables like agathi leaf, water leaf (sambar leaf), cowpea leaf and basella were less than 30. After the intervention it can be seen that consumption of cauliflower and cabbage was reduced. While use of all the other leafy vegetables increased. The t value calculated shows that there is significant change in the consumption of leafy vegetables after the intervention.

After the intervention programme all the five anganwadi centers were visited by the investigator for observing the use of green leafy vegetables in the supplementary feeding programme. It was found that locally available green leafy vegetables like amaranth and drumstick leaves were included in the supplementary feeding programme, after the intervention was conducted.

Discussion

5. DISCUSSION

The findings of the study entitled" Promoting consumption of green leafy vegetables among rural women through participatory approach" were statistically analysed and presented in the previous chapter. These findings with relevant research support are discussed in this chapter under the following headings.

5.1 Personal characteristics of the respondents
5.2 Socio-economic characteristics of the respondents
5.3 Food consumption practices with special reference to green leafy vegetables
5.4 Existing weekly menu in the selected Anganwadi centers
5.5 Collection of traditional recipes of green leafy vegetables
5.6 Acceptability of green leafy vegetable recipes
5.7 Impact evaluation of nutrition education programme

5.1 Personal characteristics of the respondents

The personal and socio-economic characteristics of the respondents studied comprised of age, caste, family size, family type and educational status, of the respondents.

The above mentioned informations were collected through direct interview with the subjects using an interview schedule and was statistically analyzed in detail. The result revealed that majority of the respondents (56 per cent) belonged to the young age group less than or equal to thirty five years. Forty one per cent of the respondents belonged to the middle age group of 36-55 years and three percent

constituted those in old age groups above fifty five years. The study is supported by Park (1997) who opined that the demographic profile of India is fast changing and is characterised by adult population forming 60 per cent.

Caste is the oldest institution of the Indian society and has a great influence on the attitude and behaviour of an individual. Arora (1991) reported that caste is a unique institution of the Indian society. Hence caste system of hundred families were analysed and it was observed that majority of the families belonged to Other Backward Community and thirty two per cent were from Forward communities while eight per cent respondents belonged to Scheduled Caste groups respectively.

The present study revealed that small sized families (3-4 members) were found to be more popular in this sample. According to Park (1997) the average family size in India is four. More than 55 per cent of the respondents hailed from small families consisting of three to four members. The rest of the subjects (35 per cent) belonged to middle size families with five to six members and four percentages belonged to the group of seven to eight members. Only six per cent of the subjects came from large size families and had more than eight members in the family. Similar reports were given by Sheethal (2011) and Krishnaroopa (2003). Kerala is a state with high literacy and people are exposed to the benefits of having small family.

It is observed by many researchers that the concept of nuclear family is becoming more and more common in our society and joint family system is fast disappearing. Similar reports have been given by Krishnaroopa (2003), Renjini (2008) and Sheethal (2011) in their studies done in Thiruvananthapuram district. Joint family is declining these days especially in the city like Thiruvananthapuram where dwellers are mostly working class people migrated from different parts of Kerala. Nuclear family has become a prevalent norm in Kerala as reported by Buliyya et al.

(2002) and Gupta and Tripathi (2006). NFHS-2 Survey (2001) conducted in Kerala found that just over half of all households are of nuclear type.

The levels of education of respondents were recorded in this study, since it can be related to awareness pertaining to health care. In this study it was observed that the present generation was better educated than the older generation. It was also observed that majority (35 per cent) of respondents had education upto pre-degree level. Beghin (2003) pointed out that educational level of women is a major factor which influences the growth and development of children. The high educational status of the respondents in a way reflects a typical picture of the Kerala population with its high literacy levels. The study also found that none of the respondents were illiterate.

5.2 Socio-economic characteristics of the respondents

The socio-economic characteristics of the respondents studied comprised of employment status, monthly income, type of house, availability of drinking water, land possession and details of cultivation of cropes by the respondents as well as their livestock possession.

The employment status of the population is an important determining factor with respect to health and nutritional status as reported by Reddy et al. (1993). The literacy rate being high in Kerala has also affected the family size as the family planning policy of Indian government has been implemented successfully. Data available indicated that the work participation rate of females has not increased as much as males in last decades in Kerala particularly in Thiruvananthapuram district (Eapen et al.,2000).The present study also revealed the same trend. Though majority of the respondents in the present study had education

above pre-degree, the percentage of unemployed respondents (57 per cent) were more. This might be due to lack of job opportunities and majority of them were housewives. This finding is also similar with the study of Cicil (2000).

NIN (1998) reported that among the Indian population, about 40 per cent in the rural and 30per cent in the urban areas were estimated to be below the poverty line, which is defined as the expenditure needed to obtain, on the average, 2400 Kcal per capita per day in the rural areas and 2100 Kcal in urban areas. The economic status directly or indirectly influences the purchasing power and standard of living. Arora (1991) suggested that household income should be taken into consideration because it is the family income which really determines the family's status and socio-economic strata of the society to which they belong. The present study indicated that majority of families belonged to middle income group.

By making frequent visit to the field the details about the housing of the respondents were collected. It was found that majority of the respondents (80 per cent) were having own houses and 13 per cent of the respondents lived in rented houses and seven per cent in leased buildings.

UNICEF (1990) had reported that lack of ready access to water and poor environmental sanitation were important underlying causes of various types of infections resulting in malnutrition. As per findings of the study majority of the population depended on tap water which is properly treated and made potable.

The present study revealed that 64 per cent of the respondents were not engaged in animal and poultry rearing. Only 3 per cent of the respondents were engaged in animal rearing and 19 per cent were engaged in bird rearing. Fourteen per cent of the respondents were engaged in both poultry and animal rearing. With regard

to livestock possession, the respondents were mostly found to be interested in cow and poultry rearing. In kerala, the farm women are usually seen to be engaged in backyard poultry rearing.

Regarding the land holding size of the selected families, it was found that majority of them were having (86 per cent) their own land. Among this, 6 per cent of the respondents had more than one hundred cents. Only 8 per cent respondents were landless. Majority of the respondents had their own land but it was less than five cents and it was used for the construction of houses, shops etc. Menon and Prema (1976) reported that size of the land holding had positive influence on creating a favourable attitude towards kitchen gardening.

Cultivation practices of green leafy vegetables were ascertained in the study. It was found that only few respondents were interested in cultivation of green leafy vegetables. Commonly cultivated green leafy vegetables were curry leaves, red amaranth and colocasia leaves. Majority of the respondents (46 per cent) were not interested in green leafy vegetable cultivation which they reported was mainly due to lack of land and time.

5.3 Food consumption practices with special reference to green leafy vegetables

In order to find out the frequency of use of green leafy vegetables in the diet, the details regarding the food consumption practices of the respondents were studied through diet survey. The diet survey revealed information regarding food habits, food preference and frequency of use of green leafy vegetables.

5.3.1 Food habits

Dietary habits of the people depend on the availability of food, which is observed to be influenced by the climate, socio-economic, cultural variables, environment, religion, Superstitions and ignorance (Devadas and Eswaran,1986). Robinson et al.,(1998) opined that the dietary habit of an individual in general has influence on his or her nutritional status.

The results of the present study revealed that majority of respondents were non-vegetarians (90 per cent). Consumption pattern of Keralities as reported by Kerala Statistical Institute (2001) also revealed that 98 per cent of the keralities are habituated to non- vegetarian foods. Similar results were observed by Sheethal (2011), Unnithan (2008), Reshmi (2007), Krishnaroopa (2003) and Beatrice (1999) in their studies undertaken in Thiruvananthapuram district. Kerala being land near to the seas, the availability of sea food is high and fish is comparatively cheaper than other animal foods. This could be the reason for the non vegetarian habit being more prevalent in Kerala.

5.3.2 Habit of dining out

The present study revealed that while 53 per cent of respondents were having food from outside home only on certain occasions. Thirty six per cent of the respondents were found to dine out frequently and eleven per cent of the respondents were found to take food outside home at least once daily. This trend was also observed by Leena (1990). This indicated that most of the respondents preferred homemade foods and majority of them were housewives and they cook food for their families.

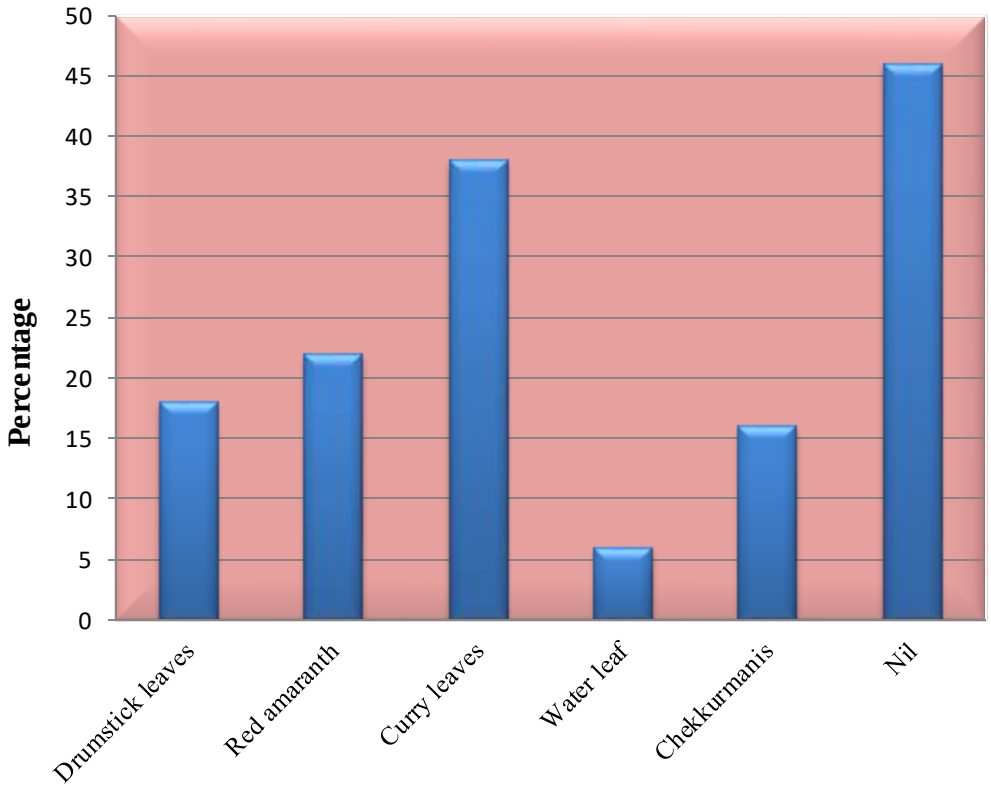


Fig1:Distribution of respondents based on cultivation of green leafy vegetables

5.3.3 Commonly used preparations using green leafy vegetables

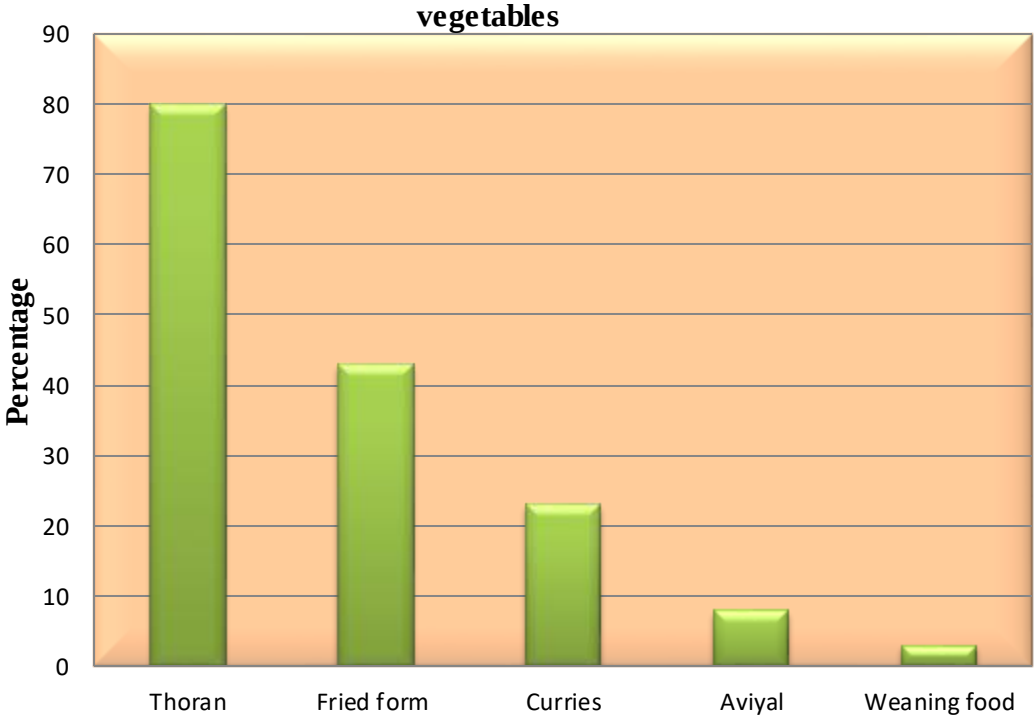
It is evident from the present study that most of the respondents (80 per cent) were using green leafy vegetables in the form of thoran and forty three per cent used them in the fried form. Twenty three per cent of families were included green leafy vegetables in curries whereas eight per cent used in aviyal, which is a mixed vegetable preparation of Kerala. A very low (3 per cent) included green leafy vegetables in weaning mix of their children. For making thoran the commonly used green leafy vegetables were amaranth and cabbage. The extracted juice of amaranth was used in the preparation of weaning mix along with ragi or banana flour. Kumari and Singh (2004) opined that health status was improved by the use of green leafy vegetables along with maize or any other flours.

5.3.4 Frequency of use of green leafy vegetables

Leafy vegetables are rich sources of minerals like iron, calcium, potassium and magnesium, and vitamins like A, C, E and K and many of the B vitamins. When consumed regularly they can substantially improve micronutrient status of the Indian population (Gupta and Prakash 2009).Green leafy vegetables also contain many helpful phytochemicals or phytofactors in scavenging the dreadful free radicals generated as metabolic byproducts in alleviating many serious diseases (Kaur and Maini, 2006).

Dietary surveys conducted among different segments of the population revealed that consumption of green leafy vegetables is much lower than the recommended dietary allowance of 100g/day. National Nutrition Monitoring Bureau (2000) Survey of Kerala also revealed that consumption of green leafy vegetables was grossly inadequate particularly among preschool children. Data indicated that

Fig2:Distribution of families based on use of green leafy vegetables



even low cost and locally available leafy vegetables like amaranth, drumstick leaves, agathi and chekkurmanis not consumed daily by most of the respondents.

The traditional green leafy vegetables like ponnaviram and lettuce leaf are never used by the respondents. Ponnaviram leaves are the good source of protein and fibre as compared to the other green leafy vegetables. However now it is not consumed due the pungent smell of the ponnaviram leaves. It is also revealed that more than 70 per cent of the respondents never consumed agathi leaf, water leaf, cowpea leaf and basella which have been used traditionally.

Above 80 per cent of the respondents used curry leaves and coriander leaves in their diets. Curry leaves and coriander leaves were used for seasoning in most of the Kerala dishes and that may be the reason for them being more acceptable. But it has to be noticed that curry leaves and coriander leaves are consumed in very small quantities to improve the taste of the dishes.

Vitamin A rich leafy vegetables like amaranth, cabbage and drumstick leaves which are locally available was used by 60 per cent of the respondents. Most of the respondents stated that plucking of drumstick leaves for preparing dish was a time consuming process so they avoided the use of drumstick leaves in their daily diet. All this may be mainly due to their ignorance about the nutritional value of these leaves.

It is evident from the result that majority of respondents used colocasia leaves, chekkurmanis, cowpea leaf and water leaf only occasionally. Cauliflower is a vegetable grown in cold climate and is not easily available in the local market. Also, the cost factor of cauliflower may be another reason for it being occasionally used by

the respondents. However other leafy vegetables are available but their consumption was also found to be low among the respondents.

Similar results have been reported in studies by Unnithan (2008), Ramlath (2007), and Humulka et al. (2000). A similar study done by Kumari and Singh (2001) on secondary school children also reported that green leafy vegetables are inadequate in adolescent diet.

The present study revealed that the frequency use of green leafy vegetables was also low. This may due to lack of awareness of the importance of green leafy vegetables in the diet. This can be improved by giving proper nutrition education. An awareness creation programme for women on nutrition through green leafy vegetable conducted by Hemalatha and Prakash (2002) also showed a definite increase in the frequency of consumption of green leafy vegetables.

5.4 Existing weekly menu in the selected Anganwadi centers

Currently the ICDS scheme is the largest nutrition programme launched by Government of India for the holistic development of the child through interventions in nutrition, health and education. The ICDS is being implemented throughout the country through a network of anganwadies at present.

The programme is targeted at poor areas, and increasingly at poor households. Programme guidelines call for the food supplements (which are limited to 40 per cent of the expected beneficiary population of an anganwadi) to be given preferentially to children and pregnant women from households at high risk of malnutrition – those of landless labourers, marginal farmers, scheduled castes or tribes. The adolescent girls and women's programmes are intended to improve health

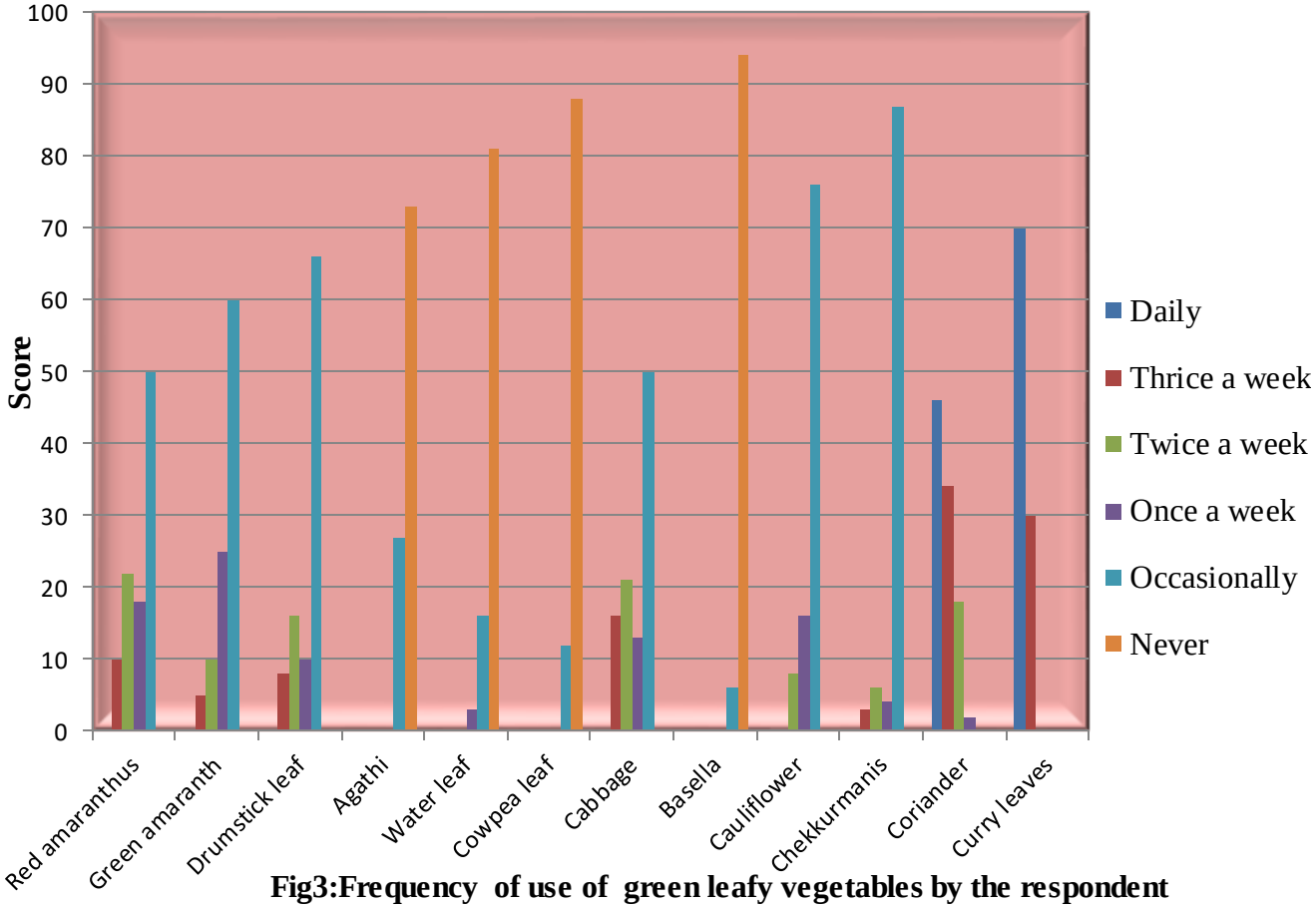


Fig3:Frequency of use of green leafy vegetables by the respondent

and nutrition over the longer term through improvements in women's skills and access to resources. It has been stipulated in the ICDS guidelines that leafy vegetables, other vegetables and fruits should be included in the supplementary feeding programme for the beneficiaries. In Kerala, mainly foods like wheat or rawa uppuma, green gram with porridge, egg, milk, ground nut, bread, rice flake and banana are given to the beneficiaries through the anganwadi centers.

In the present study, existing feeding programme in the five selected anganwadi centers were studied in order to find out the use of green leafy vegetables in the feeding programme. The feeding schedule and daily ration for feeding indicated the poor utilization of green leafy vegetables in all the five anganwadi centers. Although there are many leafy vegetables that are inexpensive and easily available and are rich source of micro nutrients, none were included in the feeding programmes.

5.5 Collection of traditional recipes of green leafy vegetables

Leafy vegetables are intimately related to Indian system and culture and are important for their nutritive as well as medicinal value. Leafy vegetables have been used in the indigenous system of medicine since ancient times and referred by the three great scholars of Ayurvedic system, the Charaka, Sushrut and Vagbhatt.

Traditionally green leafy vegetables have been used for medicinal as well as cooking purpose. A number of traditional recipes and various uses of green leafy vegetables were collected as part of the study (AppendixIV). It was found that majority of the respondents had poor knowledge about traditional use of green leafy vegetables. Traditional dishes incorporating green leafy vegetables were mainly used in the time of pregnancy and lactation, at present. Other traditional preparations are

not being used now. Similar findings have been cited by Fathima et al. (2001) Chandershekar (2003) and Siddique et al. (2004).

5.6Acceptability of green leafy vegetable recipes

Acceptability of green leafy vegetable recipes were assessed in terms of organoleptic qualities like appearance, flavour, colour, taste and texture. Organoleptic quality plays an important role in evaluating the quality of food products. For an average consumer, the concept of food quality consists in those related to the sensory characteristics which may be classified in accordance with human senses of perception as appearance, texture, odour and taste (Setty, 1989). When the quality of food is assessed by means of human sensory organs, the evaluation is said to be sensory analysis. Sensory evaluation can be used to predict the acceptace of a food item. Rajalekshmi (1993) described sensory analysis as a scientific discipline used to evoke measure, analyse and interpret reaction to these characteristics on food and materials as perceived by the sense of sight, smell, taste, touch and hearing. In order to conduct a demonstration on the preparation of selected nutritious recipes of green leafy vegetables that they can be adopted in the supplementary feeding programme of the anganwadies.

According to Mc Larson (1984) the criteria included in food quality system are general acceptance, taste, appearance, texture and aroma of food. In the present study quality parameters such as appearance, flavour, colour, taste, texture and overall acceptability of selected leafy vegetable preparations were assessed by a panel of selected members of the Home Science faculty for deciding the recipes to be demonstrated in the intervention programme later.

Appearance

Appearance is a composite of all information about the product and its environment which reaches the eye (Birch et al., 1988).

In the present study appearance of green leafy vegetable preparations were assessed by the respondents and highest mean score was obtained for chekkurmanis cutlet and lowest was for weaning food. It can be seen that all the recipes obtained a mean score of fifty and above out of a maximum of seventy five with regard to appearance.

Flavour

Flavour is an important factor which enriches the consumer's preference to a particular food (Rangana, 1984). Flavour is the unique character of odour and taste. According to Birch et al. (1988) flavour is the mingled but specific experience of sensation produced by a material taken in the mouth perceived principally by the senses of basic smell and by other cutaneous sensations in mouth.

Among various green leafy vegetable preparations the highest and lowest mean scores were obtained for wheat rawa kichdi and amaranth squash. In the case of amaranth squash, flavour of lemon predominated and that may be the reason for its lowest score. The preparations like drumstick leaves with scrambled egg, chekkurmanis cutlet and weaning mix obtained almost same acceptability with regard to flavour. It can also be seen that the scores ranged from 34 to 55 out of a maximum of 75. Amaranth squash obtained the least score of 34 while wheat rawa kichadi obtained the highest score of 55. This may be due to the good flavor of wheat rawa

kichadi. This contained carrot, ground nut, amaranth leaves and other seasonings. In the case of amaranth squash, only amaranth and lemon were used for the preparation and hence it had a poor flavor.

When mean scores of flavour was compared with critical value, it was found that the mean scores between wheat rawa kichdi, drumstick leaves with scrambled egg, chekkurmanis cutlet were not significantly different from each other while significant difference were noticed between wheat rawa kichdi and weaning food, wheat rawa kichdi and amaranth squash; drumstick leaves with scrambled egg and weaning food, drumstick leaves with scrambled egg and amaranth squash; chekkurmanis cutlet and weaning mix, chekkurmanis cutlet and amaranth squash.

Colour

Colour is the most important character by which quality of food is judged. If the colour is unattractive, a potential consumer may not be impressed by the major attributes. Clydesdale (1989) reported that colour affected the perception of other sensory characteristics such as taste and flavour. According to the report from Central Food Technology Research Institute (1980) the aesthetic, safety, sensory characteristics and acceptability of food are affected by colour.

Results of present study indicated that the mean scores were highest for chekkurmanis cutlet and lowest for wheat rawa kichdi. The chekkurmanis cutlet was more colourfull than all the other preparations. Preparations like drumstick leaves with scrambled egg, weaning food, amaranth squash, have no significant difference in their colour as compared to the critical value.

Taste

Taste is not only a sensory response to soluble materials but also aesthetic appreciation of the mouth. According to Rolls et al. (1981) in the various quality attribute tests, the first preference goes to taste followed by appearance, texture and colour.

In the case of taste the highest mean score was for chekkurmanis cutlet and lowest was for weaning food. The crispy taste of chekkurmanis cutlet was very much accepted by panel members. When compared with mean scores between chekkurmanis cutlet, wheat rawa kichadi and drumstick leaves with scrambled egg showed no significant difference when compared to critical value, showing that with regard to taste, all these three were highly acceptable to the panel members. However amaranth squash and weaning food were not very much acceptable to the panel members.

Texture

Texture is a percentage resulting from interaction between food and its consumer (Jack et al., 1995). It constitutes a physical property of food stuffs apprehended by the eye, the skin and muscle sense located in the mouth.

In the present study, drumstick leaves with scrambled egg obtained highest rank mean score of 54 and weaning food obtained a rank mean score of 40. When considering the comparison between mean scores for texture and critical value, it was found that there were no significant difference between chekkurmanis cutlet, drumstick leaves with scrambled egg and wheat rawa kichdi with respect to texture.

Over all acceptability

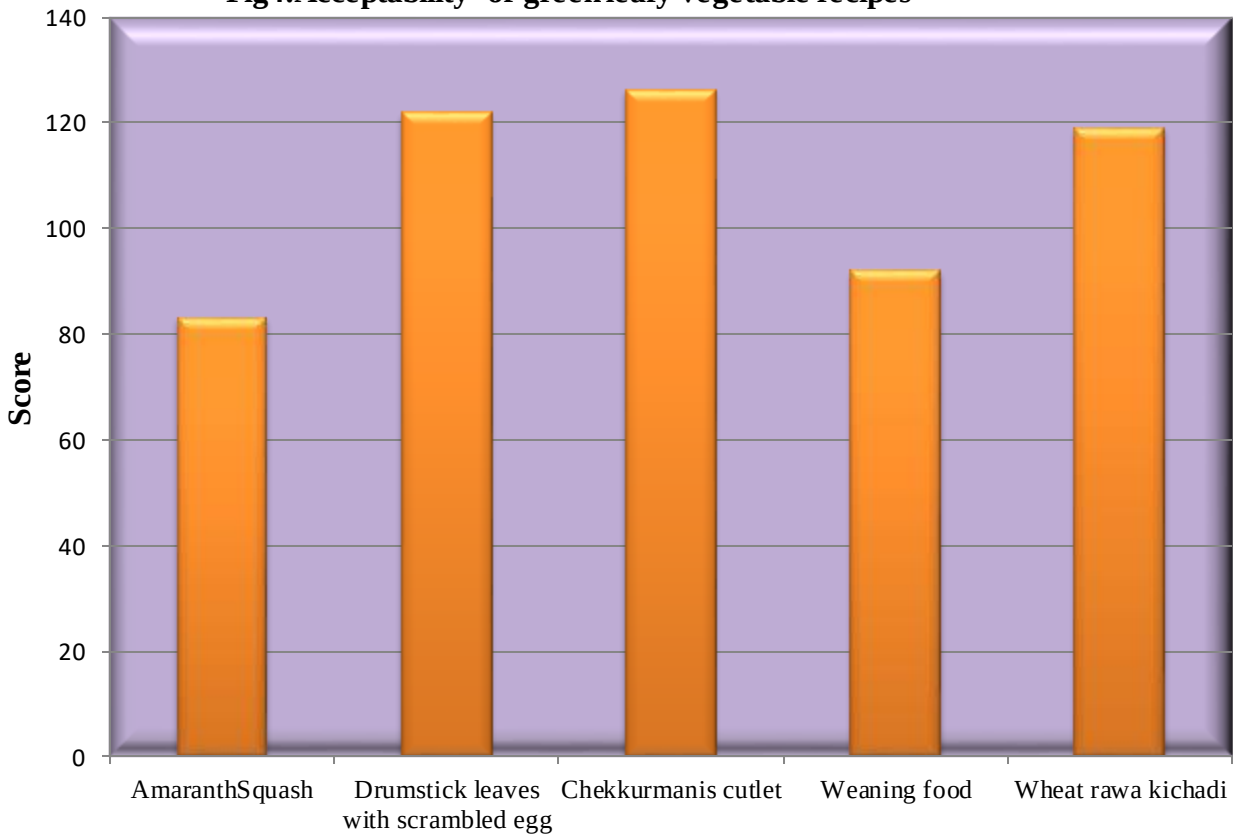
The overall acceptability depends on the concentration or amount of the particular components, nutritional and other hidden attributes of a food and its palatability or sensory quality. Indian Food Industry (1998) reported that the quality is the main criteria on which the acceptability of any product depends. Here, the over all acceptability scores were determined by pooling up the scores obtained for different quality attributes (appearance, flavour, colour, taste and texture) of each green leafy vegetable recipe. The pooled score showed that highest mean score was for chekkurmanis cutlet followed by drumstick leaves with scrambled egg, wheat rawa kichdi, weaning food and amaranth squash.

With regard to critical value, it was seen that drumstick leaves with scrambled egg, chekkurmanis cutlet and wheat rawa kichdi were not significantly different from each other. Also, weaning food and amaranth squash were not significantly different from each other.

Based on the above, for the demonstration of leafy vegetable preparations as part of the intervention programme, the recipes selected were

1. Chekkurmanis cutlet
2. Drumstick leaves with scrambled egg
3. Wheat rawa kichdi
4. Amaranth squash
5. Weaning food

Fig4:Acceptability of green leafy vegetable recipes



5.7 Impact evaluation of nutritional education programme

The present study revealed that majority of the selected respondents reported low consumption of green leafy vegetables prior to the conduct of the nutrition intervention. The nutrition intervention was designed including nutrition education using multimedia tools, method demonstration, and gardening. The impact evaluation was conducted to find out the change in the knowledge and attitude of the respondents towards green leafy vegetables, as well as change in their leafy vegetable consumption and also use of green leafy vegetables in the supplementary feeding programme of the five anganwadies selected after the nutrition intervention was conducted.

5.7.1 Impact of nutrition education on knowledge gain

A knowledge test was administrated to the respondents before and after the intervention to measure if there is any increase in their knowledge on green leafy vegetables and their importance. It was seen that the mean pre knowledge score obtained by the respondents was 14 out of a maximum of 20. After the intervention programme was conducted, the post test revealed that the knowledge score was 18 out of 20. From the score obtained for post test it is clear that there was significant gain in their knowledge. This may be because of the effectiveness of intervention programme. The respondents were exposed to multimedia education programme like video show, charts, leaflets which enabled them to understand the importance of green leafy vegetables. The intervention also included setting up of leafy vegetable gardens.

Several studies have shown that nutrition education and intervention increases the nutritional knowledge of the respondents (Vishama. 2000; Morris et al.,

Fig5: Gain in knowledge of the respondents

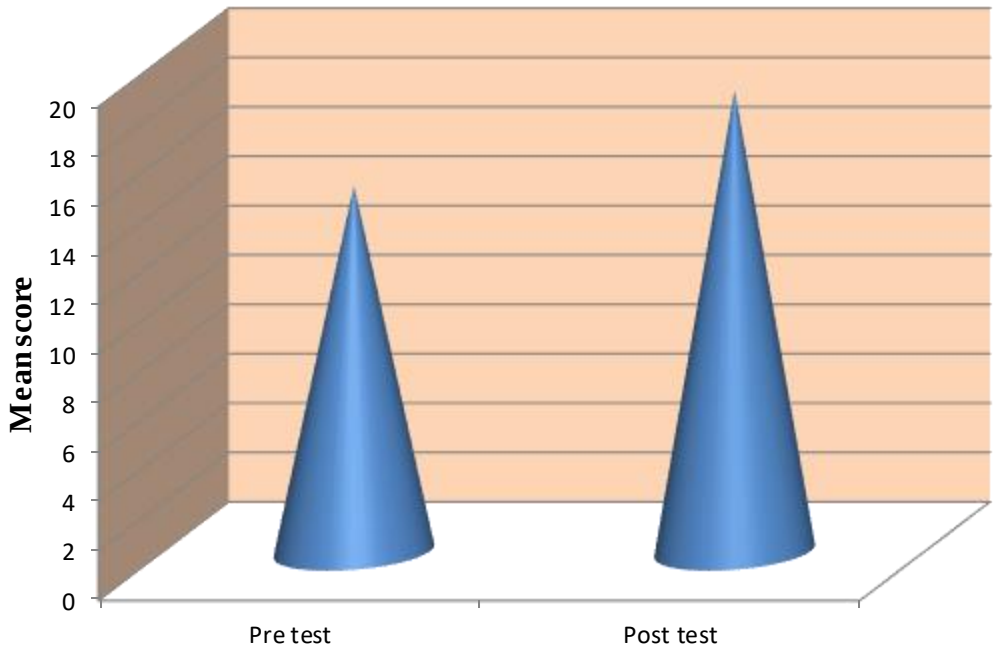
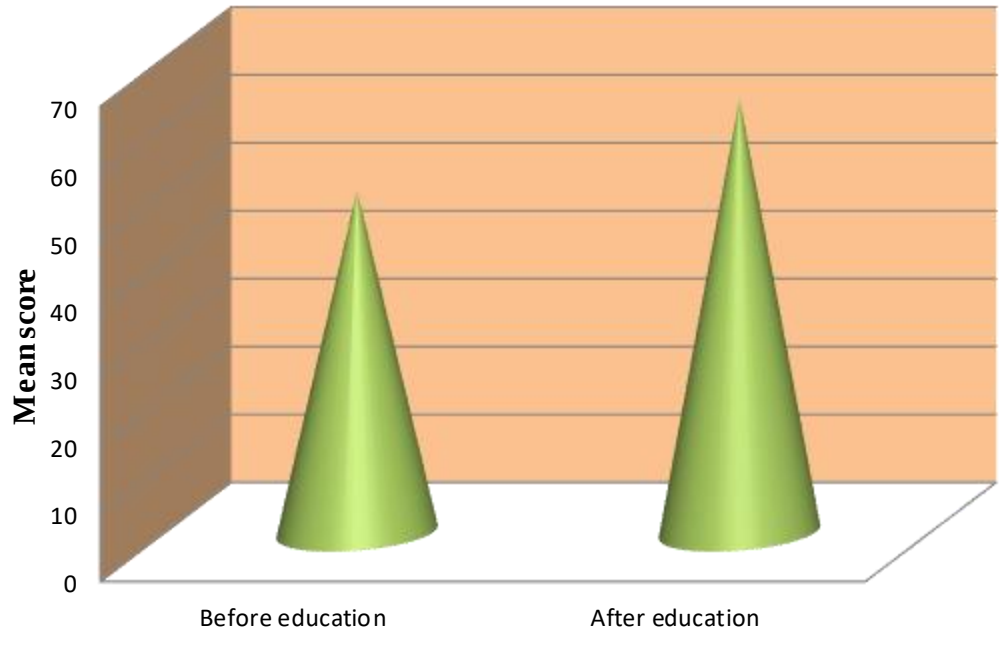


Fig6: Change in attitude of the respondents



2002; Razeena, 2000; McAleese and Rankin, 2007). Meenambigar and Seetharaman (2003) in their study on role of media in rural communication concluded that an appropriate combination of communication media can make people apply knowledge as well and motivate them to seek more information. For this, mass media and communication channels have to be utilized effectively. The nutrition education in the present study had a half an hour video show which may have attracted the respondents and also created interest among them.

5.7.2 Change in attitude of the respondents

An attitude test was administrated to the respondents before and after the intervention to measure their attitude towards green leafy vegetables. The pre test revealed that the mean attitude score was only 50 out of a maximum of 75. The post test conducted after the intervention revealed that the attitude score was 64 showing the impact of the programme on the attitude of the respondents. From the score obtained for the post test it is clear that teaching method has significant influence in changing wrong attitudes and wrong beliefs of the respondents. The findings of the study are supported by the observations of jaimy (2001) in her study on effect of training on food safety measures to the anganwadi helpers of ICDS. A study conducted by Shiny (2004) an assessment of nutrition cognition of selected rural youth and the nutrition related practices of their families revealed that effective nutrition education programmes can change the attitude of the respondents. Based on the findings of the present study it may be concluded that changes in attitudes and levels of knowledge that may be obtained from acceptance of new ideas from effective nutrition education programme which ultimately leads to practice of what is being learnt.

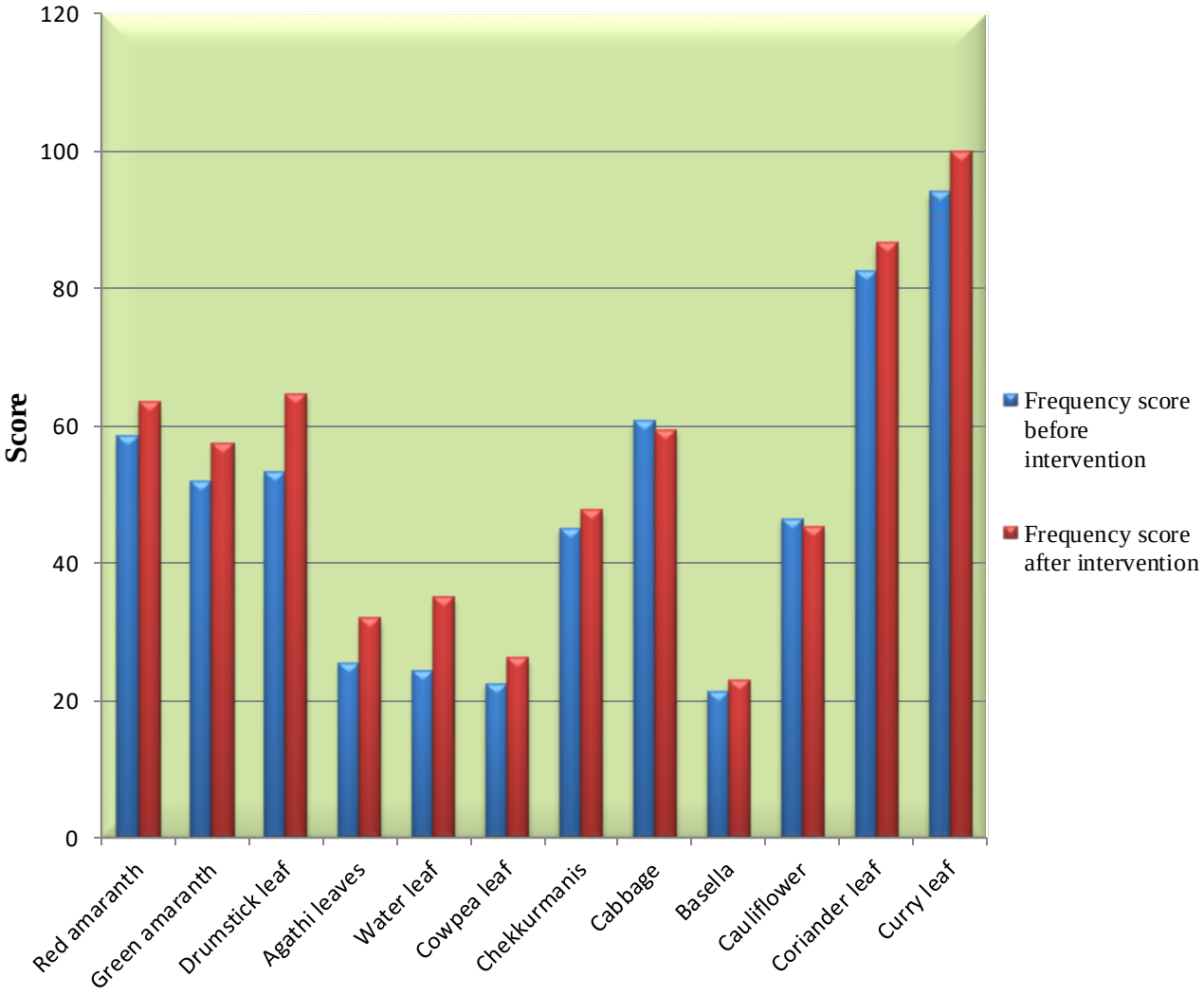
5.7.3 Frequency of use of green leafy vegetables after the intervention programme

After the intervention programme, the leafy vegetable consumption of the respondents was assessed once again by conducting diet survey. Change in green leafy vegetable consumption of the respondents was observed after the intervention programme. The result showed that the frequency of use of green leafy vegetables by the respondents who participated in the nutrition intervention increased significantly in the present study. After the intervention programme the most frequently used leafy vegetables were found to be curry leaves, coriander leaves, amaranth, drumstick leaves, agathi, sambar leaves (water leaf) and cowpea leaves. Consumption of cauliflower and cabbage was found to be less. This may be due to the fact that the respondents became aware of the nutritive value of locally available green leafy vegetables. Similar studies by Gopalan, 2000; Parlato, 1992 and Hemalatha, 2002 also proved that respondents who participated in nutrition intervention improved their frequency of consumption of green leafy vegetables. The increase in the actual leafy vegetable consumption may be due to the increase in the nutrition knowledge after the nutrition intervention programme.

5.7.4 Inclusion of green leafy vegetables in supplementary feeding programme

Before the intervention programme vegetables and leafy vegetables were not included in the supplementary feeding in the selected anganwadi. After the intervention programme locally available green leafy vegetables from their own garden were found to be used for supplementary feeding in the anganwadies. Green leafy vegetables like amaranth, drumstick leaves and chekkurmanis were cooked along with wheat and rawa uppuma, which improved the taste and nutritional value of the food. Similar studies of Dhahiya and Kapoor 1995;Kaur and Bajwa 2003;Kumawat et

Fig7: Frequency of use of green leafy vegetables by the respondents before and after intervention



al., 2003;Santhakumari and Putturaj 2004 also stated that respondents who participated in supplementary feeding programme improved their health status and they incorporated green leafy vegetables in their daily diet by themselves. The anganwadi workers also stated that they would use the leaves of agathi, drumstick, basella, water leaf and lettuce tree from the leafy vegetable garden in the anganwadies after they have grown well and the leaves could be plucked for use.

Summary

6. SUMMARY

The present study entitled "Promoting consumption of green leafy vegetables among rural women through participatory approach" was conducted with the objective of promoting consumption of green leafy vegetables among rural women through an intensive education programme employing participatory techniques and to assess the impact of the programme. Five selected anganwadi centers in Athiyannoor block namely Aralummoodu, Pathamkallu, Athiyannoor, Vazhimukku and Kaithottukonam were chosen for the study. The conduct of the supplementary feeding programme in the selected five ICDS centers was studied with the help of ICDS workers so as to gain an insight into the general quality of the programme's implementation and inclusion of green leafy vegetables in the supplementary feeding programme. Data regarding socio- economic characteristics of the respondents, frequency of use of green leafy vegetables in their daily diet, traditional use of green leafy vegetables and recipes of green leafy vegetables were collected from the respondents.

Results of the socio-economic survey showed that most of the respondents belonged to the age group less than or equal to thirty five years and belonged to Other Backward Caste (60 per cent). Analysis of family structure revealed that majority of the respondents' belonged to nuclear type of families and had a family size of 1-4 members. While analyzing the land holding size, it was found that 92 per cent of the respondents had their own land. Most of the respondents were (sixty four per cent) not engaged in any livestock rearing and 46 per cent of the respondents did not grow any green leafy vegetable at all. About 80 per cent of the respondents lived in their own house and 54 per cent of the respondents were having tap water facility for drinking purpose.

Regarding educational status it was found that most of the respondents had education up to pre-degree level. The employment status of the respondent's shows that most of them were unemployed. Most of the families had monthly income between 7323-9787 rupees and belonged to middle income group.

Dietary habits of the respondents indicated that 90 per cent of them were habitual non-vegetarians. Majority of the respondent (Fifty three percent) took food from outside the home only occasionally. With regard to frequency of use of leafy vegetables it was seen that greater per centage of respondents were using green leafy vegetables in the form of thoran, which is a common preparation in Kerala using vegetables and coconut. The study on frequency of use of green leafy vegetables revealed that most of the respondents used curry leaves and coriander leaves in their diets. Curry leaves and coriander leaves are used for seasoning in dishes and that may be the reason for them being used daily.

The conduct of the supplementary feeding programme in the selected anganwadi centers was studied with the help of anganwadi worker. It was revealed that there was poor utilization of green leafy vegetables in the supplementary feeding programme in the five anganwadi centers selected.

Recipes based on leafy vegetables and various uses of green leafy vegetables were collected from the respondents. It was found that most of the respondents had poor knowledge about traditional use of green leafy vegetables. Out of the leafy vegetable based recipes collected, five recipes were selected based on factors like cost, local availability and adaptability to the supplementary feeding programme of ICDS.

The five green leafy vegetable recipes selected were chekkurmanis cutlet, drumstick leaves with scrambled egg, broken wheat rawa kichdi, weaning food and amaranth squash. These were tested for acceptability among a selected panel of judjes. Appearance, colour, taste, texture and preference of each recipe were assessed by the panel members. The statistical analysis revealed that chekkurmanis cutlet was the highly accepted one while weaning food was the least accepted product. None of the green leafy vegetable recipes were ranked too low in mean score. This revealed that almost all green leafy vegetable recipes were liked by the panel members. The five selected recipes were included later in the intervention programme for the anganwadi workers and mothers through method demonstration.

Assessment of pre knowledge and attitude scores of respondents showed that most of respondents had poor level of knowledge, wrong attitudes and wrong believes about the use of green leafy vegetables. The nutrition education programme was conducted to make the respondents aware of the nutritional importance of green leafy vegetables in their daily diet and also promote inclusion of green leafy vegetables in supplementary feeding programmes of the selected five anganwadi centers. The intervention programme was conducted with the help of nutrition education classes with discussions, charts, a video show prepared for the study purpose, leaf let on importance of green leafy vegetables, kitchen gardening ie, setting up of a leafy vegetable garden in the selected five anganwadies, and demonstration of the leafy vegetable preparations, all with the active participation of the respondents.

The impact of the nutrition education programme was assessed after three months by conducting a post test. The results showed that there was highly significant gain in knowledge and change in attitude of the respondents thus pointing out the positive impact of the nutrition education programme. The post test conducted

revealed a significant change in the consumption of green leafy vegetables by the respondents. Locally available leafy vegetables were seen to be included in the supplementary feeding programmes of the five selected anganwadi centers. The anganwadi workers reported that they would use the leafy vegetables from the leafy vegetable garden for the feeding programme when the plants had grown. They also opined that the leafy vegetable garden set up in the anganwadi would be of great help in their nutrition and health education programme for the beneficiaries and would also motivate them to grow leafy vegetables in their homes.

The scope of nutrition communication programmes using a participatory approach for bringing about positive change in the consumption of green leafy vegetables is evident from this study. The study proved that this programme can be successfully implemented in all the anganwadi centers of our state. The increase in the actual green leafy vegetable consumption will surely help to alleviate the micronutrient deficiencies prevalent in our state especially among women and children.

References

7. REFERENCES

Agte, V. V. Tarwadi, S. Mengale, S. and Chiplonker, S. A. 2002. Potential of traditionally cooked green leafy vegetables as natural source of supplementation. J. Fd Composition and Analysis. P 885-891.

Amerine, M. A. Pangborn, R.M. and Roseller, E. B. 1965. Principles of sensory evaluation of food. NewYork, Academic Press. P 104-110.

Archana, V. 2003.Extent of house hold security of selected families of landless agricultural labours of Kalliyoor panchayath. M. Sc. (HSc) thesis, Kerala Agricultural University, Thrissur,191p.

Arora, A. 1991. The Women Elite in India. Sangana Book Limited, London.42p.

Bagchi, S. 1999. Reaching the masses for nutritional improvement future prospects. Nutr. Soc. Silver Jubilee Souvenir. P 5-7.

Beatrice, P. J. 1999. Nutritional adequacy of diets in selected hostel messes. M. Sc. (HSc) thesis, Kerala Agricultural University, Thrissur. P 40- 87.

Beghin, I. 2003. Management of social communication in nutrition. *Ind. J. Nutr. Dietet*.107p.

Bestone, 2010. Top five reasons to eat your green leafy vegetables. The leafy greens council tmg3.com.8-7p.

Birch, G. Lee, C.K. and Ray, A.1988. The chemical basis of bitterness in sugar derivatives. Sensory properties of foods. Applied Science Publishers, London.

Brahmam, G.N.V. NIN annual reports, 2003. *http: // www.ninindia.org*.

Bulliyya, G. Mohapatia, S. S. Kerkelta, A.S. and Das, P.K. 2002. Status of anaemia in elderly tribal population of sundargrah district, Orrissa. *Ind. J. Nutr. Dietet*. 39:182-190p.

Census Report of India. 1991. Series 11, Kerala (part III B). Government of India, New Delhi.27-44.

Central Food Technology Research Institute (CFTRI) 1980. Studies on improving the quality of bakery productscontaining soya and tubers. Annual report. 19p.

Chandrashekar, V. 2003. Appropriate technology for utilization of nutrients dense local plants foods. Asian congress of Nutrition February. New Delhi, 23-27p.

Cicil, M. J. 2000. Impact on nutrition education on mushroom consumption. M. Sc. (HSc) thesis, Kerala Agricultural University, Thrissur.32-49p.

Clydesdale, F. M. 1989. Influence of colour on sensory perception and food choice in developments in food colours. *Walford. J*. Newyork.

Corke, H. Cai. Y. and Hankin, J.H. 1999. *J. Fd. sci*.869-873p.

Dahiya, S. and Kapoor, A. C. 1995. Acceptability and viscosity of low cost home processed supplementary foods developed for pre school children. *Pt. Fd. Hum. Nutr*. 1-12p.

Deming, D. M. Boileau, A. C. Lee, C M. and Eradman, J. W. 2000. Amount of dietary fat and type of soluble fibre independently modulate post absorptive conversion of beta carotene to vitamin A in Mongolian Gerbils. *J. Nutr*. 130: 2789- 2796p.

Deshpande, S. and Bargle, P. C. 2006. Impact of nutrition education on intake of soya based food. *Ind. J. Nutr.Dietet*. 43: 245p.

Deshpande, S. S. Mishra, A. and Mishra, M. 2003. Nutritional profile of farm women of Madhyapradesh and impact of nutrition education on the inclusion of soya bean products. *Ind. J. Nutr. Dietet*. 40:19-190p.

Devadas, P. and Rajammal, Eswaran, P. 1986. Intra family food intake of selected rural house holds and food consumption pattern of pregnant women. *Ind. J. Nutr and Dietet*. 23: 82-89.

Dolson, L. 2008. Green leafy vegetables nutritional power houses.About.com guid.

Eapen, M. J. Chathrapathy, S. and Elamon, J. 2000. Development prospective. Peoples plan campaign, State Planning Board, Kerala, 492p.

Edward, A.L. 1957, techniques of attitude Scale construction. Vakils, Feffer and simons private Ltd., Bombay.1-40p.

Fatima, A. Begum, K and Rajalekshmi, D. 2001. Microwawe drying of selected greens and their sensory characteristics. *Pt. Fd. Hum. Nutr.* 56(4): 303-311.

Food and Agricultural Organisation (FAO), 1997. Preventing Micronutrient Malnutrition: A guid to food based approaches. A manual for policy makers and programme planners. FAO and International Life Science Institute, Washington. 2003-4810p.

Fuglie. 2005. The miracle trace moringa oleifera,Natural nutrition for the tropics.115p

Gopalan, C. 2000. Health and nutrition education of the community choosing the appropriate channels. Nutrition foundation of India bulletin, New Delhi. P 28.

Gopalan, C. 2004. Vitamin A deficiency in Nutrition Research in South East Asia. World Health Organisation, India.98p.

Gupta, M. and Tripathi, H. 2006. Communication intervention for Technical Empowerment of Resources, Poor Rural Women in Dairy Farming. Journal of Communication studies.89p.

Gupta, S. and Prakash, J. 2009.Studies on Indian green leafy vegetable for their antioxidant activity. *Pt. Fd. Hum. Nutr.* 64: 39-45.

Gupta, S. and Wagle, P. 1998. *J. Agri. Fd. Chem*.472-474p.

Hamulka, J. Senger, G. A. and Witkowska, K. 2000. Frequency of intake and energy value of breakfast for students from selected primary schools in Warsaw. P 279-290.

Haskell, J. Marjorie, P. Kazi, M. J. and Jamila, P. 2004. Studies on Indian spinach.*Am.J. Clin. Nutr*.80:105-114p.

Hemalatha, K. Prakash, J. 2002. An awareness creation programme for women on nutrition through green leafy vegetables. *Ind. J. Nutr. Dietet*. 40:64-66p.

Henerson, M. E. Morris, L.L. and Gibbon. 1987. How to measure Attitude. The international Professional publishers, New Delhi.185p.

Holf, V. Gartner, C. and West, C. E. 1998.Potential of vegetable processing to increase the delivery of carotenoids to man. *Int. J. Nutr*.68:366-370.

Indian Council of Medical Research (ICMR). 1999. Nutrient Requirements and Recommended Dietary Allowances for Indians. National Institute of Nutrition. Hydrabad.11-67p.

Indian Council of Medical Research (ICMR). 1999. Nutritive value of Indian foods. National Institute of Nutrition ICMR,Hydrabad.156p.

Indian Food Industry. 1998. Technology, Quality and scope of fruit wines especially apple bewarage.14p.

Jack, F. R. Peterson, A. and Piggot, J.R. 1995. Perceived texture- Direct and indirect method for use in product development. *Int. J. Fd. Sci.Tech*.1-12p.

Jackson, M. J. 1997.The assessment of bioavailability of micronutrient introduction. *Eur. J. Clin. Nutr*.51:84-91.

Jaimy, S. 2001. Effect of training of food safety measures to the anganwadi helpers of ICDS. M. Sc. (HSc) thesis, Kerala Agricultural University, Thrissur,98p.

Jana, B. L., and Das, P. K. 2007. Leafy Vegetables and Mushrooms. Agrotech,Udaipur.17-120p.

Jayalekshmi, G. 2001. Empowerment of rural women through self help group an action research. Phd (Ag) theiss, Kerala Agriculatural University, Thrissur, 246p.

Joshi, S. and Sing, R. R. 2002. Development and evaluation of educational material for nutrition education. *Ind. J. Nutr.Dietet*. 373p.

Kaur, J. and Bajwa, U. 2003. Effect of pre treatment of green leafy vegetables on the quality attributes of vegetable impregnated paneer, 40 (6) : 32-77p.

Kaur, N., and Maini, D. 2006. Impact of nutrition councelling on the knowledge, attitude, and practice scores of at risk coronary heart diseases subjects. *Ind. J. Nutr Dietet*. 43:82-89p.

Kerala Statistical Institute, 2000. Socio economic changes in Kerala- A study based on selected localities , KSI, Thiruvananthapuram.30p.

Krishnakumary, K.2000. Genotypic and seasonal influence on leaf spot disease in amaranth. ph.D (Hort) thesis, Dept. of Olericulture College of Horticulture, KAU, Vellanikkara.1-82p.

Krishnaroopa, 2003. Determinants of dietary profile of higher secondary children. M.Sc (HSc) theiss, Kerala Agriculatural University, Thrissur, 246p.

Kumar, A. Gupta, S. Gupta, N. and Singh, B. B. 2004. Production and impact study of vitamin A related video filims for school children. *Ind. J. Nutr.Dietet.40:225p.*

Kumari, M. Sheetal, G., and Lakshmi, J. 2004.*J. Fd Chem*.2:217-222.

Kumari, P. and Singh, U. 2004. Impact of supplementation of quality protein maize ladoos on the nutritional status of pregnant women. *Ind. J. Nutr.Dietet. 28p.*

Kumawat, N. Mathur, R. and Kohli, G. K. 2003. Impact of dry green leafy vegetable powder in prevention of anaemia in young women. Asian congress of Nutrition February. New Delhi, 23-27p.

Kuppuswamy, B. 2006. Manual of Socio economic status (Urban), Manasayan, Delhi.22p.

Kurian, A. and Sankar, A. 2007.Medicinal plants, pitam pura. New Delhi.17-220p.

Kushwa, A. Soivastava, S. K. and Shukla, P. 2003. Evaluation of use of spinach leaf powder incorporated food products against vitamin A deficiency. Asian congress of Nutrition February. New Delhi, 159p.

Lakin, A. Walker, A., Straten, M. 2003.Foods that Harm Foods that Heal. Reader's Digest,London.190p.

Lee, S. 2010. Importance of vitamin E and K-*www.http: // ezinearticles.com*

Leena, P.J. 1990. Influence of dietary habits on atherosclerosis. M. Sc. (HSc) thesis, Kerala Agricultural University, Thrissur.42-49p.

Mc Larson, A. 1984. Containing the costs of food services.*Am J. Nutr. Dietet*. 84: 7-100p.

Meenambigar, G. and Seetharaman, R. N. 2003. Role of media in communication. J. of rural communication studies. 47-52p.

Menon, A. Prema, L. and 1976. The credibility of various source of information on human nutrition. *Agri. Res.J.* Kerala:16(12) p 217- 222.

Mini, C., and Krishnakumary, K. 2004. Leafy Vegetables.Agrotech,Udaipur.15-200p.

Mohandas, S. and Kowsalya, S. 1999. Acceptability and nutrient profile of cauliflower leaves (Brassica oleracea, var.botrytis).*Ind. J. Dietet*.17:9-12.

Nambiar, V. and Sheshadri, S. 2001. Bioavailability trials of iron and beta carotene from fresh and dehydrated drumstick leaves. *Pt.Fd. Hum nutr*, 56: 83-95p.

Nambiar,V. and Seshadri, S.2000. Retention of total and beta carotene from fresh radish leaves. *J. Fd. Sci. Tech*38:458-461.

National Nutrition Monitorig Bureau Reports, 2000. *http:// www. nnmbindia.org*.

NFHS-2, 2001. National Family Health Survey. International Institute for population sciences, Mumbai.315p.

NIN, 1993.Leaf concentrates as a source of beta carotene and other micronutrients. Annual Report, National Institute of Nutrition,India.67-69p.

NIN, 1998. Carotene content of foods. National Institute of Nutrition, India.135p.

Pande, V. K., Sonune, A. V., and Philip, S. K. 2000.Solar drying of Coriander and Methi. *J. Fd. Sci. Tech*.37:110-113.

Pandian, S. Radhakrishnan, T. and Sivakumar, P.S. 2002. Effect of video education on knowledge retention. Agricultural Extension review.13-19p.

Park, K. 1997. Health education. Parks Text book of Preventive and Social Medicine.Bhanot Publishers, Jabalpur. 233p.

Parlato, M. Green, C. and Fishmanc, C.1992.Community to improve nutrition behavior and the challenge of motivating the audience to act.

Phanikumar, H. K. 2010. Moringa leaf powder as neutraceutical,Science Tech.10p.

Prajapati, N. D., Purohit, S. S., Arun, K. S., and Kumar, T. 2004. Hand book of Medicinal Plants. Agrobiosis, Jodhipur.120-160p.

Prakash, P., Manjredi, T. G., Jackson, C. L., and Gerber, L. E. 2002. Beta carotene alters the morphology of NCI-H 69 small cell lung cancer. *J. Nutr*.132 :121-124.

Purushothaman, V. and Paul, M.2000. Enhancing the biological absorption of micronutrients to improve the material and infant health status. *Ind. J. Dietet*.17:9-22.

Rajagopalan, S. 2006. Ensuring access to food vectors. The Hindu survey of Indian Agriculture. 41-45p.

Rajalekshmi, S. 1993. Sensory methods for quality assurance programme in food industry. Food Technology Update Souvenior.p 18.

Ramlath, P. 2007. Effect of councelling under dietary habit of fisherfolk. M.Sc. (HSc) thesis, Kerala Agricultural University, Thrissur,17-99p.

Ranganna, S. 1984. Manual of fruit and vegetable products. Tata Mc Gran- Hill Publishing Compony. New Dehi.

Rangaswamy, P. 1989. Tools for collecting data interview. A hand book of methodology of research.p 100-110.

Rani, S. Singh, P.T. 2006. Utilisation focused evaluation of multimedia package. *Ind. J. Dairying. HSc.* 25p.

Razeena, K. A. 2000. Impact of educational programmes on the health and dietary practices of the workers of sewage farm in Thiruvananthapuram. M.Sc. (HSc) thesis, Kerala Agricultural University, Thrissur,17-79p.

Reburn, J. A. Krondle, M. and Lau, D. 1979. Social determinants in food selection. *Am. J. Dietet*. 74: 637- 42.

Reddy, C. V. K. 1999. Greens for good health. Nutrition. 33: 3-8.

Reddy, C.V.K. 2004. Scientific Programme and Abstracts of National Institute of Nutrition, Hydrabad, India.

Reddy, V. Rao, N. P. Sastry, J. G and Krishnakanth, K 1993. Nutritional trends in Hydrabad. 45p.

Rekha, M. N., Chauhan, A. S., and Eipeson, E. 2000.Instant soup mixes from palak and Indian dill. . Souvenir ICFOST, Indian Convention of Food scientists and Technologists. Mysore. 22-24p.

Renjini, R. 2008. Diet, life style pattern and health profile of professionals in software industry. M.Sc (HSc) theiss, Kerala Agriculatural University, Thrissur, 94-128p.

Reshmi, R. 2007. Age of menarche and nutritional status of urban school girls. M.Sc (HSc) theiss, Kerala Agriculatural University, Thrissur, 94-128p.

Robinson, K. Arhert, K. Refsum, H. Brattstorm, L. and Graham, I. 1998. Low circulating folate and vitamin B6 concentrations: Risk factors for stroke and coronary disease. Circulation, 97: 437-443p.

Rolls, B. J. Rowe, E.A. and Rolls, E. T. 1981. Variety enhances food intake in man. A text book of physiological behavior.p 2-31.

Santhakumari, G. and Putturaj, S. 2004. Dietary characteristics of trained and untrained farm women. *Ind. J. Nutr.Dietet*. 41(1) : 312.

Santhoshkumar, S. 1990. An experimental study on the relative effectiveness of selected visual aids in teaching neoliterate. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur.198p.

Satyanarayan, N., Giridhar, K., Balaswamy, K., Shivaswamy, V. and Rao, D. 2001. Studied on the development of instant chutneys from pudina and gongura. *J. Fd. Sci. Tech*. 38:122-514.

Saxena, R. 1999. How green is your diet? Nutrition 33:9p.

Setty, L. 1989. Colour as criterion of quality. CFTRI. Mysore. p 624.

Shashikala, Y. Seghal, S. and Chandrasekar, V. 2003. Effect of domestic processing and cooking on selected contents of some green leafy vegetables. *Pt. Fd.Hum. Nutr*.58: 1-11.

Sheela. K. V. 2004. Effectiveness of IEC materials on health and Nutritional practices of adolescent girls. M.Sc. (HSc) thesis, Kerala Agricultural University, Thrissur,65-100p.

Sheethal, K.C. 2011 Promoting fruit and vegetable consumption among school children through nutrition intervention programme.M.Sc. (HSc) thesis, Kerala Agricultural University, Thrissur.P69-148.

Shenoy, S. Mini, R. and Sulabha, S. 2000. Processing and value addition of green leafy vegetables. *Ind. J. Nutr.Dietet*. 42(2) : 312-319p.

Sheth, M. Gurudasani, R. Mistry, V. and Mehotra, S. 2006. Food safety education as an effective strategy to reduce diarrhoeal morbidity in children less than two years of age. *Ind. J. Nutr.Dietet*. 43(1) : 22-32.

Shingade, M. Y., Chavan, K. N., and Gupta, D. N. 1995. Aproximate composition of unconventional leafy vegetables from the Konkan region of Maharashtra. *J. Fd Sci. Tech*. 32: 429-431.

Shiny, R. L (2004) Assessment of nutritional cognition of selected rural youth and the nutrition related practices of their families. M.Sc (HSc) theiss, Kerala Agriculatural University, Thrissur, 94-128p.

Siddique. N. A., Bari, M. A., Rahman, M. H., and Sultana, R. S. 2004.Collection of indigenous knowledge and identification of endangered medicinal plants by survey. *J. Bio. Sci*.4:72-80.

Sindhu, K.S. 1984. Methodology of research in education. Sterling Publishers, New Delhi. 145-158p.

Sindhudevi, P. 1994. Differential preference of work by agricultural labouraers and their employment and wage pattern in Thiruvananthapuram District. M.Sc (Ag) theiss, Kerala Agriculatural University, Thrissur, 246p.

Smolin, L. A. and Grosvenor, M. B. 2000. Nutrition Science and application. Saunders college,Orlando.530p.

Subbulakshmi, G. and Rajeshwari, M. 2001. Golden Greens. Research unit College of Home science, Nirmala Niketan, Mumbai. 49 p.

Supe, S.V. and Singh, S.N. 1968. Dynamics of rational behavior of Indian farmers. New Dew heights publishers and distributors, Daryaganj. Delhi-110006.

Thurstone, L.L. (1946). Comment. *Am. J. Soc*. 52: 39-50.

Tucker, K.L. 2005. High homocysteine low B complex vitamin predict cognitive decline in ageing men. *Am. Clin. Nutrn. 82-127p.*

Underwood, P. 2000. Dietary approaches to the control of vitamin A deficiency.*Fd. Nutr. Bull.* 21:117-123.

UNICEF, 1990. The nature of the nutritional problems strategy for improved nutrition of children and women in developing countries. UNICEF News. 19 p.

Unnithan, A.G. 2008. Contributing factors and problems associated with overweight among rural and urban school children, Ph.D thesis KAU, Thrissur. 140-147p.

Verma, T. S., Joshi, S. and Sharma, S. C. 2001. Cabbage. Text book of vegetables, Tuber crops and Spices, ICAR. New Delhi, 97-129p.

Yagammi, C. Kanimozhi, S. and Vijayalekshmi, P. 2002. Effect of nutrition education of mother on the nutritional status of infants. *Ind. J. Nutr. Dietet.39p.*

Appendices

APPENDIX- I

KERALA AGRICULTURAL UNIVERSITY

COLLEGE OF AGRICULTURE VELLAYANI

DEPARTMENT OF HOME SCIENCE

Interview schedule to elicit information on personal and socio-economic characteristics of the respondents

1. Name and address :
2. Age :
3. Caste : Forward/OBC/SC/ST
4. Family size : Small/Medium/Large
5. Family type : Nuclear/Joint
6. House holds members and their demographic particulars :

Sl. No.	Sex	Age	Education	Employment	Monthly income

7. Land possessed ……. Cents/Acres/Nil
8. Green leafy vegetables cultivated in your land :
9. Details of livestock possessed : Animals/Poultry/Both
10. Type of house : Own/Rented/Leased
11. Source of drinking water : Own pipe/Own well/ Common pipe/ Common well

APPENDIX- II

KERALA AGRICULTURAL UNIVERSITY

COLLEGE OF AGRICULTURE VELLAYANI

DEPARTMENT OF HOME SCIENCE

Schedule to collect dietary habits of the respondent

1. Dietary habit of the respondent : Vegetarian/ Non –vegetarian
2. Habit of dining out : Daily/ Frequently/ Occasionally
3. Commonly used green leafy vegetable preparations :
4. Frequency use of green leafy vegetables :

Green leafy vegetable	Daily	Thrice a week	Twice a week	Once a week	Occasionally	never
Red amaranth						
Green amaranth						
Drumstick leaf						
Agathi						
Chekkurmanis						
Basella						
Cabbage						
Cauliflower						
Cowpea leaf						
Colocasia leaf						
Water leaf						
Curry leaf						
Corinader leaf						

APPENDIX- III

KERALA AGRICULTURAL UNIVERSITY

COLLEGE OF AGRICULTURE VELLAYANI

DEPARTMENT OF HOME SCIENCE

Interview schedule to elicit information on knowledge of the respondents towards green leafy vegetables

Name of the respondent:

Address:

Sl.No.	Statements	True	False
1	Green leafy vegetables should be included in the diet atleast thrice a week		
2	Green leafy vegetables are the richest source of vitamins and minerals		
3	A daily intake of atleast 100g green leafy vegetables is recommended by nutritionists		
4	Frequent consumption of green leafy vegetables leads to diarrhea.		
5	Green leafy vegetables contain antioxidants that prevents cancer and heart diseases.		
6	We get only a small amount of nutrients form leafy vegetables		
7	Nutritional value of leafy vegetable is lost during the cooking process		
8	Consumption of green leafy vegetables prevents micronutrient deficiencies		

9	Leafy vegetables should be cooked in closed vessels to prevent nutrient loss		
10	Green leafy vegetables cooked with oil improves its bioavailablity		
11	Different types of leafy vegetables should not be cooked together		
12	Leafy vegetables consumed with fish and meat affect the health		
13	Green leafy vegetables contains large amounts of fat		
14	Green leafy vegetables contains vitamin A which prevents night blindness in children		
15	Green leafy vegetables contains fibre which improves the process of digestion		
16	Use very small amount of water for cooking leafy vegetables		
17	Well cooked leafy vegetables are good for consumption		
18	Green leafy vegetables are the rich source of vitamin C		
19	Green leafy vegetables are not given to children below three years		
20	Kidney patients should avoid the consumption of leafy vegetables		

APPENDIX- IV

KERALA AGRICULTURAL UNIVERSITY

COLLEGE OF AGRICULTURE VELLAYANI

DEPARTMENT OF HOME SCIENCE

Interview schedule to elicit information on attitude of the respondents towards green leafy vegetables

Name of the respondent:

Address:

Sl. No.	Statements	Agree	Fully Agree	No Comments	Disagree	Fully Disagree
1	Raw cabbage is good for consumption					
2	Collecting drumstick leaves for cooking is difficult					
3	Leafy vegetable consumption leads to stomach discomfort					
4	Leafy vegetables are cooked and given to children according their likes					
5	Leafy vegetables are locally availble					
6	Only a very small space is need for the cultivation of leafy vegetables					

7	Cultivation and of green leafy vegetables are expensive					
8	Leafy vegetables are not easily affected pests					
9	Children like beetroot, carrot and beans more than green leafy vegetables					
10	The use of pesticides are low in leafy vegetables, so they are safe for consumption					
11	Consumption of leafy vegetables in rainy season leads to stomach ache					
13	Leafy vegetables have medicinal property so they prevent diseases					
14	Leafy vegetable contains fibre, so they are not given to children					
15	Leafy vegetable dishes are forcefully given to children					

APPENDIX- V

KERALA AGRICULTURAL UNIVERSITY

COLLEGE OF AGRICULTURE VELLAYANI

DEPARTMENT OF HOME SCIENCE

Evaluation card for composite scoring test

Name of the panel member:

Address:

Name of products: 1) Amaranth squash, 2) Weaning mix, 3) Chekkurmanis cutlet
4) Wheat rawa Kichdi, 5) Drumstick leavws with scrambled egg

Assign scores for each sample for various characteristics

Quality attributes	Maximum score	Code number of samples				
		1	2	3	4	5

Scores: Excellent (5) Very good (4) Good (3) Satisfactory (2) Poor (1)

APPENDIX- VI

KERALA AGRICULTURAL UNIVERSITY

COLLEGE OF AGRICULTURE VELLAYANI

DEPARTMENT OF HOME SCIENCE

Green leafy vegetable recipes and their method of preparation

Name of the respondent:

Address:

1) CHEERAYILA SADHAM

INGREDIENTS

1. Rice - 1 cup
2. Onion - 2 nos
3. Cheerayila - 3 cup
4. Groundnut - 1 tbsp
5. Coconut - 1 cup
6. Jeerakam - 1 tsp
7. Bengalgram dhal - 1tbsp
8. Tomato - 2 nos
9. Ghee - 1 tbsp
10. Salt - to taste

METHOD OF PREPARATION

Cook the rice well and strain it. Roast and powder the item number 1, 6 and 7. Take oil in frying pan and add items 2, 3, 4, 8 and sauté well. Finally mix this with the rice and season it with ghee and salt to taste.

II) MURINGAYILA CURRY

INGREDIENTS

1. Drumstick leaf - 2 cup
2. Green gram - half cup
3. Grated coconut - half cup
4. Chilly - 3 nos
5. Jeerakam - 1tsp
6. Coriander - half tsp

METHOD OF PREPARATION

Cook green gram dhal and murigayila. Then grind item number 3, 4, 5, 6 and add to dhal and drumstick leaf. Add salt to taste.

III) CHEMBILA PALAHARAM

INGREDIENTS

1. Chembila - 12 nos
2. Raw rice - half cup
3. Grated coconut - half cup
4. Chilly - 3 nos
5. Tamarint - 1tsp
6. Oil - 7 tbsp
7. Salt - to taste

METHOD OF PREPARATION

Grind the item number 1, 3, 4 and 5. Then the grind mixture paste on the both sides of the chembila. The paste chembila steam about 15 minutes. Take oil in frying pan and fried the steam chembila to it.

IV) AMARANTH SQUASH

INGREDIENTS

1. Red amaranth - 100g
2. Sugar - 1 cup
3. Lemon - 2 nos
4. Water - half litter

METHOD OF PREPARATION

Cook chopped amaranth in water for five minutes and strains the extract from it. Add sugar and lemon juice to it.

V) WEANING FOOD

INGREDIENTS

1. Ragi powder - 25 g
2. Greengramdhal - 15g
3. Amaranth - 30g
4. Jaggery - 30g
6. Ground nut - 10g

METHOD OF PREPARATION

Roasted and powdered the item number 2 and 3. Then add jaggery syrup to it, and mix with all to ragi powder. Cook chopped amaranth in water for five minutes and strains the extract from it. Then add the extract to ragi mixture and cook for five minutes.

VI) DRUMSTICK LEAVES WITH SCRAMBLEDEGG

INGREDIENTS

1. Egg (beatens) - 2nos
2. Drumstick leaf - 40g
3. Onion - 1 nos
4. Carrot - 2tbsp
5. Chilly - 2 nos
6. Oil - 3 tbdp

METHOD OF PREPARATION

Take some oil in frying pan and heated, add item number 2, 3, 4 and five, then sauté it well. Then add the beaten egg to it and cook well. Add salt to taste.

VII) CHEKKURMANIS CUTLET

INGREDIENTS

1. Tapioca - 1 cup
2. Chekkurmanis - 100g
3. Onion - 1 nos
4. Ginger - small piece
6. Carrot - half cup
7. Chilly - 4 nos
8. Oil - 1 cup
9. Garam masala - 1tsp
10. Bread crumbs - half cup
11. Egg white - 3 tbsp

METHOD OF PREPARATION

Take some oil in frying pan and add the chopped item number 2, 3, 4, 6 and 7, then sauté well. Add garamasala powder and salt to it. Then mix it with smashed tapioca. Remove from fire, shape into round cutlets, dip in beaten egg white, roll in powdered bread crumps and deep fry.

VIII) POSHAKA DOSA

INGREDIENTS

1. Dosa mavu - 2 cup

2. Cowpea leaf - 100g
3. Onion - 1 nos
4. Curry leaf - 10g
6. Carrot - half cup
7. Chilly - 4 nos
8. Coriander leaf - 5g
9. Ginger - to taste

METHOD OF PREPARATION

Mix all chopped items with dhosa mavu. Then the dosamavu pour on a tawa and prepare dosas.

IX) WHEAT RAWA KICHADI

INGREDIENTS

1. Broken wheat - 1 cup
2. Amaranth leaf - 100g
3. Onion - 1 nos
4. Curry leaf - 10g
5. Carrot - half cup
6. Chilly - 4 nos
7. Beans - 25g
8. Oil - 2 tbsp

METHOD OF PREPARATION

Take a frying pan with oil and add the chopped item number 2, 3, 4, 5, 6 and 7 to it and sauté well. Then add cooked broken wheat to it and mix well. Add salt to taste.

X) DRUMSTICKLEAF SOUP

INGREDIENTS

1. Drumstick leaf - 1 cup
2. Tomato - 30g
3. Onion - 1 nos
4. Milk - 1 cup
5. Ghee - 1 tbsp
6. Pepper powder - half tsp

METHOD OF PREPARATION

Cook the chopped item number 1, 2 and 3 in two cups of water and then strain it. Add item number 4, 5 and 6 to the strained soup and mix well. Add salt to taste.

APPENDIX- VII

KERALA AGRICULTURAL UNIVERSITY

COLLEGE OF AGRICULTURE VELLAYANI

DEPARTMENT OF HOME SCIENCE

Teaching aid used in nutrition education programme (LEAFLET)

APPENDIX- VIII

KERALA AGRICULTURAL UNIVERSITY

COLLEGE OF AGRICULTURE VELLAYANI

DEPARTMENT OF HOME SCIENCE

Teaching aid used in nutrition education programme

VIDEO SHOW

Abstract

PROMOTING CONSUMPTION OF GREEN LEAFY VEGETABLES AMONG RURAL WOMEN THROUGH PARTICIPATORY APPROACH

by

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(2009-16-105)

THESIS

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ABSTRACT

The present study entitled "Promoting consumption of green leafy vegetables among rural women through participatory approach" was conducted with the objective of promoting consumption of green leafy vegetables among rural women through an intensive educational programme employing participatory techniques and to assess its impact.

The assessment of personal and socio-economic characteristics, dietary habits, collection of traditional recipes and knowledge about uses of green leafy vegetables, current supplementary feeding programme of the selected five anganwadi centers were done on the selected sample of the one hundred respondents. The respondents were selected from the five ICDS centers namely Athiyannoor, Aralummoodu, Pathamkallu, Vazhimukku, and Kaithottukonam in order to impart nutrition education programme for promoting green leafy vegetable consumption and also to promote inclusion of leafy vegetables in the supplementary feeding programme of the selected five anganwadi centers. The impact evaluation of nutrition education programme was assessed after a gap of three month.

The findings of the socio-economic survey done revealed that majority of the respondents belonged to the age group less than or equal to thirty five years and belonged to Other Backward Caste (about 60 percent). Analysis of family structure revealed that majority of the respondents belonged to nuclear type of families and had a family size of 1-4 members.

While analyzing the land holding size, it was found that eighty six percent of the respondents had their own land. Most of the respondents were (sixty four percent) not engaged in any livestock rearing and forty six percent of the respondents

did not grow any green leafy vegetable at all. About eighty percent of the respondents lived in their own house and about fifty four percent of the respondents were having tap water facility for drinking purpose.

Regarding educational status it was found that majority of the respondents had education up to pre-degree level. The employment status of the respondents shows that majority of them were unemployed. Most of the families had monthly income between 7323-9787 rupees and belonged to middle income group.

Dietary habits of the respondents indicated that ninety percent of them were habitual non-vegetarians. Majority of the respondents (about fifty three percent) took food outside home occasionally. A majority percentage of respondents were using green leafy vegetables in the form of thoran. The frequency of use of green leafy vegetables revealed that most of the respondents used curry leaves and coriander leaves in their diets.

The conduct of the supplementary feeding programme in the selected anganwadi centers was studied with the help of anganwadi worker. It revealed that poor utilization of green leafy vegetables in the supplementary feeding programme in the five selected anganwadi centers.

A number of traditional recipes and various uses of green leafy vegetables were collected from the respondents. Five green leafy vegetable recipes namely chekkurmanis cutlet, drumstick leaves with scrambled egg, wheat rawa kichdi, weaning mix and amaranth squash were selected from these and subjected to acceptability tests among a selected panel of judges.

Chekkurmanis cutlet was the highly accepted one while weaning mix was the least accepted product. None of the green leafy vegetable recipes were too low in mean score, this revealed that almost all green leafy vegetable recipes were liked by the panel members.

Assessment of pre knowledge and attitude scores of respondents showed that majority of respondents had poor level of knowledge and attitude about the use of green leafy vegetables. The nutrition education programme was conducted to make the respondents aware of the importance of green leafy vegetables in their daily diet and inclusion of green leafy vegetables in supplementary feeding programme of the selected five anganwadi centers. The nutrition education programme was conducted with the help of nutrition education classes, charts, a video show on leafy vegetables prepared for the purpose of the study, leaf lets, kitchen gardening, demonstration and discussion.

The impact of the nutrition education programme was assessed after three months by conducting a post test. The results showed that there was highly significant gain in knowledge and change in attitude of the respondents thus pointing out the positive impact of the nutrition education programme. The post test conducted revealed a significant change in the consumption of green leafy vegetables by the respondents. Locally available leafy vegetables were found to be included in the supplementary feeding programmes of the five selected anganwadi centers. The anganwadi workers also reported that they would use the leafy vegetables from the leafy vegetable garden for the feeding programme when the plants had grown. The scope of nutrition communication programmes using a participatory approach for bringing about positive change in the consumption of green leafy vegetables is evident from this study. The study proved that this programme can be successfully implemented in all the anganwadi centers of our state. The increase in the actual

green leafy vegetable consumption will surely help to alleviate the micronutrient deficiencies prevalent in our state especially among women and children.