

**INTERNATIONAL JOURNAL OF FOOD
AND NUTRITIONAL SCIENCES**

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Official Journal of IIFANS

ORGANOLEPTIC ATTRIBUTES OF GARDEN CRESS SEED INCORPORATED SNACKS SUITABLE FOR ADOLESCENTS

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Received on: 8th September, 2014

Accepted on: 8th December, 2014

ABSTRACT

Garden cress seed is a food that abounds nutrients and health enhancing components. It has been shown to have a wide range of positive physiological effects on human health. *Garden cress seeds* are significant source of iron, containing 100 milligrams iron per 100g. Other minerals and vitamins are abundantly present in Garden cress seeds. The present study was conducted with the objectives of identifying snacks that are suitable for the adolescent population and modifying them with the incorporation of *Garden cress seed* at different levels. The adolescent age group was purposively selected as there are increased nutritional demands during this period and poor micronutrient intake. The prepared snacks were evaluated for sensory attributes and acceptability. Evaluation was carried out using a seven point Hedonic scale. A total of ten recipes were prepared with the incorporation of Garden cress seeds at 5, 10, 20 and 30 grams respectively. From the study it can be inferred that for 60% of the prepared snacks, the highest sensory attributes were at 10g level of incorporation. The nutrient profile of prepared snacks revealed a direct relationship, with the increase in *Garden cress seed* incorporation there was an increase in iron, protein and calcium content of the snacks. It can be concluded that Garden cress seed incorporation is a feasible strategy to enhance micronutrient content of diets of adolescents.

Key words: Garden cress seeds, nutrient enhancement, iron rich foods, adolescent diet.

INTRODUCTION

Garden cress (*Lepidium sativum*) is an annual herb, belonging to *Brassicaceae* family that is native to Egypt and West Asia but is widely cultivated in hot temperate climates throughout the world for various culinary and medicinal uses (Malleshi N, 2004). Garden cress is commonly referred to as 'Aliv' in Marathi, 'Halim' in Hindi, and 'Asali' in Malayalam (Rahman M.A, 2004). The crop is mainly cultivated for seeds. Garden cress seeds are small, oval-shaped, pointed and triangular at one end, smooth, about 3-4mm long, 1-2 mm wide, reddish brown in color. A furrow present on both surfaces extending up to two thirds downward, a slight wing like extension present on both the edges of seed. On soaking in water seed coat swells and gets covered with transparent, colorless, mucilage with mucilaginous taste. The seed length and width are $298 \pm 3.2\mu\text{m}$ and $100 \pm 1.9\mu\text{m}$ respectively.

Garden cress seeds, known as Halim in Hindi are loaded with nutrition. It is an important source of iron, folic acid, calcium, vitamins C, E and A. It is a rich source of iron 'containing 100 mg iron/100g. Garden cress seeds are high in calories. It has about 454 kcal and 33 gram of carbohydrate per 100 gram with a protein content of 25.3grams. It is often given post partum to lactating mothers. It has low fat of 24.5 g, when compared with other nuts and oilseeds. The garden cress

is important source of iron containing 100 mg iron per 100 g. Minerals like calcium, phosphorus. Vitamins like carotene, thiamine, riboflavin, niacin are abundantly present in cress seeds and the seeds also have dietary fiber (Balasubramanian S.S, 2009).

Various health benefits have been observed with the consumption of Garden cress seed. It reduces the symptoms of asthma and improves lung function in asthmatics. Garden cress seed are widely used in many traditional medicinal preparations including cough syrups. Seeds are recommended for the dispersion of chronic enlargement of spleen. Powder of Garden cress seeds with sugar can also be used to cure diarrhea, indigestion and dysentery (Nadkarni et al 1954). A tea spoon full of Garden cress seeds boiled in 6 ounces of water for ½ hour and the decoction with a table spoonful of honey is given as an effective medicine to increase breast milk, sexual stamina and sexual retentivity (Chopra et al, 2012).

Garden cress seeds show many medicinal properties such as antidiabetic, hypocholesterolemic, antihypertensive, antidiarrheal, antispasmodic and laxative activities. It also has fracture healing, hepatoprotective, diuretic, and nephrocurative, and nephroprotective, antiinflammatory, antipyretic and analgesic potential. Garden cress seed can be used as a

promising multipurpose medicinal source (Eddouks et al, 2005)

Garden cress seed though an oilseed is abundant in all nutrients. Garden cress oil (GCO) has a balanced amount of polyunsaturated fatty acids (PUFA) (46.8%) and monounsaturated fatty acids (MUFA) (37.6%) and also contains natural antioxidants viz., tocopherols and carotenoids which protect the oil from rancidity. Garden cress seed is an oilseed, usually oilseeds are often considered high in calories, since many people are not aware of the nutritional information of these seeds. These are consumed less as compared with other super healthy foods like oats, greens, fruits and vegetables. Garden cress seeds are very high in iron and folic acid content. These seeds are used as herbal medicine to treat iron deficiency anaemia, because 100g of garden cress seed provide 100 mg. of iron. Iron is important for growth, brain development and the immune system, however it is commonly deficient or sub optimal in both children and adolescents. Iron deficiency mostly seen in adolescent period,. Recent reports of the World Health Organization (WHO) suggested that in South East Asia region a large number of adolescent, who constitute 20% of the population in these countries suffer from malnutrition and anemia which adversely impacts their health and development (WHO, 2005).

Inadequate iron intake increases the incidence of iron-deficiency anemia, especially among those adolescents at highest risk, such as pregnant adolescents, vegetarians, and competitive athletes. Vegetarianism is popular among some adolescents as they experiment or rebel and individuate. Without appropriate supplementation, these adolescents may be at risk for nutrient deficiencies. Consumption of garden cress seed with high iron intake can be a ideal solution to overcome the Iron Deficiency Anemia (IDA) (Srilakshmi, 2010)

Deaton and Dreze (2009) through their study on nutrition are of the view that per capita consumption of calorie, protein and many other micro nutrients have declined in India during the last 25 years. The planning commission (Government of India) has reported that a vast majority of adolescents consume energy dense snacks that are deficient in nutrients. The present study aims at incorporating iron rich garden cress seeds into snacks such as muffins and cookies which are popular among the youth today.

METHODOLOGY

In order to select snacks for the present study, various recipes were explored; recipes were improvised using information collected from various sources. Each product was developed with the incorporation of Garden cress seeds at four levels respectively. The selected recipes included five types of cookies and muffins respectively. The selected snacks were modified by adding Garden cress seeds at four levels (sample I- A, B, C, D-5g, 10g, 20g, 30g respectively) to make them more nutritious and healthy. The nutrient composition of the snack (without garden cress seed [control]) and the modified snacks were computed using ICMR, 2010 value and compared with control to study the extent of nutrient enrichment, and Recommended Daily Allowance (RDA)

met. The food product was evaluated for acceptability through a seven point Hedonic scale method. This method is helpful in grading products and comparison of quality attributes by indicating which characteristic is at fault in a poor product.

RESULTS AND DISCUSSION

Humans need a wide range of nutrients to lead a healthy and active life. The required nutrients for different physiological groups can only be derived from a well balanced diet. Components of the diet must be chosen judiciously to provide all the nutrients to meet the human requirements in proper proportions for the different physiological activities. The amount of each nutrient needed for an individual depends upon his/her age, body weight and physiological status. Recommended Dietary Allowance (RDA) is the average daily dietary nutrient intake level sufficient to meet the nutrient requirement of nearly all (97 to 98 percent) healthy individuals in a particular life stage and gender group (NIN, 2010).

The RDA for iron in adolescent girls is 26 mg. per day (NIN-2010). RDA percent of iron in the prepared snack items are presented in the *figures 1*, it shows that 5 to 30 gram garden cress seed incorporated cookies and muffins entirely meet (100%) the required iron. Figure 3 shows most acceptable level of incorporation of Garden cress seed among the various snacks prepared.

Overall, the results of sensory evaluation of the prepared cookies and muffins revealed that the acceptability of the prepared cookies and muffins did not suffer on account of incorporation of Garden cress seed, on the other hand, it was observed to be much higher in most of the prepared products. The highest mean acceptability score for 60% of the snacks prepared was observed to be for the snacks incorporated with 10g garden cress seeds. Thus, it can be concluded that there need not be any concern regarding the acceptance of the product, by the target group of adolescent girls.

The findings of Nora .V (2014) point out that sensory aspects such as appearance, taste, color, texture, flavor and overall acceptability of cookies with 10, 20 and 30 g Garden Cress Seeds was good. The panelists also expressed that though different quantities of garden cress seeds were used in the preparation (10, 20 and 30g), none of the samples had a bitter after taste and their taste was as acceptable just as the control cookies.

The compiled nutrient profiles data table I shows that the nutritive quality of the products was enhanced significantly with the incorporation of Garden cress seed, especially that of energy (515.85 kcal), iron (up to 17 mg), protein (up to 20.2 g), and calcium (up to 126.3 mg) at the highly acceptable level of incorporation (10g Garden cress seed). The % RDA met was also found to be about 50% which is a significant figure.

A similar study conducted by Nathiya. M (2013) reported that the iron content of the control was around 14 mg, where as the samples which had Garden cress seeds in them provided a minimum of 24 mg / 100g. This was nearly 90% of the RDA for Indian adult (NIN, 2009). Fat present in the cookies was slightly higher due to the addition of butter and oil from the garden cress seeds.

Based on the findings of this study it was found that Garden cress seeds which are loaded with many nutrients especially iron and calcium can be incorporated into snacks consumed by adolescents as they help in enhancing the nutritive quality of the diet without compromising on the sensory attributes. Being a time of growing up both physically and socially, the nutrition

choices adolescents make will affect not only their current health, but their future health as well. Instead of buying high- calorie, ready- made foods that are popular among them healthier version of these snacks can be tried by the incorporation of Garden cress seeds at home. The similar findings were noticed by Parameshwari and Nazni, 2012.

Table I -Composition of principle nutrients (Energy, protein, iron and calcium) among the various snacks prepared at 10g GCS incorporation

Sl. No	Name of GCS incorporated snack	Energy (g)	Protein (g)	Iron (mg)	Calcium (mg)
1	Cheese Aliv cookies	294	6	12	126
2	Halim cashew nut cookies	419	13	13	105
3	Corn flake Halim cookies	352	5	12	54
4	Carrot Halim cookies	418	7	12	72
5	Soya dates nutria cookies	461	14	13	122
6	Mini raisin muffin	515	10	13	91
7	Carrot Aliv muffin	368	6	13	102
8	Mango banana Halim muffin	492	19	13	103
9	Honey Aliv muffin	463	9	18	96
10	Fruit muffin	533	20	13	96

*GCS-Garden cress seed

CONCLUSION

Garden cress seed is an important food stuff loaded with nutrients as well as health enhancing properties. The Garden cress seeds are significant source of iron, containing 100 mg iron per 100g. The minerals like calcium, phosphorus, vitamins (carotene, thiamine, riboflavin, niacin) are also abundantly present in Garden cress seeds. Its high nutritive value and cheaper availability makes it possible for people of all sections of the society to include them in their diets and enhance the nutritive quality of their meals.

Development of recipes for adolescents is an emerging area of interest, especially the modification and enrichment of snacks. Snacks can be made healthier and nutritious by either changing the main ingredients or incorporation of nutritious substances into the snacks.

Incorporation of Garden cress seed in foods have shown marked increased in the iron and protein content (Nathiya and Nora, 2014). Iron deficiency anaemia is a prevalent problem among the reproductive women in India (NIN, 2010) particularly adolescent girls. With this in mind, the investigator explored the possibility of enhancing adolescent diet by modification of snacks that are popular among them with the incorporation of iron rich Garden cress seeds.

Snacks preferred by adolescents were modified to be nutritious by incorporation of Garden cress seed. The snacks made were rich in iron, calcium and protein. The Garden cress seeds incorporated cheese aliv cookies scored high for appearance, texture and taste and were almost in par with the control. 10g Garden cress seed incorporated Cashew nut cookies got the highest mean acceptability. Corn flake Halim cookies got relatively high scores for all sensory attributes, Carrot Halim cookies also scored highest at the 10g level of incorporation of Garden cress seed. The texture of soya dates nutria cookies received much acceptance at 5g of

Garden cress seed incorporated 30g Garden cress seed incorporated Mini raisin muffin got high scores for taste. 20g Garden cress seed incorporated Carrot Aliv muffin scored high for texture, flavor and taste. Mango banana Halim muffin was soft and fluffy and the 20g level of incorporated Garden cress seed scored highest. Honey Aliv and fruity muffin scored better than the control.

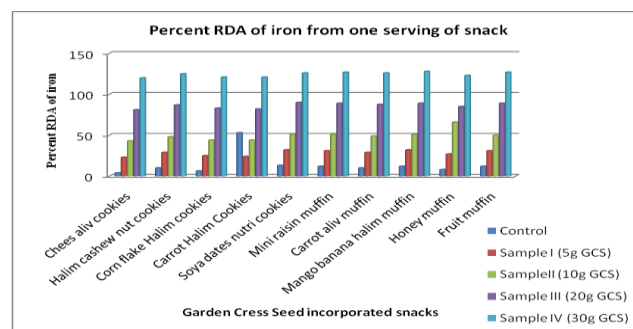


Figure 1- Percent RDA of iron from one serving of snack

*RDA. Adolescent girls- ICMR 2010 *GCS-Garden cress seed

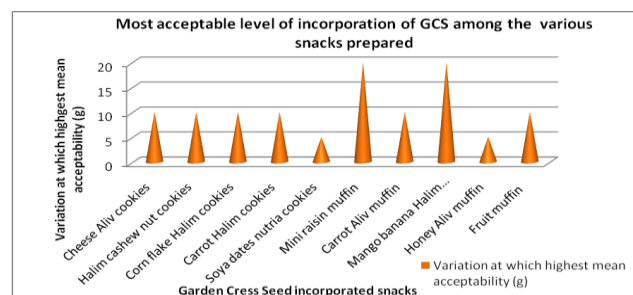


Figure 2- Most acceptable level of incorporation of GCS among the various snacks prepared

*GCS-Garden cress seed

From the study it can be inferred that 60% of the prepared snacks, the highest accepted snacks were of 10g

level of incorporation of Garden cress seed (*figure 2*). The nutrient profile of prepared snacks revealed a direct relationship of the increase in Garden cress seed with the increase in iron, protein and calcium. Thus it can be concluded that the incorporation of Garden Cress Seeds in snacks preferred by adolescents offers a window of opportunity to improve the micronutrient composition of the snacks and in turn enhance the micronutrient intake of the diets consumed by adolescents.

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