International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2020; 8(4): 3946-3950

Received: 12-05-2020
Accepted: 21-06-2020

Josephine John
Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar, Haryana, India

Varsha Rani
Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar, Haryana, India

Veenu Sangwan
Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar, Haryana, India

Sonia
Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar, Haryana, India

Corresponding Author:
Varsha Rani
Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar, Haryana, India

Garden cress seeds: A superior grain for the development of nutrient rich cutlets

Josephine John, Varsha Rani, Veenu Sangwan and Sonia

DOI: https://doi.org/10.22271/chemi.2020.v8.i4ax.10264

Abstract
Garden cress seeds are highly nutritious grain, possessed galactogogue, antioxidant, thermogenic and anti inflammatory activities and prevent anaemia, PEM, osteomalacia, and osteoporosis. This study was aimed to utilize GCS for its maximum potential for the development of nutrients rich cutlets. GCS supplemented cutlets were developed by incorporating 10, 20 and 30 per cent of roasted GCS and these were evaluated for sensory parameters, proximate composition, dietary fiber components and total and *in vitro* bio- accessible minerals. In terms of sensory parameters, GCS supplemented cutlets were adjudged between 'liked moderately' to 'liked very much' (Figure-1) and were acceptable by the judges. The contents of moisture, crude protein, crude fat, crude fibre, ash, total carbohydrates, total dietary fiber calcium and iron of type-I, type-II and type-III cutlets ranged from12.45 to 13.23, 7.12 to 9.83, 14.65 to 20.09, 2.96 to 3.84, 1.55 to 2.43, 51.39 to 60.49, 10.31 to 13.89 per cent and 58.94 to 124.15, 1.80 to 3.35 mg/100g, respectively. Results indicated that roasted garden cress seeds can be successfully incorporated up to 30 per cent for the development of nutrient rich cutlets without compromising the sensory acceptability. GCS supplemented cutlets had significantly (P<0.05) higher contents of protein, fat, fiber, calcium and iron than that of control cutlets.

Keywords: Nutrient rich, garden cress, *in vitro*

Introduction
Garden cress seeds (GCS) have been considered the superior grain as these are packed with high amounts of nutrients. The high amounts of lipid in seeds indicated their goodness in energy. The low level of moisture make it more stability and suitable for long shelf life. High amount of ash is the index of heavy mineral supply. They are also rich in essential amino acids, essential fatty acids and blessed with a perfect combination of PUFA (46.8%) and MUFA (37.6%) (Singh & Paswan, 2017) [23]. Abd El-Salam *et al.* (2019) [1] determined the chemical composition, minerals contents, phenolic compounds, flavonoids and antioxidant activity of GC seeds powder. The results revealed that GC seeds contained 7.05 per cent moisture, 19.73 per cent crude protein, 14.18 per cent crude fat, 35.45 per cent carbohydrate, 18.79 per cent crude fibers and 4.8 per cent ash. In addition, potassium **(**2955.50 mg/100g) was the most abundant element in GC seeds followed by phosphorus (947.32 mg/100g) and magnesium (322.00 mg/100g). The extract of GC seeds had a 157.24 mg/g of total phenols and 75.01 mg/g of total flavonoids. Gallic acid and hisperidin were the most abundant phenolic and flavonoid compounds in GC seed extract being 3001.75 and 4934.99 µg/100g, respectively.

Dehusked GCS help to heal and prevent osteomalacia, osteoporosis, protein energy malnutrition (PEM) and aid in bone fracture when consumed for a long time (Gopalan *et al.* 2010) [12]. Also, seeds help in relieving renal problems and hypertension. The interesting fact about carbohydrates composition of GCS is that it is comprised of 90.0 per cent of non-starch polysaccharides and only 10 per cent of starch. The seed bran has high dietary fiber content and also it has high water holding capacity. Therefore, defatted GCS may be considered as functional food for weight reduction therapy.

In general, they are essential for growth, brain development and immune system (Jouad *et al.* 2001) [16]. Additionally, GCS play a major role in preventing and treating anaemia because of the highest amount of iron hence being a key source of iron for vegetarians when consumed with vitamin C rich foods (Gupta & Singhal, 2011) [13]. GCS are used as galactogogue,

aphrodisiac, antiscorbutic, antihistaminic, depurative, diuretic, rubefacient, thermogenic, ophthalmic and act as tonic. Apart from being rich in nutrients, garden cress seeds are available around the year at low price which is affordable to people of all socio-economic status so they can be incorporated into food products so as to improve nutritional quality with no increase of any cost of food products (Chaudhary & Gupta, 2017a) [7]. Cutlet is a fried snack and quite popular among children who have been witnessed most malnourished. Generally it is made up of mashed potatoes and peas mixed with spices, coated with chickpea flour and fried in oil. It is a high energy snack as it is fried however, with the supplementation of GCS it may also become rich in of iron, calcium and protein and may be the best snacks for malnourished children. Keeping in view the above facts, efforts have been made to prepare GCS supplemented cutlet and to evaluate their sensory and nutritional properties.

Materials and methods

Development and sensory evaluation of cutlets

Garden cress seeds were procured from Goyal supermarket, Hisar. Seeds were roasted at ~ 150°C in iron vessel until it imparted a pleasant aroma and taste, which was achieved in ~ 5 minutes. Roasted and cooled seeds were supplemented in potato based control cutlets. Potatoes were replaced by 10, 20 and 30 per cent of GCS for the development of cutlets. Other ingredients used were peas (20g), chopped onion, carrot, capsicum, coriander leaves etc. (30g), bread crumbs (60g), corn flour and chickpea flour mix (30g), spices and oil to fry.

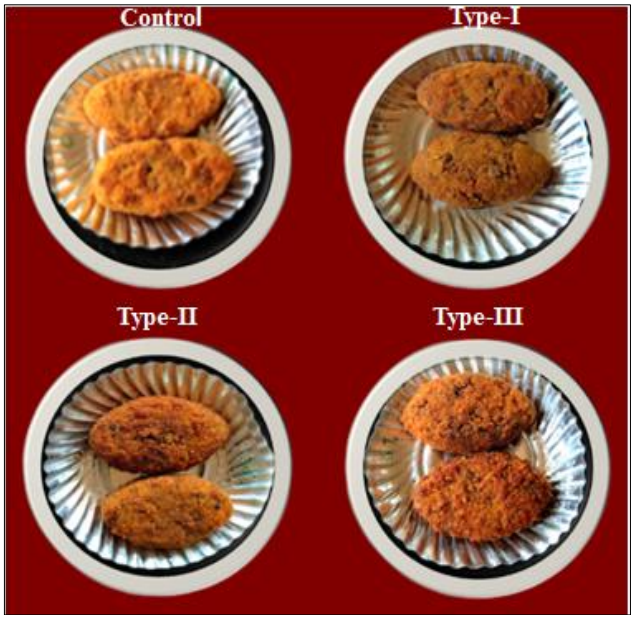

Plate 1: Garden cress seeds supplemented cutlets

Developed cutlets were subjected to organoleptic evaluation by a panel of 20 semi-trained judges from I.C. College of Home Sciences, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana. The judges were asked to rate the product on the basis of texture, aroma, colour, appearance, and taste of cutlets by employing a nine-point hedonic rating scale. Overall acceptability was calculated by summing up and average of sensory parameters. Mean scores for all these characteristics were calculated.

Nutritional Analysis of cutlets

Proximate composition i.e. moisture, protein, fat, crude fibre, ash were determined by employing the standard method of AOAC (2010) [6]. Total, soluble and insoluble dietary fiber constituents were determined by the enzymatic method given by Furda (1981) [11]. The contents of calcium, iron and zinc in acid digested samples explained above were determined by Atomic Absorption Spectrophotometer as per the method explained by Lindsey & Norwell (1969) [18]. Available calcium and zinc were extracted by adopting methodology of Kim & Zemel (1986) [17]. *In vitro* available iron in the raw and roasted GCS samples was extracted according to the procedure explained by Rao & Prabhavathi (1978) [21].

Statistical Analysis

Data of sensory evaluation and nutritional composition of garden cress seeds supplemented cutlets were statistically analysed for analysis of variance in a complete randomized design (CRD) by OPSTAT software developed by Sheoran & Pannu (1999) [22].

Results and Discussion

As per the scores given to colour, appearance, aroma, texture and taste, the overall acceptability of GCS supplemented cutlets was higher than that of control cutlets. As per the scores of color, appearance, aroma, texture and taste the overall acceptability of control cutlets was 7.64 hence, these were adjudged as 'liked moderately'. Mean scores of overall acceptability of type-I, type-II and type-III cutlets varied from 7.24 to 8.24, being highest for the type-II cutlets and lowest for type-III cutlets. However, all the supplemented cutlets were adjudged between 'liked moderately' to 'liked very much' (Figure-1) and were acceptable by the judges. Roasting is a common process applied for nuts and seeds, to enhance their sensorial properties and nutritional value. It also improves shelf life, palatability and acceptability of developed products (Jain *et al*. 2016) [15]. It was observed that raw seeds were having tanginess and peppery taste which was removed after roasting of seeds at 150 ^{0}C for 5 minutes. A pleasant aroma was arised in the roasted seed. cutlet, *parantha*, *laddoo*,*kheer* and biscuit using varying proportions (3 to 15%) of GCS, *pinni*, *panjiri*, *laddu*, *burfi*, *chikki* and biscuits with best acceptable levels of 10, 10, 5, 5, 25 and 7.5 per cent, respectively of GCS, nut based sweet snack using 10 per cent of GCS, *Khakhra* with varying proportions of GCS, muffins with roasted and germinated GCS (10%) were developed by earlier co-workers (Dashora & Choudhary, Doke *et al*. 2017; 2016; Jain *et al*. 2016; Rajshri & Haripriya 2018; Solanke *et al*. 2018) [9, 10, 15, 19, 24].

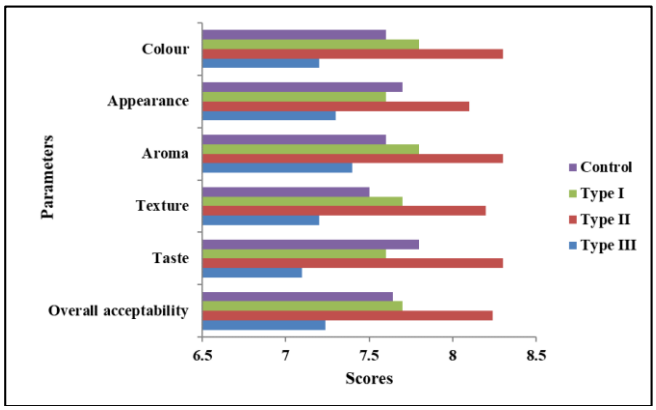

Fig 1: Sensory scores of garden cress seeds supplemented cutlets

The contents of moisture, crude protein, crude fat, crude fibre, ash and total carbohydrates in cutlets prepared with 100 per cent potatoes were observed as 13.62, 12.45, 5.74, 2.45, 1.05

and 64.69 per cent, respectively, which were found to be increased significantly ($P \leq 0.05$) in type-I, type-II and type-III cutlets except the moisture and total carbohydrates (Table 1). A non significant difference was observed for moisture content between control and GCS supplemented cutlets. Total carbohydrates content was found to be decreased significantly on each supplementing level of GCS. The contents of moisture, crude protein, crude fat, crude fibre, ash and total carbohydrates of type-I, type-II and type-III cutlets ranged from12.45 to 13.23, 7.12 to 9.83, 14.65 to 20.09, 2.96 to 3.84, 1.55 to 2.43 and 51.39 to 60.49 per cent, respectively. Maximum contents of crude protein, crude fat, crude fibre and ash were observed in type-III cutlets, whereas the maximum contents of moisture and total carbohydrates were found in type-I cutlets.

Table 1: Proximate composition of GCS supplemented cutlets (%, on dry weight basis)

Treatments	Moisture*	Crude protein	Crude fat	Crude fiber	Ash	Total CHO's
Cutlets						
Control	13.62±0.23	5.74±0.24	12.45±0.22	2.45±0.26	1.05±0.20	64.69±1.12
Type-I	13.23±0.21	7.12±0.18	14.65±0.17	2.96±0.26	1.55±0.20	60.49±1.09
Type-II	12.86±0.25	8.57±0.25	16.84±0.21	3.32±0.23	2.07±0.26	56.34±1.20
Type-III	12.42±0.18	9.83±0.25	20.09±0.26	3.84±0.20	2.43±0.17	51.39±0.96
CD (P<0.05)	NS	1.13	2.15	0.54	0.37	3.37

Values are mean ± SD of three independent determinations, NS-Non significant
Cutlet control: 100% potatoes; Type-I: GCS@10%, Type-II: GCS @20%,
Type-III: GCS @ 30%; GCS: Garden cress seeds/ flour, * Moisture was analysed on fresh weight basis

The contents of protein, fat, ash and crude fiber were increased significantly in all the three levels (type-I, type-II and type-III) of GCS supplemented cutlets. Similar increase for these nutrients after supplementing with GCS was observed in *Khakhra* supplemented with 5 to 30 per cent (Solanke *et al*. 2018) [24], cookies supplemented with 2.5 to 10.5 per cent (Yadav *et al*. 2018) [25], biscuits, *namakpara* and *laddoo* supplemented with 5 to 15 per cent (Rana & Kaur, 2016) [20], *pinni panjiri laddoo, burfi, chikki* and biscuits supplemented with 5 to 25 per cent (Jain *et al*. 2016) [15] and noodles supplemented with 15 per cent (Hanan *et al*. 2019) [14].

Soluble dietary fibre content of control as well as GCS supplemented cutlets ranged from 3.21 to 3.25 g/100g. GCS supplementation did not bring any change in soluble dietary fiber content of cutlets (Table 2). Insoluble dietary fibre content of control cutlets was found to be 5.18 g/100g, which was increased significantly with the supplementation of GCS. Among the three types of GCS supplemented cutlets, type-III exhibited higher content (10.68 g/100g) of insoluble dietary fibre followed by type-II (8.84 g/100g) and (7.07g/100g) in type-I cutlets.

Table 2: Dietary fibre content of GCS supplemented cutlets (%, on dry weigh basis)

Treatments	Soluble dietary fibre	Insoluble dietary fibre	Total dietary fibre
Cutlets			
Control	3.25±0.18	5.18±0.24	8.43±0.42
Type-I	3.24±0.24	7.07±0.18	10.31±0.42
Type-II	3.23±0.17	8.84±0.23	12.07±0.40
Type-III	3.21±0.22	10.68±0.28	13.89±0.50
CD (P<0.05)	NS	1.17	1.18

Values are mean ± SD of three independent determinations, NS-Non significant
Cutlet control: 100% potatoes;Type-I:GCS@10%, Type-II: GCS @20%,
Type-III: GCS @ 30%; GCS: Garden cress seeds

With regards to total dietary fibre content, control cutlets prepared using potatoes had 8.43 g/100g, that increased significantly ($P \leq 0.05$) with the supplementation of GCS in control recipe. The contents of total dietary fibre within cutlets prepared using GCS varied from 10.31 to 13.89 g/100g, being highest in type-III whereas lowest in type-I cutlets. The results regarding dietary fibre profile of GCS supplemented cutlets are corroborated with those of earlier findings (Hanan *et al*. 2019 Jain *et al*. 2016;) [14, 15]. Doke *et al*. (2018) [10] analysed the dietary fibre profile of *chikki* supplemented by 10 per cent of GCS and observed that *chikki* contained 8.5, 4.3 and 12.7 per cent of soluble, insoluble and total dietary fibre, respectively.

Calcium, iron and zinc content of control cutlet was observed as 26.34, 1.03 and 0.87 mg/100g, respectively which were ranged from 58.94 to 124.15, 1.80 to 3.35 and 1.35 to 2.30 mg/100g within three types of GCS supplemented cutlet. Type-III cutlets had significantly (P<0.05) higher contents of total calcium, iron and zinc followed by type-II and type-I cutlets. All the three types of GCS supplemented cutlets had significantly (P<0.05) higher contents of total calcium, iron and zinc than that of control cutlets. The per cent availability of calcium, iron and zinc among GCS supplemented cutlets ranged from 40.86 to 48.66, 11.05 to 18.33 and 38.26 to 45.19 per cent, respectively. Type-I cutlets had maximum per cent availability of calcium, iron and zinc.

Table 3: Total and *in vitro* available mineral (mg/100g) of GCS supplemented cutlets

Treatment	Ca		Fe		Zn	
	Total	Available	Total	Available	Total	Available
Cutlets						
Control	26.34±0.30	13.90±0.09 (52.77)	1.03±0.17	0.21±0.01 (20.39)	0.87±0.24	0.48±0.08 (55.17)
Type-I	58.94±0.24	28.68±0.07 (48.66)	1.80±0.28	0.33±0.02 (18.33)	1.35±0.23	0.61±0.08 (45.19)

Type-II	91.54±0.22	40.46±0.08 (44.20)	2.78±0.23	0.39±0.02 (14.03)	1.83±0.23	0.75±0.08 (40.98)
Type-III	124.15±0.22	50.73±0.07 (40.86)	3.35±0.27	0.37±0.02 (11.05)	2.30±0.32	0.88±0.11 (38.26)
CD (P<0.05)	11.07	2.26	0.47	0.11	0.27	0.06

Values are mean ± SD of three independent determinations, NS-Non significant
Cutlet control: 100% potatoes;Type-I:GCS@10%, Type-II: GCS @20%,
Type-III: GCS @ 30%; GCS: Garden cress seeds

Increased mineral profile of GCS supplemented *dahiwala* bread, *mathri*, cookies and muffins, iron rich flour, *pinni panjiri laddu, burfi, chikki* and biscuits, *ladoo, mathri, shakarpara* and biscuits, sweet snack (*chikki*), nutri-cereals based *laddoo*, muffins, noodles, was also observed by Agarwal & Sharma (2013a) [2], Agarwal & Sharma (2013b) [3], Jain *et al.* (2016) [15], Chaudhary & Gupta (2017b) [8], Doke *et al*. (2018) [10], Rajshri & Haripriya (2018) [19] and Hanan *et al*. (2019) [14]. Iron and protein rich products play important role in improving iron status of anaemic population. Garden cress seeds supplemented products have been shown their efficacy in reducing anaemia at significant level in children and adolescent girls (Angel & Devi 2012; Angel & Devi 2015; Dashora & Chaudhary 2016; Jain *et al*. 2017) [4, 5, 9, 15].

Conclusion

It may be concluded that garden cress seeds are more acceptable when incorporated in cutlets than consumed as such due to the fact that it forms mucilageous or gel like appearance which gives unpleasant taste and aroma. Roasted garden cress seeds can be successfully incorporated up to 30 per cent for the development of nutrient rich cutlets without compromising the sensory acceptability. GCS supplemented cutlets had significantly (P<0.05) higher contents of protein, fat, fiber, calcium and iron than that of control cutlets. Consumption of garden cress seeds supplemented nutrient rich cutlets may improve the protein and iron status in malnourished children and adolescents as protein energy malnutrition (PEM) and anaemia are the major nutritional problems in India.

References

1. Abd El-Salam KH, Toliba AO, El-Shourbagy GA, Sh El-Nemr E. Chemical and functional properties of garden cress (*Lepidium sativum* L.) seeds powder. Zagazig Journal of Agriculture Research. 2019; 46(5):1517-1528.
2. Agarwal N, Sharma S. Garden cress (*Lepidium sativum* L.) A non conventional traditional plant item for food product. Indian Journal of Traditional Knowledge. 2013b; 12(4):699-706.
3. Agarwal N, Sharma S. Appraisal of garden cress (*Lepidium sativum* L.) and product development as an all pervasive and nutrition worthy food stuff. Annals. Food Science and Technology. 2013a; 14(1):77-84.
4. Angel M, Devi KPV. Effect of garden cress seeds incorporated health mix among selected anaemic adolescent girls (12-15 years) in Dindigul district, Tamil Nadu, India. International Journal of Science and Research. 2012; 3(11):64-66.
5. Angel M, Devi KV. Therapeutic impact of garden cress seeds incorporated *laddoo* among the selected anaemic adolescent girls (12–15 years). J Drug Discov Ther. 2015; 3:18-22.
6. AOAC. Official method of analysis of Association of official. Analytic Chemists. Washington, D.C, 2010
7. Chaudhary P, Gupta R. Nutritional evaluation of garden cress seeds (*Lepidium sativum*). International Journal of Food and Science. 2017a; 6(3):35-40.
8. Chaudhary P, Gupta R. Formulation and sensory evaluation of iron rich recipes using garden cress seeds (*Lepidium sativum).* International Journal of Food and Nutritional Science. 2017b; 6(2):25-33.
9. Dashora R, Choudhary M. Development of recipes from garden cress seeds and its effect on anaemic patients. Food Science Research Journal. 2016; 7(2):299-305.
10. Doke S, Chetana R, Guha M. Quality assessment of sweet snack from garden cress (*Lepidium sativum* L*)* seed- An unexplored health grain. Journal of Food Processing and Preservation. 2017; 42:1-6.
11. Furda I. Simultaneous analysis of soluble and insoluble dietary fibre. In*:* The analysis of dietary fibre in Food. (eds. W.P.T. James & O. Theander) Marcel Dekker, New York, 1981, 163-172.
12. Gopalan C, Sastri BVR, Balasubramanian SC, Rao BSN, Deosthale YG, Pant KC. Nutritive value of Indian foods. National institute of nutrition, Hydarabad, India: Indian Council of Medicine Research, 2010.
13. Gupta C, Singhal S. Effect of garden cress seeds and amla intervention on the haemoglobin status of non-pregnant women. Asian Journal of Home Science. 2011; 6(2):216-219.
14. Hanan MAA, Nahla SZ, Abdelaleem MA. Utilization of garden cress seeds *(Lepidium sativum* L.) as natural source of protein and dietary fiber in noodles. International Journal of Pharmaceutical Research & Allied Sciences. 2019; 8(3):17-28.
15. Jain T, Grover K, Grewal SI. Development and sensory evaluation of ready to eat supplementary food using garden cress (*Lepidium sativum*) seeds. Journal of Applied and Natural Science. 2016; 8(3):1501-1506.
16. Jouad H, Haloui M, Rhiouani H, El Hilaly J, Eddouks M. Ethnobotanical survey of medicinal plants used for the treatment of diabetes, cardiac and renal diseases in the North centre region of Morocco (Fez–Boulemane). Journal of Ethnopharmacology. 2001; 77(2-3):175-182.
17. Kim H, Zemel MB. *In vitro* estimation of the potential bioavailability of calcium from sea mustard (*Undaria pinnatifida*) milk and spinach under stimulated normal and reduced gastric acid conditions. Journal of Food Science. 1986; 51(4):957-963.
18. Lindsey WL, Norwell MA. A new DPTA-TEA Soil test for zinc and iron. *Agron. Abst*, 1969; 61:84-89.
19. Rajshri VS, Haripriya A. Effect of processing on selected nutrient profile of garden cress seeds and development of garden cress seed based muffin. International Journal of Academic Research and Development. 2018; 2(3):1542-1547.
20. Rana R, Kaur P. Sensory and nutritional evaluation of value added products of garden cress seeds. International Journal of Current Research, 2016; 8(1):24997-25001.
21. Rao BSN, Prabhavathi T. An *in vitro* method for predicting the bioavailability of iron from foods. *The* American Journal of Clinical Nutrition. 1978; 31(1):169-175.
22. Sheoran OP, Pannu RS. Statistical Package for agricultural workers. “O. P. Stat” College of Agriculture,

Kaul, CCS Haryana Agricultural University, Hisar. India, 1999.
23. Singh CK, Paswan VK. The potential of garden cress (*Lepidium sativum* L.) seeds for development of functional foods. Advances in Seed Biology, Intech Open. 2017; 14:279-294.
24. Solanke GM, Lal A, Samarth AG, Lal AA, Tiwari P. Development and quality evaluation of value added *khakhra* using different variety and proportion of flour. Journal of Pharmacognosy and Phytochemistry. 2018; 7(4):1778-1781.
25. Yadav A, Singh P, Sarma U, Bhatt G, Govila VK. Nutritional and sensory attributes of cookies enriched with garden cress seeds. International Journal of Recent Scientific Research. 2018; 9(12):30146-30149.