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RESEARCH ARTICLE

SENSORY AND NUTRITIONAL EVALUATION OF VALUE ADDED PRODUCTS OF GARDEN CRESS SEEDS

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ABSTRACT

Supplemented garden cress seed (GCS) product was 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 (GCS) flour 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 products .It was 13.60% in Biscuit followed by *Ladoo* (13.37%) and *Namakpare* (7.61%) as compared to their control.

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INTRODUCTION

Garden cress seed *(Lepidium sativum)* is an annual, erect edible herb and a member of the Brassicaceae family (Diwakar *et al.,* 2010). Garden cress seeds do not belong to the group of common food stuffs but these are cultivated as a salad plant throughout India. (The Wealth india 1962). Seeds, leaves and roots of Garden cress are of economic importance, however, the crop is mainly cultivated for seeds (Tiwari and Kulmi 2004). It is also known as common cress, land cress and Halim in India (Gokavi *et al*., 2004). The seeds of the indigenous plant have essential medicinal, physiological and nutritional role. The seeds are also used in the treatment of diarrhoea, respiratory disturbances, cough, bleeding piles and to anemia (Chpora *et al.,* 1956).Iron content in the seed powder often helps to cure mild anaemic conditions, especially in children. (Abdulliah-Juma, 2007). The seeds are aperients, diuretic, tonic, demulcent, aphrodisiac, rubefacient, carminative, galactagogue and emmenagogue (Nadkarni, 1954). The seeds are wildly consumed as salad and spice (Gokavi *et al.,* 2004). Garden cress seeds are rich source of protein, fat, iron, calcium and phosphorous.

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In this way garden cress seeds, after being processed through as simple as dehusking could become helpful in preventing and curing various diseases like PEM, anaemia, osteoporosis, osteomalacia and bone fracture through long term consumption as a food stuff of nutraceuticals nature. (Nidhi *et al.,* 2013) Garden cress seed (*Lepidium sativum Linn*) is categorized under nuts and oil seeds by ICMR. Nutritive value of the seeds show protein 25.5g, fat 24.5g, carbohydrate 33.0g, calcium 377 mg, phosphorous 723 mg, iron 100 mg, fibre 7.6g, carotene 27 mg, thiamine 0.59 mg, riboflavin 0.61mg, niacin 14.3 mg (Gopalan *et al.,* 2010).

It is the highest iron containing plant source ever known with better bioavailability (Yogesh chand 2010). Garden cress seeds have been used in traditional food and medicine supplement since ancient times in india (Mali *et al.,* 2007). The powder of the seeds were creamish yellow in colour, microscopy of the seeds powder shows uniform thick wall, oily endosperm, number of reddish- brown fragments of seed coats and raddish coloring matter (Anonymous Ayurvedic 2001). It is used in different food supplement. Simply there is a need to supplement these garden cress seed flour in various recipes to make them popular among vulnerable group. Health drink prepared by using 3 per cent of the seed powder in skimmed milk with 1 per cent fat and 5 per cent sugar. Prepared Health

drink were subjected to sensory analysis based on 9- point hedonic scale. The drink that was found most organoleptically acceptable and overall acceptability was 8.75 respectively (Snehal Mohite *et al.,* 2012). Flakes was prepared little millet and supplemented with garden cress seed. Addition of garden cress seeds significantly increased iron content in Millet Garden Cress seed flakes by 7.18 per cent and recorded 65.83 mg iron per 100 g of flakes compared to control little millet flakes (61.42 mg/100g).

Protein content of Millet garden cress flakes was 13.15 per cent and fat content was 114.28 per cent higher than control millet flakes. However, Millet garden cress flakes recorded significantly lower total carbohydrates (64.53%) and total dietary fiber (22.70%) than control millet flakes (66.14 and 24.10%). (kavita kotagi *et al.,* 2013). The value added instant *dhokla* mix was developed by using ingredients viz. soybean, ragi and garden cress seed. Five per cent addition of garden cress seed scores highest for colour (4.8), texture (4.8), taste (4.6), flavour (4.6) and overall acceptability (4.75). Value added instant *dhokla* mix found to contain more protein (18.39g), fat (4.95g), total minerals (3.97g), fiber (1.31g), iron (8.52 mg), calcium (123.28 mg) and phosphorus (313.33 mg) per 100g which was increased by 3.57g, 2.02g, 1.37g, 0.69g, 4.6 mg, 83.18 mg and 74.67 mg respectively over the basic mix. The *dhokla* was organoleptically acceptable after six months storage period. (Amruta *et al.,* 2014)

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.

Fig.1. Processing of Garden cress seed

- Cleaning out of Garden cress seed
- 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 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 60^0 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 garden cress seed (control) were "desirable" in term of color, appearance, aroma, texture, taste, and over all acceptability. Mean scores for overall acceptability of Type I and Type III were in the category of 'moderately "desirable". Type II biscuits were better than compared to control in term of all attributes and rated as "desirable". Nathiya *et al* (2014) found that cookies prepared by using, oats, wheat flour, wheat germ, soy flour and garden cress seeds. The addition of garden cress seeds by per 100 g of cookie dough was 10 g, 20 g, and 30 g. Organoleptically evaluation was done using 5 point hedonic scale by semi trained members. Overall acceptability were rated as good.

Namakpara: The *Namakpara* prepared by incorporating 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. Addition of garden cress seed flour brought down the score in term of colour, aroma and over all acceptability, but appearance, texture, and taste were almost similar as compare to control. The freshly prepared mathri supplement with processed roasted garden cress seed powder, microwave garden cress seed powder, whole garden cress seed powder. Addition of garden cress seed powder (5 %) and equal in all type developed mathri. Developed mathri was rated "desirable" by the panel of 15 judges for the colour, appearance, flavour, texture, taste and over over all acceptability. (Nidhi *et al*., 2013)

Ladoo: *Ladoo* prepared without use of garden cress seed flour (control) was "desirable" in all attributes. Type I and Type II were "desirable" in term of texture, taste, and over all acceptability but taste was all most similar compared to control. Type III brought down the scores as compare to control and rated as "moderately desirable". Amruta *et al.* (2010) developed the value added instant garden cress seed kheer mix by using ingredients viz. garden cress seed, rajgira seed, and skimmed milk powder. Four variations were developed and organoptically evaluated in comparison with basic variation. The value added kheer mix was organoleptically acceptable after six months storage period.

Nutritional evaluation of garden cress seed based products

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

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=85g • Folded the Wheat flour and 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 150^0 C for15-20 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 garden cress seed flour (control=0 g) sample I=5 g, sample II= 10 g, sample III=15 g, • Made a corse 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 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.

Table 2. Mean scores of various characteristics of garden cress seed flour Biscuits, *Namakpara* and *Ladoo*

Products	Color	Appearance	Aroma	Texture	Taste	Overall acceptability
Biscuits						
Control	8.10 ± 0.23^{b}	8.00 ± 0.25^{a}	8.10 ± 0.31^{ab}	8.20 ± 0.29^{ab}	8.40 ± 0.16^{ab}	8.16 ± 0.22^{ab}
Type I	7.70 ± 0.15^{bc}	7.30 ± 0.21^{b}	7.60 ± 0.22^{b}	8.00 ± 0.21^{b}	7.90 ± 0.23^{b}	7.70 ± 0.15^{b}
Type II	8.40 ± 0.16^{a}	8.30 ± 0.15^{a}	8.50 ± 0.22^{a}	8.40 ± 0.16^{a}	8.80 ± 0.13^{a}	8.40 ± 0.11^{a}
Type III	7.50 ± 0.16^{c}	7.80 ± 0.24^{ab}	7.50 ± 0.16^{b}	7.80 ± 0.20^{c}	7.90 ± 0.23^{b}	7.70 ± 0.16^{b}
CD(P<0.05)	0.52	0.63	0.68	0.63	0.56	0.48
Control	8.40 ± 0.22^{a}	8.50 ± 0.22^{a}	8.20 ± 0.20^{a}	8.30 ± 0.21^{a}	8.40 ± 0.16^{ab}	8.36 ± 0.16^{a}
Type I	8.00 ± 0.25^{ab}	8.10 ± 0.23^{ab}	8.00 ± 0.21^{a}	8.10 ± 0.18^{a}	8.30 ± 0.21^{ab}	8.10 ± 0.16^{ab}
Type II	8.10 ± 0.18^{ab}	8.10 ± 0.18^{ab}	8.10 ± 8.18^{a}	8.40 ± 0.16^{a}	8.50 ± 0.16^{a}	8.24 ± 0.11^{ab}
Type III	7.80 ± 0.24^{b}	7.80 ± 0.20^{b}	7.80 ± 0.24^{a}	7.80 ± 0.29^{a}	7.80 ± 0.29^{b}	7.80 ± 0.23^{b}
CD(P<0.05)	0.65	0.60	0.60	0.62	0.61	0.50
Control	8.30 ± 0.23^{a}	8.00 ± 0.25^{a}	8.10 ± 0.31^{a}	8.20 ± 0.29^{a}	8.40 ± 0.16^{a}	8.16 ± 0.22^{a}
Type I	7.90 ± 0.23^{ab}	8.00 ± 0.29^{b}	8.00 ± 0.25^{ab}	8.10 ± 0.27^{a}	8.00 ± 0.25^{bc}	8.00 ± 0.24^{b}
Type II	7.90 ± 0.18^{ab}	7.90 ± 0.18^{ab}	7.80 ± 0.24^{ab}	8.20 ± 0.20^{a}	8.30 ± 0.21^{ab}	8.02 ± 0.16^{b}
Type III	8.00 ± 0.25^{b}	8.00 ± 0.25^{b}	7.80 ± 0.24^{b}	7.80 ± 0.24^{a}	7.90 ± 0.27^{c}	7.90 ± 0.25^{b}
CD(P<0.05)	0.64	0.61	0.51	0.60	0.53	0.41

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

Table 3. Proximate composition and iron content of garden cress seed based products

Products	Moisture%	Crude protein %	Crude fat %	Crude fibre %	Ash%	Iron mg/100g
Biscuits						
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
Type II	3.06±0.09	6.99± 0.37	27.32±0.14	0.14±0.02	1.37±0.09	13.60±0.07
CD(P<0.05)	0.25*	1.59*	5.11	0.56*	0.11*	0.58**
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
TYPE II	5.62±0.01	8.21±0.22	17.28±0.54	0.19±0.06	1.93±0.07	7.61±0.14
CD(P<0.05)	1.10*	0.18*	0.47*	0.21*	0.17*	0.52*
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
TYPE II	0.92±0.06	14.91±0.16	23.37±2.20	0.82±0.03	2.13±0.06	13.37±0.18
CD(P<0.05)	0.02	1.36	4.32*	0.09*	0.11*	0.33**

Values are mean ± S.E. of three independent determinations

Moisture: The moisture content of control biscuit was 1.56%, while it was 3.06% in supplemented biscuits. The moisture content of control *namakpara* was 6.12%. Which was decreased in type II (5.62%). Control *ladoo* contained 0.81% moisture content. And it was 0.92% in supplemented.

Protein: The Table 3 shows increase in protein content of supplemented biscuits (6.99%), which was more as compared to the control one (6.05%). The protein content of control *namakpara* was 9.95%. The protein content of control *ladoo* was 14.82% and the increase in protein content of

supplemented *ladoo* (14.91%). Nathiya *et al*. (2014) reported 17 - 22 g 100 g protein content in garden cress seed cookies.

Fat: The supplemented biscuit contained 27.32% fat whereas the value of fat in control biscuit was 27.21%.Fat content is lower down in supplemented *namakpara* (17.28%) 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 23.37% fat, whereas it was 19.50% in control *ladoo*.

Fibre: The fibre content of supplemented biscuit was 0.14% and *namakpare* was contains 0.19%. And Ladoo was found (0.82%).The fibre content lower down as compared to control (Table 3). Ameuta *et al* (2014) also estimated fibre 1.37 in standardized garden cress seed dhokla.

Ash: The ash content of control biscuit was 0.45%, while it was 1.37% in supplemented biscuits. The ash content of control *ladoo* was 1.43%which was lower than in supplemented ladoo 2.13%. The ash content in control *namakpara* was 2.48% which decreased significantly 1.93% in supplemented *namakpara*.

Iron: The Table 3 shows highly significant increase in the iron content of supplemented biscuit, *namakpara*, and *ladoo* as compred to control. The iron content of supplemented biscuit was 13.60 mg and that of control which 5.20 mg. The iron content of control *namakpara* was 2.70 mg while it was 7.61 mg in supplemented *namakpara* and iron content of control *ladoo* was 6.49 mg which was significant increase in supplemented *ladoo* 13.37 mg. Amruta *et al.* (2010) also estimated iron 28.79 mg, iron in standardized garden cress seed kheer.

Conclusion

Present investigation reveals out the effect of garden cress seed 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. Garden cress seed products were desirable in terms of color, taste and texture. The result of sensory evaluation showed that the incorporation of garden cress seed flour 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. Garden cress seed 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 reas of India. Hence, it is concluded that these products could be recommended for supplementation in nutrition programs.

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