

**INTERNATIONAL JOURNAL OF FOOD AND
NUTRITIONAL SCIENCES**

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Official Journal of IIFANS

SENSORY AND NUTRITIONAL EVALUATION OF FOOD PRODUCTS ENRICHED
WITH GERMINATED GARDEN CRESS SEED FLOURReenu Rana^{1*} and Parvinder Kaur²

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Received on: 5th May, 2016Accepted on: 8th July, 2016

Supplemented products from Germinated Garden Cress Seed Flour (GGCSF) were standardized and analyzed for their sensory and nutritional evaluation. Sensory evaluation of products was made in terms of their color, appearance, aroma, taste, texture, and over all acceptability using nine point hedonic scales. The recipes for the preparation of various products from GGCSF were standardized by use of various degrees (5%, 10%, and 15%). The sensory evaluation of supplemented products was significantly different as compared to their control. All supplemented product were desirable and moderately desirable in all terms. The moisture, protein, and fiber contents of supplemented products were significantly higher as compared to those of control. Iron was maximum in supplemented in Biscuit (12.90 mg) followed by Ladoo (13.13 mg) and Namakpare (6.75 mg) as compared to their control.

Keywords: Germinated garden cress seeds, Sensory and nutritional quality biscuit, Namakpara, Ladoo

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, 2004). Garden cress is commonly referred to as 'Aliv' in Marathi, 'Halim' in Hindi, and 'Asali' in Malayalam (Rahman, 2004). It is also known as Asalio or chandrasur in India and it is an important medicinal crop in India. It is a fast growing, edible plant botanically related to watercress and mustard and sharing their peppery, tangy flavor and aroma. The main character of *Lepidium sativum* is that it can grow in any type of climate and soil condition with few requirements. Seeds, leaves and roots are economically important, however, the crop is mainly cultivated for seeds. It is an important source of iron, folic acid, calcium, vitamins C, E and A Minerals like calcium, phosphorus. Vitamins like carotene, thiamine, riboflavin,

niacin are abundantly present in cress seeds and the seeds also have dietary fiber. 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 25.3 grams. 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 (Balasubramanian, 2009). Garden cress seeds are very high in iron and folic acid content. These seeds are use as herbal medicine to treat iron deficiency anaemia, because 100 g of garden cress seed provide 100 mg of iron. Iron is important for growth, brain development and the immune system (Poojara, 2014). It is also reported that these seeds contain Glucosinolates, sulphur-containing glycosides found in brassicaceous plants that can be hydrolysed enzymatically by plant myrosinase or non-enzymatically to form primarily isothiocyanates and/or simple nitriles. From a human health perspective, isothiocyanates are quite

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important because they are major inducers of carcinogen-detoxifying enzymes the most potent inducers are benzyl isothiocyanate (BITC) present in garden cress (*Lepidium sativum* L.). The seed coat of germinating seeds contains much mucilage, which has an allelopathic substance, lepidimoide. The effects of the germinating seeds were studied to determine the potential for slowing down the hydrolysis of starch to glucose in diabetic persons. The seeds significantly lowered the glycaemic response to a test meal (Pramod *et al.*, 2012). iron content in the seed powder often helps to cure mild anaemia conditions, especially in children (Abdulliah-Juma, 2007). Its was found that for maximum and healthy sprouting of the L, sativum seeds selenium is an essential elements that must be provided during germination. Germinated garden cress seed can be cheap and more effective in improving anemia in anemic adolescent girls. Therefore, some food products were developed by incorporating germinated seed of *L. sativum* (Mamta Sharma, 2015). Simply there is a need to supplement these garden cress seed flour in various recipes to make them popular among vulnerable group.

Bhujia, sandwich, *raita*, salad and soup was prepared by germinated garden cress seeds added in different preparations at range of 7-30%. Organoleptic evaluation of all food preparations were conducted by a panel of ten judges using Hedonic nine point scale. In germinated garden cress seeds incorporated food preparations, maximum and best acceptable level was 25% in *Bhujia* and minimum (10) in *raita* and sandwich. Among all germinated garden cress seeds incorporated food preparations soup scored highest (8.18±0.40) and *raita* scored minimum (7.5±0.70) for overall acceptability . With incorporation of garden cress seeds, iron and protein content increased significantly (p≤0.05) in all most acceptable food preparations (Mamta Sharma, 2015).

MATERIALS AND METHODS

The current investigation was set up the sensory and nutritional evaluation of traditional recipes designed underutilized cereal as well as nut and oilseed garden cress seed.

Procurement of Material

The seed involving Garden cress seed (*Lepidium Sativum*) were purchased the town market of Gohana, Sonipat, Haryana.

Soaking in Addition to Germination

Garden cress seed were cleaned, make out free from dust as

well as other foreign materials then seed were soaked in sufficient water for 12 hours after soaking the seeds were washed with distilled water and then germinated for overnight.

Processing of Garden cress seed

- Cleaning out of Garden cress seed
- Soaking with regard 12 hours on room temperature
- Germination (in muslin fabric with regard to room temperature)
- Blow drying
- Milling (Hummer traverse)
- Flour
- Sieving
- Packaging
- Storing for further use in airtight container.

Standardization of Recipes

The recipes for the preparation of various products from processed garden cress seed flour were standardized making use of various level (5 g, 10 g, and 15 g). The processed garden cress seed flour incorporated products, Biscuits, *Namakpara*, *Ladoo* were prepared.

Organoleptic Evaluation: Organoleptically evaluation was done by using 9-point hedonic scale.

Nutritional Evaluation of Acceptable Products

For nutritional evaluation, the products were ground in mixer-grinder and dried in oven at 60 °C for 6 hours to a constant weight. Dried sample were packed in polyethylene bags and analyzed. Proximate composition was estimated by AOAC method. And Iron was analyzed by using atomic absorption spectrophotometer (Lindsey and Norwell, 1969).

Statistical Analysis

Statistical analysis of data was done by using complete randomized design (Panse and Sukhatme, 1961), and t-test were used for analyzing the data.

RESULTS AND DISCUSSION

Biscuit: Biscuits prepared without use of germinated garden cress seed (control) were “desirable” in term of color, appearance, aroma, texture, taste, and over all acceptability.

Table 1: The Detail of Method of Preparation of Products

Products	Method of Preparation
Biscuit	Creamed ghee (60 g) and sugar (30 g) with milk (30 ml)
	Added wheat flour (control =100 g sample I = 95 g sample II = 90 g sample III = 85 g
	Folded the Wheat flour and germinated Garden cress seed flour (control = 0 g, sample I = 5 g, sample II = 10 g, sample III = 15 g in above mixture
	The dough was rolled and cut into biscuit shape with the help of cutter
	Baked at 150 °C for 15-20 minute
Namakpara	Ajwain (3 g), Salt (2 g), oil as moin (10 g) and water
	Added refined wheat flour (control = 100 g) sample I = 95 g, sample II = 90 g, sample III = 85 g
	Mix germinated garden cress seed flour (control = 0 g) sample I = 5 g, sample II = 10 g, sample III = 15 g
	Made a coarse paste by added all the ingredients and mix thoroughly
	Make a smooth pliable dough
	Rolled the dough into thin layer and cut into small square pieces
	Heated oil and deep-fried namakpara until golden brown in colour
Ladoo	Added sugar (70 g) and ghee (60 g)
	Take Bengal gram flour (control = 100 g), sample I = 95 g, sample II = 90 g, sample III = 85 g
	Mix germinated garden cress seed flour (control = 0 g) sample I = 5 g, sample II = 10 g, sample III = 15 g
	Roasted flours separately till light brown in colour
	Mix Roasted flour together and fried in ghee for 2-3 minutes
	Removed from fire and allow to cool
	Added sugar and mix well and formed into shape of Laddoos

type I biscuits were prepared by incorporated 5% GGCS flour were 'desirable' in term of colour, texture, and taste and 'moderately desirable' in respect of appearance, aroma and over all acceptability. Type II biscuits were better than compared to control in term of all attributes and rated as "desirable". Type III biscuits were level brought down the scores for all attributes expect the texture, taste and over all acceptability.

Namakpara: The *Namakpara* prepared by incorporating germinated garden cress seed flour was subjected to sensory analysis. The panel members evaluated the product for the colour, appearance, flavour, texture, taste and overall acceptability. The result of the sensory analysis is presented in Table 2. The control sample was "desirable" in all attributes. Type I was 'moderately "desirable" in term of colour, appearance, aroma, whereas, in terms of texture,

taste and overall acceptability, it was 'desirable'. Type II *namakpara* were better than compared to control in term of colour, texture, and over all acceptability but appearance aroma and taste were similar as compare to control. Addition of germinated garden cress seed flour type III were brought down the score in term of colour, aroma taste, and over all acceptability. Type II was better accepted as compared with type I and and type III. Germinated garden cress seed flour incorporated *Namakpara* and almost similar as compared with control.

Ladoo: *Ladoo* prepared without use of germinated garden cress seed flour (control) was "desirable" in all attributes. Type I *Ladoo*, which were prepared by incorporating 5% germinated garden cress seed flour were 'desirable' in all attributes. But taste was better as compared to control *ladoo*. Type II were increase the scores for sensory attributes like

Table 2: Mean Scores of Various Characteristics of Germinated Garden Cress Seed Flour Biscuits, *Namakpara*, and *Ladoo*

Products	Color	Appearance	Aroma	Texture	Taste	Over All Acceptability
Biscuits						
Control	8.10±0.23 ^b	8.00±0.25 ^b	8.10±0.31 ^a	8.20±0.29 ^a	8.40±0.16 ^b	8.16±0.22 ^a
Type I	8.00±0.25 ^{bc}	7.50±0.22 ^c	7.90±0.23 ^a	8.30±0.21 ^a	8.20±0.24 ^c	7.98±0.17 ^b
Type II	8.30±0.15 ^a	8.50±0.22 ^a	8.12±0.18 ^a	8.20±0.20 ^a	8.70±0.15 ^a	8.32±0.06 ^a
Type III	7.90±0.23 ^c	7.80±0.20 ^{bc}	7.80±0.29 ^b	8.10±0.29 ^a	8.50±0.22 ^{ab}	8.02±0.17 ^{ab}
CD (P<0.05)	0.63	0.65	0.74	0.67	0.57	0.48
Control = 100% wheat flour I = 95% WF + 5% GGCSF II = 90% WF + 10% GGCSF III = 85% WF + 15% GGCSF						
<i>Namakpara</i>						
Control	8.30±0.15 ^a	8.30±0.21 ^a	8.30±0.21 ^a	8.50±0.16 ^b	8.70±0.15 ^a	8.42±0.11 ^a
Type I	7.90±0.27 ^b	7.90±0.23 ^b	7.90±0.27 ^b	8.10±0.27 ^c	8.40±0.26 ^b	8.04±0.24 ^b
Type II	8.40±0.16 ^a	8.30±0.15 ^a	8.30±0.21 ^a	8.80±0.13 ^a	8.70±0.15 ^a	8.50±0.16 ^a
Type III	7.90±0.23 ^b	8.00±0.14 ^b	7.50±0.22 ^c	8.10±0.10 ^c	7.70±0.26 ^c	7.84±0.16 ^c
CD (P<0.05)	0.61	0.54	0.66	0.52	0.61	0.48
Control = 100% Refined wheat flour I = 95% RWF + 5% GGCSF III = 85% RWF + 15% GGCSF						
<i>Ladoo</i>						
Control	8.40±0.22 ^a	8.50±0.22 ^a	8.20±0.20 ^{bc}	8.30±0.21 ^{bc}	8.40±0.16 ^a	8.36±0.16 ^b
Type I	8.10±0.23 ^b	8.20±0.24 ^b	8.40±0.16 ^b	8.40±0.22 ^b	8.50±0.16 ^a	8.32±0.17 ^b
Type II	8.30±0.15 ^{ab}	8.60±0.16 ^a	8.60±0.16 ^a	8.60±0.16 ^a	8.60±0.16 ^a	8.54±0.13 ^a
Type III	8.00±0.25 ^b	8.00±0.25 ^c	7.80±0.29 ^c	8.00±0.25 ^c	8.00±0.25 ^b	7.96±0.25 ^c
CD (P<0.05)	0.63	0.65	0.6	0.62	0.55	0.54
Control = 100% Bengal gram flour I = 95% BGF + 5% GGCSF II = 90% BGF + 10% GGCSF III = 85% w BGF + 15% GGCSF						

Note: Values are mean ± SE of ten panelists. Values with same superscripts do not differ significantly CD (P≤0.05).

appearance, flavour, texture, taste and overall acceptability and type III laddoo were 'moderately desirable' in terms of aroma, and over all acceptability. And it was 'desirable' in rest of colour, appearance, texture, and taste.

Nutritional Evaluation of Garden Cress Seed Based Products

Nutritional evaluation of most accepted level of GCS (10%) in Biscuit, *Namakpara*, and *Ladoo*

Moisture: The moisture content of control biscuit was 1.56%, while it was 3.09% in supplemented biscuits. The moisture content of control *namakpara* was 6.12% which was increase in type II (6.35%). Control *ladoo* contained 0.81% moisture content. And it was 0.86% in supplemented.

Protein: The Table 3 shows increase in protein content of supplemented biscuits (7.49%), which was more as compared to the control one (6.05%). The protein content of supplemented *namakpara* was 8.08%. The protein content of control *ladoo* was 14.82% and the increase in protein content of supplemented *ladoo* (15.03%).

Fat: The supplemented biscuit contained 20.83% fat whereas the value of fat in control biscuit was 27.31%. Fat content in supplemented *namakpara* (27.30 %) as comparison to control (18.21%). A significant increase in fat in supplemented *ladoo* was observed as compared to control one. The supplemented *ladoo* contained 22.26% fat, whereas it was 19.50% in control *ladoo*.

Table 3: Proximate Composition and Iron Content of Germinated Garden Cress Seed Products

Product	Moisture %	Crude Protein %	Crude Fat %	Crude Fiber %	Ash %	Iron mg
Biscuit						
Control	1.56±0.02	6.05±0.04	27.3±0.10	0.27±0.09	0.45±0.01	5.22±0.01
Supplement 10%	3.09±0.03	7.49±0.48	20.83±0.16	0.23±0.03	0.90±0.05	12.90±0.11
CD (P<0.05)	0.25*	1.59*	5.11*	0.56	0.11*	0.58*
Ladoo						
Control	0.81±0.01	14.82±0.01	19.50±0.09	2.37±0.04	1.43±0.01	6.49±0.01
Supplement 10%	0.86±0.03	15.03±0.32	22.26±1.79	0.90±0.09	2.16±0.03	13.13±0.10
CD (P<0.05)	0.02 *	1.36*	4.32*	0.09*	0.11*	0.33*
Namakpara						
Control	6.12±0.01	9.95±0.01	18.21±0.06	1.00±0.05	2.48±0.09	2.70±0.02
Supplement 10%	6.35±0.67	8.08±0.24	27.30±1.30	2.20±0.02	1.28±0.06	6.75±0.05
CD (P<0.05)	0.02 *	0.09*	0.06*	0.01*	0.03*	0.06*
Note: Values are mean ±S.E of three independent determinations.						

Fibre: The fibre content of supplemented biscuit was 0.23% and *namakpara* was contains 2.20 %. And Ladoo was found (0.90%). The fibre content lower down as compared to control biscuits and *ladoo* (Table 3).

Ash: The ash content of control biscuit was 0.45%, while it was 0.90% in supplemented biscuits. The ash content of control *ladoo* was 1.43% which was lower than in supplemented *ladoo* 2.16%. The ash content in control *namakpara* was 2.48% which decreased significantly 1.28% in supplemented *namakpara*.

Iron: The Table 3 shows highly significant increase in the iron content of supplemented biscuit, *namakpara*, and *ladoo* as compared to control. The iron content of supplemented biscuit was 12.9 mg and that of control which 5.22 mg. The iron content of control *namakpara* was 2.70 mg while it was 6.75 mg in supplemented *namakpara* and iron content of control *ladoo* was 6.49 mg which was significant increase in supplemented *ladoo* 13.13 mg.

CONCLUSION

Present investigation reveals out the effect of GGCS and its utilization into products like biscuit, *namakpara* and *ladoo*. The sensory characteristics of the product were analyzed by 9 point hedonic scale. This varies with respect to the different levels of garden cress seed. GGCS products were

desirable in terms of color, taste and texture. The result of sensory evaluation showed that the incorporation of GGCS up to 10% was found to be most acceptable to obtain biscuit, *namakpara*, and *ladoo*, with improved nutritional quality and good sensorial attributes. The developed supplemented products contained significantly higher moisture, protein, fibre content as compared to those of control. GGCS was rich in iron content. Iron rich supplements were found suitable for improving iron status of adolescent girls hence, it is concluded that these products could be recommended for supplementation in under nutrition intervention program for combating iron deficiency, which is a major problem in rural areas of India. Hence, it is concluded that these products could be recommended for supplementation in nutrition programs.

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