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Research Article

DEVELOPMENT AND STANDARDIZATION OF IRON RICH LADDU

Uma Rani M.[1] and *Sucharitha K.V. [2]
Department of Home Science, Sri Venkateswara University, Tirupati-517502
**Author for Correspondence*

ABSTRACT
Iron deficiency is a common problem in India due to various factors, lack of iron foods in their diet is one of the factors. Garden cress Seed scientifically named as (Lepidium sativum) belonging to Brassica ceae family. It is one of the most important oil seeds crop grown in the hot regions like West Asia. The seeds are rich in iron content, 100gm of seeds provide 100mg of iron. The present study was planned to develop convenient snack food for adolescents. Laddu is a traditional recipe of Indian foods with different compositions and combinations, in the present work laddu with iron rich foods was developed. Two different compositions were developed and subjected to sensory evaluation using 5 point hedonic scale rating method.

***Keywords*:** *Garden Cress Seeds, Laddu, Iron, Adolescents*

INTRODUCTION
Iron deficiency which is the most common nutritional deficiency in the world is a major public health problem especially in developing nations notably in women and child bearing age.
Severe iron deficiency leads to iron deficiency anemia which is affecting more than 30 % of the global population.
Adolescent have increased requirements for iron due to inadequate intake of dietary iron especially heme iron. Adolescent girls have lower iron stores compared to adolescent boys.
Country experience with decades of iron supplementation programme has been less than satisfactory with the levels of Iron.
Iron deficiency remaining stubbornly high in this vulnerable group even in the face of supplementation. The challenge there fore is to increase in intake, bioavailability and absorption of iron in the system (Gopalan *et al.,* 2014).
Hence, the investigator made an effort to develop an iron rich laddu using garden cress seeds, ground nuts and jaggery.
Garden cress is commonly referred to as Hadim seeds. It is an annual herb which is native to Egypt and Asian but is widely cultivated in hot temperate climates throughout the world for various culinary and medical uses (Malleshi and Guo, 2004).
These seeds are small oval shaped pointed and triangular at one end, smooth, about 3-4 mm long, 1-2 mm wide reddish, brown in colour (Rahman, 2004).
The health benefits of Garden cress Seeds have been recognized in Europe and India for decades now. It is an important source of iron, folic acid, calcium, vitamin C, E and A.
It is the richest source of iron containing 100mg of iron for 100g of seeds. Garden cress seeds also provides good amount of carbhohydrate, calories and protein containing 33g, 454 k.cals and 25.3g respectively. It is low in fat but contains good amounts of PUFA.
Studies shows supplementation of seeds for 1-2 months increased hemoglobin levels. As it also contains good amount of tocopherol, beta carotene and ascorbic acid it also improved body immunity (Bala Subramanian, 2009).
The main purpose of the study was to develop a ready to eat snack food item rich in iron. Garden cress seeds were choosen to incorporate and the other ingredients like groundnuts and jaggery were selected, which are also rich in iron.
Protein and fat are also important nutrients in adolescent period hence groundnuts were choosen. The formulation was presented in methodology.

MATERIALS & METHODS

Methodology

The formulation, development and standardization of iron rich laddu using garden cress seeds was carried out in the Department of Home Science, Sri Venkateswara University Tirupathi.

Formulation of Garden Cress Laddu

i) *Procurement of ingredients*

Garden cress seeds, ground nut seeds, jaggery were used in the formulation of the iron rich laddu. All the ingredients were procured from the local market.

ii) *Pretreatment and Preparation*

Ingredients used for laddus were accurately weighed. Garden cress seeds were cleaned and roasted with ghee. Ground nuts seeds were cleaned and roasted separately and powdered. The fine Powder's were accurately weighed and mixed with the powdered jaggery to form an iron rich laddu.

Analysis

Two variations of Garden cress laddu were formulated and standardized following the method mentioned above. The variations were coded as SI and SII. The nutrient composition was calculated using nutritive values of Indian foods (Gopalan *et al.,* 2004).

The adolescents of age 10-16 years were selected randomly to assess the acceptance of the laddu. The acceptability of laddu was tested by sensory evaluation.

Table 1: Composition of Various Samples for Standardization of the Product

S.No.	Ingredients	Sample-I (S-I)	Sample – II (S- II)
1.	Groundnuts	20	20
2.	Jaggery	20	15
3.	Garden Cress Seeds	10	15
4.	Elachi for Flavor	Required amount	Required amount

The two variations SI and SII developed using Garden cress Seeds, groundnuts, jaggery and elaichi. The nutrient content was calculated to fifty grams of the sample SI containing 10g of Garden Cress seeds, 20g of groundnuts and 20g of jaggery. In SII 15g of Garden Cress seeds, 20g of ground nuts, 15g of jaggery respectively and elachi is added for flavour. The two varations were subjected to sensory by the trained panel memebers to asses the appearance, colour, flavor, texture, taste and overall acceptability using five point hedonic scale.

Gigi Elizabeth *et al.,* (2014) developed ten recipes with the incorporation of Garden Cress Seeds. They reported that incorporation of 10g of garden cress seeds is acceptable in sixty percent of the developed snacks.

Angel *et al.,* (2014) formulated and developed cheapest nutritious iron rich health mix with garden cress seeds. In the mix he stated that 5g incorporation of garden cress seeds is acceptable.

Sharma, (2015) studied the acceptability of germinated garden cress seeds by incorporating into the food consumed daily like sandwich, raitha, soups and salads. She incorporated 7-30% of germinated seeds in to the above recipes, and stated that samples prepared with 10-15% of garden cress seeds was most acceptable.

RESULTS AND DISCUSSION

The nutrient composition of the products standardized for fifty grams of laddu and calculated nutritive values are presented in the table 2. The essential nutrients like calcium, iron, folic acid and vitamin- C nutritive values were calculated by using the nutritive value of Indian foods by Gopalan *et al.,* (2007). The major nutrients CHO, protein and fat were calculated, the minor nutrients iron, calcium and folic acid were calculated. The total calories for SI and SII were 236 and 39.55, protein 7.85 and 9.09 respectively.

There is so much difference in carbohydrate and protein content between SI and SII. The iron content of SII was more than SI, because more garden cress seeds were added.

Table 2: Proportion of the Ingredients Used and their Nutrient Content

Sample – I							
Ingredents	**Amount (gms)**	**Energy (kcals)**	**Protein (gm)**	**Fat (gm)**	**Cho (gm)**	**Calcium (mg)**	**Iron (mg)**
Garden cress Seed	10	45.4	2.53	2.45	6.6	37.7	10
Ground nuts	20	114	5.24	7.96	5.34	15.4	0.62
Jaggery	20	76.6	0.08	0.02	19	16	0.528
Total	50	236	7.85	10.43	30.94	69.1	11.145
Sample-II							
Garden cress seed	15	68.1	3.79	3.67	4.95	56.55	15
Ground nuts	20	114	5.24	7.96	5.34	15.4	0.62
Jaggery	15	57.45	0.06	0.015	14.25	12	0.396
Total	50	239.55	9.09	11.645	24.54	83.95	16.01

*Nutritive values calculated using – NIN
Source: Nutritive values calculated by C. Gopalan, nutritive value of Indian Foods

Table 3: Organoleptic Evaluation of the Iron Rich Laddu

S.NO	**Samples**	**Appearance**	**Color**	**Flavor**	**Taste**	**Texture**	**Overall Acceptability**
1.	Sample-I	4.2	4	3.9	4	4	4.06
2.	Sample-II	3.2	4	3.8	3.3	3.5	3.80

The organoleptic evaluation of Iron rich laddu was done and the data was expressed in terms of mean scores on a 5 point hedonic scale and presented in table 3, among the samples sample I recorded highest score for all the attributes. Each attribute was rated as excellent, very good, good and fair appropriate scores was given as 5,4.3,2,1 respectively. The mean scores of the attributes like appearance, color, flavor, taste, texture and overall acceptability were calculated and presented in table.

The sample I recorded highest score for appearance 4.2 and for sample II 3.2. The scores with respect to color indicated same between the two samples. The scores with respect to flavor indicated little differences between the two samples. The sample I recorded highest score 4 for taste were as it was 3.3 for sample II. The sample I recorded as highest score 4.06 for overall acceptability where as lowest score was recorded in sample II 3.80. The mean scores, shows

Sample I was acceptable.

Conclusion

Garden cress seeds are an important food stuff loaded with nutrients as well as health enhancing benefits nutritive value of these seeds is very high. It is available in almost all parts of the world. Its high nutritive value and cheaper availability makes it possible for people of all the sections of society to include in the diet and improve the micro nutritive quality of their food.

Snacks can be made healthier and nutrious by either changing the main ingredients or incorporation of nutritious substances into the snacks. In the present study development of laddu for adolescence is of interest especially the modification and enrichment.

Incorporation of garden cress seeds in foods have shown marked increased in the iron and protein content. In the present study 2 samples in different trials were carried out with different proportions of garden

cress seeds. In the process of standardization of ingredients, Garden cress seeds, jaggery was altered and amount of groundnuts along with the elachi for flavor were kept constant for the two samples.

Organoleptic scores were observed for 2 different samples. The data from the table 3 reveals that the mean sensory scores for the attribute color of the two samples were almost similar to each other. The mean score of first trial 4.2 explains its high acceptability which was attributed to the appearance and round shape of the laddu. In case of sensory attribute flavor of the first sample dominated the other sample during the sensory evaluation of the product. The highest mean score were taken as a mark of desirability which may be due to the pleasant aroma of groundnuts and garden cress seeds used in equal quantity in the first sample. The mean scores of first samples taste subsequently dominated the other trial, which is denoted by higher sensory mean scores of first sample taken as a mark of desirability which may be due to the sweet and roasted groundnuts and less garden cress seeds respectively.

The taste of ground nuts dominated the final product in the first sample which in turn affected the final scores of the panel members therefore the overall acceptability mean scores were again more for the first sample rather than the other sample which can be attributed to the comprehensive role played by the individual sensory characteristics in the final acceptance of the product as the first sample gained highest scores against the other formulations for all the attributes. The vital part is through food supplementation, the developed laddus can be supplemented for anemic adolescents to combat anemia.

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