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## Research Article

### NUTRITIONAL AND SENSORY ATTRIBUTES OF COOKIES ENRICHED WITH GARDEN CRESS SEEDS

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#### ABSTRACT

The present study was primarily undertaken to develop economically complement and nutritionally enrich cookies with garden cress seeds. Cookies were developed using roasted garden cress seeds. The seeds were incorporated at different levels in the standardized formula. Enrichment of garden cress seeds in different samples of cookies were made at 2.5%, 5.5%, 8.5% and 10.5% level and T<sub>0</sub> of cookies with a slight modification of standardized process was used. All the samples of the garden seed enriched cookies were evaluated for its sensory attributes by using 9-point hedonic scale. Nutritional content such as energy, carbohydrate, protein, fat, calcium and iron levels along with the cost of different samples of developed cookies were also determined in the study. Amidst different samples of the developed cookie, T<sub>4</sub> with the maximum level (10.5%) of enrichment of garden cress seeds showed highest amount of macronutrients and major micronutrients (iron & calcium). On the other hand, in terms of mean scores of overall acceptability based on the sensory attributes, T<sub>2</sub> with 5.5% of garden cress seeds enrichment scored highest. The cost per 100 g of each treatment of developed cookie ranged from Rs 20.34 for T<sub>0</sub> to Rs 24.52 for T<sub>4</sub> which makes its economical viable for commercial packaging and sale. Therefore, it can be concluded that cookies developed from the enrichment of garden cress seeds has acceptable sensory attributes and improved nutritional content.

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#### INTRODUCTION

The rising number of the urban population has increased the demand for products and services associated with fast-paced city living, particularly products which are convenient and time-saving. Cookies are one of the most widely accepted processed convenience food. It is a baked or cooked food that is small, flat and sweet. It usually contains flour, sugar and some type of oil or fat. Cookies constitute a major component of human snacks in most part of the world. It is one of the few universal staples, which is complete in itself and requires no additional preparation. Thus for many, cookies are important sources of carbohydrates, vegetable proteins and some vitamins and minerals. The nutritional value of cookies can be enhanced by enrichment with a wide variety of proteins, vitamins and minerals sources. They offer a valuable vehicle of enrichment with nutrients because of their popularity, relatively low cost, varied taste, ease of availability, high nutrient density, and long shelf-life.

Garden cress (*Lepidiumsativum*) seeds also known as Halim in Hindi is reddish brown seeds obtained from Garden cress plant (*Lepidiumsativum*, family- Cruciferae), an important nutritional and medicinal plant in India since Vedic era due to its health promoting properties.

The seeds contain 25.3 per cent protein, 24.5 per cent fat and provide 454 Kcal/100g. It is a good source of calcium (377 mg/100g), iron (100mg/100g), magnesium (430mg/100g) and other nutrients (thiamine, 0.59mg/100g; riboflavin, 0.61mg/100g; niacin, 14.3mg/100g) (Gopalan *et al.*, 2009)

Garden cress seed (*Lepidiumsativum*L.), an unexplored health grain, is a rich source of nutrients, nutraceuticals, and possess numerous health beneficial properties. Garden cress seeds show many medicinal properties such as anti-diabetic, hypocholesterolemic and anti-hypertensive.

Garden cress seeds can be used as a promising multipurpose medicinal source (Eddouks *et al.*, 2005).

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Keeping all these reports in view, an attempt was made to develop nutrient-rich garden cress cookies and determine its nutritional content and sensory attributes.

## MATERIALS AND METHODS

The present study was carried out to analyze Nutritional and Sensory Attributes of Cookies Enriched with Garden cress seeds. The study was executed in the research laboratory of Nutrition & Dietetics, Faculty of Allied Health Sciences, SGT University, Gurugram, Haryana.

**Procurement of raw ingredients:** All the raw ingredients for research purpose were commercially available and purchased in a single lot from the local market of Gurugram, Haryana, India. All the dry ingredients were cleaned manually to remove damaged seed, stones, dust, light materials, glumes, stalks and other extraneous materials. Cleaning was done by hand sorting. After cleaning, all the raw ingredients were packed in an airtight container until further use.

**Processing of seeds:** Garden cress seeds were processed before enrichment in cookies. The seeds were roasted at  $150 \pm$  for 3 minutes in an iron vessel until a prominent aroma of garden cress seeds comes (Jain and Grover, 2017). After cooling, the roasted garden cress seeds were used for incorporation in cookies.



Fig 1 Roasted and unprocessed Garden cress seeds

**Development of cookies using garden cress seeds:** The standardized formula of cookies, T<sub>0</sub> contained 35 % Bengal gram flour, 25% powdered sugar, 25% butter and 15% oats flour. Cookies were developed using roasted garden cress seeds. For the preparation of cookies, GCS were used at different levels. Enrichment of garden cress seeds in different samples of cookies were made at 2.5%, 5.5%, 8.5% and 10.5% level T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> respectively.

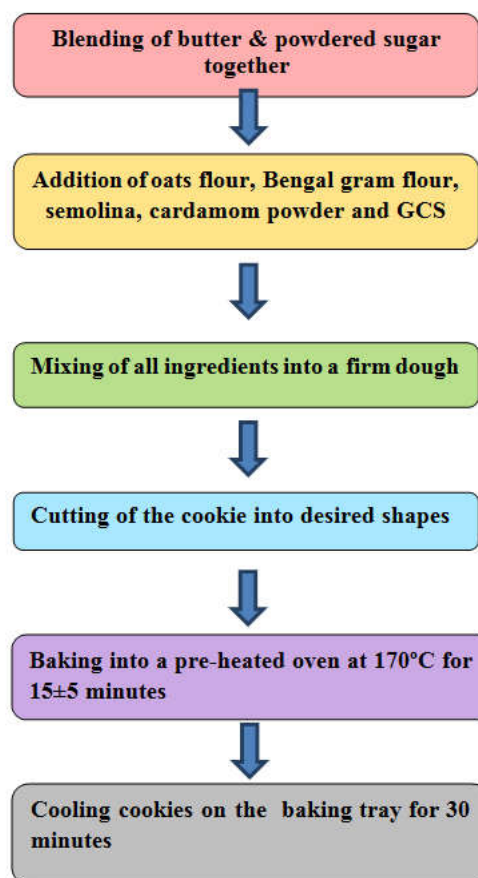


Fig 2 Flow diagram for the preparation of GCS enriched cookies

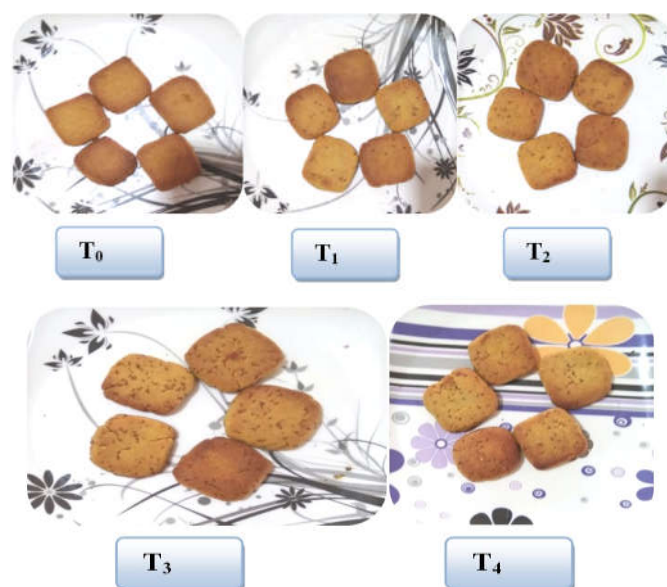


Fig 3 Developed treatments of GCS cookies T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>

**Sensory attributes of garden cress seed enriched cookies:** All samples of garden cress seed enriched cookies prepared with different levels of garden cress seed were served to a group of 7 trained panelists for the evaluation of color and appearance, body and texture, taste and flavor and overall acceptability on a nine point hedonic scale (Chowdhury et al 2011). Scores ranging from 9 to 1 were recorded where scores 9 represented “like extremely” and 1 represented “dislike extremely”. The

quality parameters of all coded samples were quantified and the mean scores were calculated.

**Determination of nutritional content of garden cress seed enriched cookies:** The parameters analyzed were protein, total fat, calcium, iron by AOAC procedures (1990). The total carbohydrate content was determined by difference method.

Energy value of the product was calculated by multiplying the figure for percentage of protein, fat and carbohydrate.

$$\text{Energy value (Kcal/100 g)} = (4 \times \text{Protein \%}) + (9 \times \text{Fat \%}) + (4 \times \text{Carbohydrate \%})$$

**Cost evaluation of garden cress seed enriched cookies:** Cost of all the samples of the garden cress seed enriched cookie was evaluated based on the current market price of raw ingredients used in the development of cookies.

**Statistical analysis of garden cress seed enriched cookies:** The data was collected and presented in results as a mean and standard deviation. Average nutritional and sensory scores values of the enriched cookies were statistically analyzed by using two way ANOVA (analysis of variance).

## RESULTS AND DISCUSSIONS

**Sensory attributes of garden cress seed enriched cookies:** The sensory attributes of garden cress seed enriched cookies are summarized in table 1. The treatment T<sub>2</sub> (5.5% incorporation) of the product was found to be highly acceptable with scores 7.39, 7.66, 7.57 for colour, flavour and taste and overall acceptability after control (T<sub>0</sub>) while treatment T<sub>2</sub> score 7.16 highly acceptable in term of texture. Sharma (2015) studied the acceptability of germinated garden cress seeds by incorporating into the food consumed daily like sandwich, raitha, soups and salads. The other levels of incorporation were also liked at various degrees although a little less than T<sub>2</sub>.

Sensory evaluation of all the food preparations developed by combining garden cress seeds were organoleptically acceptable (Kaur and Sharma 2015). It is evident from the result of ANOVA, the sensory attributes of control and experimental garden cress seed enriched cookies were observed in regards to color & appearance, texture, flavor & taste and overall acceptability as calculated value of F (10.7, 6, 10 and 6.8 respectively) was greater than the tabulated value at 5% (2.87) probability level. Therefore, it can be concluded that there is a significant difference between various treatments of garden cress seed enriched cookies.

**Table 1** Sensory attributes of garden cress seed enriched cookies

Sample code	Sensory attributes			
	Colour & Appearance	Texture	Taste & Flavour	Overall Acceptability
T <sub>0</sub>	7.95 ± 0.37	6.90 ± 0.32	7.67 ± 0.24	7.6 ± 0.26
T <sub>1</sub>	7.38 ± 0.10	6.94 ± 0.26	7.32 ± 0.38	7.43 ± 0.19
T <sub>2</sub>	7.39 ± 0.40	7.16 ± 0.56	7.66 ± 0.44	7.57 ± 0.59
T <sub>3</sub>	7.10 ± 0.29	6.76 ± 0.52	6.96 ± 0.41	7.03 ± 0.31
T <sub>4</sub>	6.81 ± 0.36	6.64 ± 0.32	6.91 ± 0.27	6.85 ± 0.24
CD at 5%	0.46*	0.29*	0.41*	0.46*

\*= Significant

**Nutritional content of garden cress seed enriched cookies:** “Table 2” shows the nutrient composition of the control and garden cress seed enriched cookies. Results showed that energy

value of control was 444.22 ± 3.31 Kcal and garden cress seed enriched cookies recorded 489.06 ± 2.85 T<sub>4</sub>. It can be noticed that energy value increased with the increase in the enrichment of garden cress seed. A significant difference was noted in energy content among different treatment of garden cress seed enriched cookies.

Results evidenced that protein content of garden cress seed enriched cookies was higher in all the variations than control. The statistical significant difference was noticed with protein content at 5% (2.87) probability level. Previous investigation performed by also reported (Jain *et al.*, 2016) the results showed that the supplementation improved the amino acid composition of the developed food products in which enriched *pinni* contained maximum lysine and tryptophan content.

The results indicate that fat content of garden cress seed enriched cookies is significantly more than control at 5% (P<0.05) probability level. The carbohydrates content of all the samples of garden cress seed enriched cookies showed an increase in the overall carbohydrates composition with the increase in the level of enrichment. A Non - significant difference was observed among different treatment of garden cress seed enriched cookies for carbohydrates content.

**Table 2** Macronutrient composition of garden cress seed enriched cookies

Sample code	Energy (Kcal) (per 100 gm)	Macronutrients		
		Carbohydrates (g) (per 100 gm)	Proteins (g) (per 100 gm)	Fats (g) (per 100 gm)
T <sub>0</sub>	444.22 ± 3.31	54.08 ± 2.96	11.09 ± 1.06	20.73 ± 1.15
T <sub>1</sub>	452.7 ± 4.36	54.51 ± 2.85	11.42 ± 0.68	20.97 ± 0.61
T <sub>2</sub>	469.53 ± 2.74	55.96 ± 2.75	12.11 ± 0.80	21.71 ± 0.78
T <sub>3</sub>	478.9 ± 2.45	56.06 ± 2.63	13.01 ± 1.15	22.38 ± 0.70
T <sub>4</sub>	489.06 ± 2.85	57.30 ± 2.55	13.82 ± 0.81	23.14 ± 0.91
CD at 5%	3.76*	NS	0.98*	0.60*
	Fcal=303.53	Fcal=1.12	Fcal= 17	Fcal=35.05

\*= Significance NS =Non Significant

“Figure 4” shows calcium content of control was 34.42 mg& garden cress seed enriched cookies recorded 74.48 mgT<sub>4</sub>. It can be noticed that the value obtained for calcium content of the garden cress seed enriched cookies was significantly more due to the value addition of nutritious ingredients. In case of iron, a similar trend to calcium was observed. Enrichment of garden cress had the direct impact on the iron composition of developed cookie T<sub>4</sub> having maximum enrichment of seeds was recorded with maximum iron concentration of 13.89 ± 0.12 mg other than control. Incorporation of garden cress seed in foods have shown marked increased in the iron and protein content (Nathiya and Nora, 2014).

A significant difference was noted in iron content among different treatment of garden cress seed enriched cookies. 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 was concluded that garden cress seed incorporation is a feasible strategy to enhance micronutrient content of diets of adolescents (K.G and Poojara, 2014).

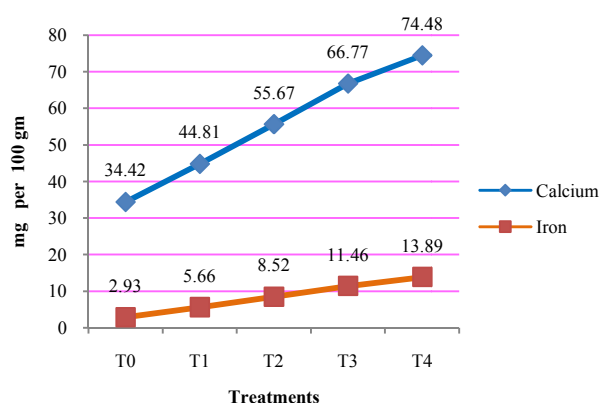


Fig 4 Calcium and Iron content of garden cress seed enriched cookies

**Cost evaluation of garden cress seed enriched cookies:** Cost of all the samples of the developed cookie was evaluated based on the current market price of raw ingredients used in the development of cookie. T<sub>0</sub> which had 0% enriched of cookie had the least cost whereas T<sub>4</sub> with the highest amount of enriched (10.5%) has maximum cost amidst all developed cookie samples.

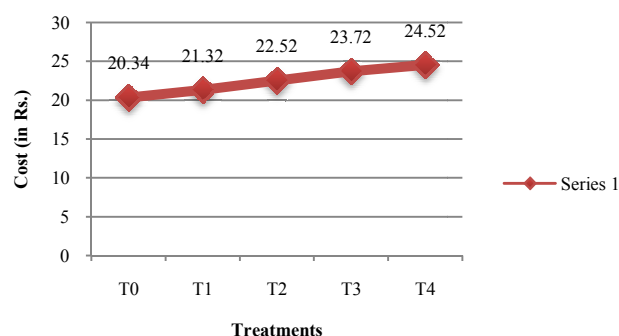


Fig 5 Cost evaluation of garden cress seed enriched cookies

## CONCLUSION

From the present study, it can be concluded that cookies developed from the enrichment of GCS had acceptable sensory attributes and also had improved nutritional profile in terms of macronutrients and micronutrients such as energy, proteins, fats, carbohydrates, iron and calcium. Amongst the different samples of the developed cookie, T<sub>4</sub> with the maximum level of enrichment (10.5%) of GCS had the highest amount of macronutrients and major micronutrient (iron & calcium). On the other hand, in terms of the mean score of overall acceptability based on the sensory attributes, T<sub>2</sub> with 5.5% of GCS enrichment scored the highest. The cost per 100 gm of each treatment of developed cookie ranged from Rs 20.34 for T<sub>0</sub> to Rs 24.52 for T<sub>4</sub> which makes its an economical more beneficial product for packaging and sale. Thus, garden cress seeds enriched cookie which is high in energy and nutrients

especially protein, iron and calcium can be preferred as a potential health snack to enhance the nutritious quality of the diet of children, adolescent and malnourished population without compromising much on the sensory attributes.

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