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RESEARCH ARTICLE

ACCEPTABILITY EVALUATION OF IRON RICH PRODUCT DEVELOPED FROM LEPIDIUM SATIVUM

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ABSTRACT

Iron Deficiency Anemia is a major public health problem which affects all age groups. Women in reproductive years are more susceptible to iron deficiency and consequent anemia. A lot of reasons are a part of the etiological factors of anemia and diet being one of the major cause. A poor, nutrient deficient diet makes anemia part of a vicious cycle which fails to end. The present study is aimed at development of ladoos, which are rich in iron by incorporating garden cress seeds at various levels. Garden cress seeds are highly nutritious and are excellent source of iron which is 100 g/ 100g of seeds. These are readily available and can be used for food fortification. In this study 4 variations of ladoos were prepared viz., A, B, C and D by incorporating 2.5g, 5g, 7.5g and 10 g of garden cress seeds, respectively. All the four variations were subjected to sensory evaluation. Variation D was found to be the most acceptable one. The nutrient content was calculated to be around 10.50g/100g of the product.

INTRODUCTION

Garden cress seeds (*Lepidium Sativum*) belonging to the family Brassicaceae (Cruciferae), believed to have originated primarily in highland regions. It is believed to be originated in Egypt and West Asia, is widely cultivated in all parts of the world with hot and temperate climate. The garden cress is widely used in medicine as well as cooking (Malleshi N, 2004). The seeds are known by various names, commonly as Chandrashoor (Sharma & Agarwal, 2010) or Halim in Hindi, Aliv in Marathi and Asali in Malayalam (Rahman M.A, 2004). The seeds are the major part of the crop, commonly used. They are small, brownish red in color, oval in shape, triangular and pointed at one end and smooth in texture (Gigi *et al.*, 2014). Garden cress seeds contain good amount of iron which is around 100mg of 100g of seeds. These are low in fat but a very good source of PUFA. The seeds provide around 454 kcal energy, 33 g/100g carbohydrates, and 25.3 g/100g of protein (Rani & Sucharitha, 2016). A lot of studies conducted shows that garden cress seeds possess a lot of pharmacological properties like anti anemic, anti-diabetic, aperients, diuretic, and tonic, also possess galactogogue and emmanogogue properties. (Gokavi *et al.*, 2004). The galactogogue properties of garden cress seeds are well documented and traditional preparations including kheer is prepared for lactating mother to increase milk production (Mandal, 2008 & Pattanaik, 2003). Since the seeds have such humongous pharmacological and

nutritional properties, they can be used for fortification and value addition to various foods and for development of functional foods (Gokavi *et al.*, 2004). Anemia is a condition that develops when our blood lacks enough healthy red blood cells or hemoglobin. Hemoglobin is a main part of blood cells and binds oxygen. Certain forms of anemia are hereditary and infants may be affected from the time of birth. Women in the childbearing years are particularly susceptible to iron deficiency anemia because of the blood loss from menstruation and the increased blood supply demands during pregnancy. Older adults also may have a greater risk of developing anemia because of poor diet and other medical conditions. The menace of increased maternal and perinatal mortality has significantly increased as a result of anemia and the figures have been as high as 115,000 maternal deaths and 591,000 perinatal deaths all over the world (Salhan & Tripathi, 2012). Iron deficiency is mainly seen in adolescent years. Studies conducted by World Health Organization in the South East Asian region indicates that 20% of the population which is primarily belonging to adolescent age group suffers from malnutrition and anemia, which adversely affects health and development (WHO, 2005). Dietary factors have a significant role in the development of iron deficiency and consequent anemia (Katheryn *et al.*, 2014). Both poor health as well as poor nutrition are the causes of anemia. Any sort of dietary intervention aimed at eradicating anemia should primarily improve the iron stores of the body and bring about subsequent increase in hemoglobin levels (Mittal *et al.*, 2011). Since Garden Cress seeds are a rich source of Iron. Therefore, a number of studies which have been conducted shows positive

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results. A study conducted by Bala Subramaniam, 2009 showed an increase in the hemoglobin levels when the diet was supplemented with garden cress seeds for a period of 1-2 months. There was also an immunity boost amongst subjects because of the presence of tocopherols, beta carotene and ascorbic acid. Therefore, the following study was conducted to develop Iron Rich Laddoos by incorporating garden cress seeds and to study the acceptability of the same.

Table 1. Ingredients used for making Iron rich laddoos

S.No.	Ingredients	Amount [in grams]
1	Wheat flour	100
2	Sugar	90
3	Ghee	60
4	Garden Cress Seeds Powder	As per the Four variations

MATERIALS AND METHODS

Procurement of Raw Materials: Garden cress seeds were purchased from Nature’s Basket online store. The raw material was physically examined to ensure they were disease free and then stored properly. Wheat flour, ghee, sugar, were purchased from local market of Gurgaon.

Development of food product [Laddoos]: Using the above ingredients laddoos were developed by incorporating the garden cress seeds at 4 different levels viz., 2.5grams, 5grams, 7.5grams and 10 grams. The Iron content of garden cress seeds is high (28.6g/100g) therefore it is taken as a substrate for product development. The seeds were prepared by roasting and then ground to a fine powder to be incorporated in the standard recipe of laddoos. The four prepared variations were named as Sample A, B, C and D. The details of four variations are shown in the following table.

Table 2. Showing the 4 variation of Iron Rich Laddoos

s.no.	Variations	level of incorporation of garden cress seeds
1	Variation A	2.5 grams
2	Variation B	5 grams
3	Variation C	7.5 grams
4	Variation D	10 grams

Sensory Evaluation of the product: The sensory evaluation was done using 9-point hedonic scale. For each variation, sensory evaluation was conducted by 20 semi trained panel of judges. Using hedonic rating test, the prepared products were examined on the basis of taste, color, texture, firmness and overall acceptability.

RESULTS AND DISCUSSION

The samples were analyzed statistically using Mean and Standard Deviation, which were calculated on the basis of ratings given by the panel of judges. The samples were analyzed on the basis of various organoleptic attributes, which showed slight variations from each other. Table No. 2 shows the comparison among the various samples of laddoos on the basis of their organoleptic quality factors.

Product A

Taste: The sample had mean 8.5 ±1.19. It was made using lowest amount of garden cress seeds (2.5 grams).

Table 2. Showing Mean and SD Scores of the four variations

Attributes	Variation A	Variation B	Variation C	Variation D
Taste	8.5±1.19	8.1±1.44	8.5 ±1.19	9.15±0.98
Colour	8.75±1.16	8.75±1.29	8.95±0.94	8.9±1.41
Texture	8.9±1.41	8.7±1.03	8.8 ±1.05	8.65±1.03
Firmness	8.9±1.20	8.65±1.08	8.55±0.88	8.9±1.41
Stickiness	9.15±0.98	8.7 ±1.17	8.95±1.19	8.75±1.29
Overall acceptability	8.5±1.43	8.46±1.05	8.75±1.29	8.1±1.44

Since the product did not had much of the incorporation. Therefore, It did not had any unacceptable aftertaste.

Color: The sample had mean 8.75±1.16.The color of the sample was attractive and brown in color. The laddoos resembled normal wheat laddoos.

Texture: The sample had mean 8.9±1.41. It was easy to break and soft.

Firmness: The sample had mean 8.9±1.20 and quiet firm.

Stickiness: The sample had mean 9.15±0.98. Product had minimal stickiness.

Overall Acceptability: The sample had mean 8.5±1.43. The sample was acceptable by all the panel members.

Product B

Taste: The sample had mean 8.1±1.44.This sample has around 5 grams of incorporation and hence had a slight bitter aftertaste.

Color: The sample had mean 8.75±1.29.The color of product B was darker than that of product A.

Texture: The sample had mean 8.7±1.03.The texture was good and soft.

Firmness: The sample had mean 8.65±1.08. It was firmer than product A, which might be attributed to the presence of garden cress seeds.

StickinessThe sample had mean 8.7 ±1.17. There was no stickiness in the product.

Overall Acceptability: The sample had mean 8.46±1.05. This sample was acceptable by the panel members.

Product C

Taste: The sample had mean 8.5±1.19.The product had a slight bitter aftertaste.

Color: The sample had mean 8.95±0.94.The color of product C was darker than product A and B.

Texture: The sample had mean 8.8 ±1.05.The texture was same as all the samples.

Firmness: The sample had mean 8.55±0.88.It was firmer than sample A & B. The degree of firmness increases with the level of incorporation.

Table 4. Showing nutrient composition of the most acceptable product (Sample D)

Ingredients	Amount (g)	Energy (Kcal)	Protein (g)	Fat (g)	Carbohydrates (g)	Iron (mg)
Whole Wheat Flour	100	341	1.21	0.17	69.4	0.49
Garden Cress Seeds	10	45.4	2.53	2.54	33.0	10
Sugar	90	39.8	0.1	-	9.94	0.01
Ghee	60	90	10	60	-	-
TOTAL		516.2	13.84	62.7	112.34	10.50

Stickiness: The sample had mean 8.95 ± 1.19 . There was no stickiness in this variation.

Overall Acceptability: The sample had mean 8.75 ± 1.29 . It was also well accepted by the panel members.

Product D

Taste: The sample had mean 9.15 ± 0.98 . The taste of product D was good. Although, It had an aftertaste of garden cress seeds but despite that, it was liked by the panel members.

Color: The sample had mean 8.9 ± 1.41 . The color of product D was darkest out of all.

Texture: The sample had mean 8.65 ± 1.03 . The texture was also very soft and firm.

Firmness: The sample had mean 8.9 ± 1.41 . This sample had a higher degree of firmness.

Stickiness: The sample had mean 8.75 ± 1.29 . There is no stickiness in this variation. It is very soft.

Overall Acceptability: The sample had mean 8.1 ± 1.44 . It was well accepted by all but less than product B.

Although all the four variations of laddoos prepared i.e. A, B, C and D were liked and acceptable by the panel members. But from the Mean and Standard Deviation scores mentioned above, it can be seen that the Sample D was the most acceptable. It had an aftertaste of garden cress seeds but still it was liked by the panel members. The Nutrient content of the most acceptable product was calculated. Table No. 3 shows the nutritive value of Sample D as follows:

Conclusion

Garden Cress Seeds are the richest source of Iron and therefore they have been chosen for the purpose of product development. In this study four variations of laddoos were prepared using garden cress seeds for incorporation. The laddoos were liked and accepted by all the panel members. The Sample D, which contained around 10 grams of garden cress seeds was found to be the most acceptable one. The iron content of laddoos after incorporation came to be 10.50 g/100g.

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