



Sensory and Nutritional Evaluation of Value added Chapatti Using Garden Cress Seed (*Lepidium sativum*) Powder

Vidhya N¹, Parameshwari S^{2*}

¹ PG Student, Department of Nutrition and Dietetics, Periyar University, Salem-11, Tamil Nadu, India

² Associate Professor, Department of Nutrition and Dietetics, Periyar University, Salem, Tamil Nadu, India

Abstract

In this study, sensory qualities and nutritional composition of value added wheat chapattis by using garden cress seed powder were evaluated at different proportions (0%, 5%, 10%, and 15% garden cress seed powder). Chapattis prepared with 0% garden cress seed powder and 100% of wheat flour was served as control chapattis. The sensory evaluation of value added product, 10% garden cress seed powder with 90% of wheat flour composite chapattis was most accepted as compared to the control chapattis. Results showed this accepted variation of chapattis had significantly higher energy, fiber content, Iron, vitamin A, vitamin C and antioxidant activity of Beta carotene and also low glycemic value as compared to those of control chapattis. Based on the generated results, value added novel chapattis could be formulated by using wheat flour with garden cress seed powder which is good for health.

Keywords: Garden cress seed powder, Sensory qualities, Antioxidant activity, Beta carotene, Glycemic value, Value added novel chapattis.

1. Introduction

Garden cress botanically called as *Lepidium sativum*, is a fast growing edible plant which belongs to the *cruciferae* family (*Brassicaceae*). It's native to Egypt and West Asia. These seeds are used for various culinary and medicinal uses [1]. Phenolic compounds such as glycosides, tannins, steroids, sterols, flavonoids and alkaloids *viz.*, lepidine and two new monomeric imidazole alkaloids semi lepidinose A and B were identified in garden cress seeds [2].

Garden cress (*Lepidium sativum*, family- *Cruciferae*) [3] has been considered as an important nutritional and medicinal plant in India due to its health promoting properties [4, 5, 6]. The seeds comprise a good amount of protein (23 - 25%) and an almost equal amount of fat. The calcium content of seeds is 317 mg/100g. It also contains an admirable amount of iron (17 - 33 mg/100g) and zinc (4-5mg/100g)[7,8] and other nutrients thiamine (0.59mg/100g), riboflavin (0.61mg/100g), niacin (14.3mg/100g) [9] which can combat malnutrition, anaemia and other micronutrient deficiencies.

Moreover garden cress seeds are helps to treat anaemia due to its richest iron content. Consumption of garden cress seeds will helps to reduce the risk of cardiovascular diseases and also helps to control blood glucose level [10]. Garden cress seed possess various pharmacological properties such as hypertension, diabetes and kidney diseases [10, 11] and in prevention of cancer, cardiovascular diseases and mild glycaemia in diabetic patients. Essential fatty acids of seed work as memory boosters [10, 12].

2. Materials and Methods

2.1 Procurement of garden cress seeds

Garden cress seeds, used for the preparation of chapatti, were purchased from market of Ahmadabad, Gujarat. Wheat flour was purchased from local market of Salem.

2.2 Preparation of garden cress seed powder

Take the seeds and roasted at 150° C for 3-5 minutes on a low flame in an iron vessel till a prominent aroma of garden cress seeds comes. Roasting increased the palatability and acceptability of the seeds in the developed products [7] and was found more nutritious as compared to the raw seeds. It increased the calcium and iron content with improved iron bioavailability, decreased anti-nutritional factors and improved *in vitro* protein and starch digestibility [8]. After cooling, the seeds were ground in a grinder. The roasted seed powder was packed in an air-tight plastic container.

2.3 Preparation of garden cress seed powder incorporated chapattis

The value added chapattis were standardized using three different variations (5%, 10% and 15%) of garden cress seed powder and randomly coded as V1, V2 and V3. Chapatti prepared with 0% garden cress seed powder and 100% of wheat flour was served as control. The three different variations of garden cress seed powder was add with wheat flour and salt in a bowl. Then, add some water

so that the mixture develops a dough-like texture. Once made the dough, cover it in a bowl for 10 minutes. After 10 minutes, form small dough balls with the dough and roll them flat with a rolling pin. Heat a heavy frying pan or tawa

over medium heat and cook each chapatti on both sides. Each chapatti should rotate every few seconds to make sure that it gets cooked evenly.

Table 1: Ingredients for garden cress seed powder incorporated chapattis

Ingredients	Control (0%)	Level of Incorporation		
		Variation – I 5%	Variation- II 10%	Variation-III 15%
Whole wheat flour(g)	100	95	90	85
Garden cress seed powder (g)	-	5	10	15
Salt	A pinch	A pinch	A pinch	A pinch
Water (ml)	50	50	50	50

2.4 Sensory evaluation of developed chapattis

Chapattis were evaluated with respect to different sensory parameters namely colour and appearance, texture, mouth feel, taste, flavour, and overall acceptability.

The sensory evaluations of products were made by panel of 30 judges as described by Amerine *et al.* [13] on 9-point hedonic scale.

2.5 Nutritional evaluation of acceptable products:

Proximate composition and Antioxidant activity of β -carotene analysis were estimated by.

AOAC method [14, 15, 16] and Glycemic Index was determined by the method of Wolever *et al* [17].

2.6 Statistical analysis

Data were expressed as the mean of three replicates. The experimental data were analyzed using Analysis of Variance followed by Duncan, Multiple ranges at ($p \leq 0.05$) using SAS (version 9.1.3). The data were analyzed according to the User Guide of Statistical Analysis System [18].

3. Results and Discussion

Sensory evaluation was done for all the formulated chapattis supplemented with Garden cress seed powder. By using this Garden cress seed powder, different variations of chapattis prepared, and sensory evaluation was done in all the developed variations of prepared chapattis by semi- trained panel members using 9 points hedonic rating scale.

3.1 Organoleptic evaluation of the garden cress seed powder incorporated chapattis

Table 2: Statistical analysis of organoleptic evaluation of the chapattis

Variations	Colour	Texture	Flavour	Taste	Mouthfeel	Overall acceptability
Control	7.42±0.16 ^d	5.12±0.31 ^c	3.21±0.72 ^a	4.61±0.46 ^{bc}	4.72±0.87 ^{bc}	4.55 ±0.12 ^{bc}
Variation 1	6.22±0.12 ^b	6.55±0.32 ^b	5.87±0.18 ^b	4.55±0.38 ^a	4.55±0.18 ^a	6.74±0.26 ^{bc}
Variation 2	8.00 ±0.12 ^c	7.82±0.26 ^{ab}	8.64±0.28 ^c	6.58±0.24 ^a	6.89±0.36 ^a	8.12±0.26 ^c
Variation 3	6.22±0.22 ^a	7.62±0.32 ^{ab}	7.85±0.15 ^{ab}	6.42±0.38 ^a	6.55±0.84 ^a	6.34±0.26 ^a

Each value in the table are represented as Mean \pm SD. Means with different superscript are significantly different using Duncan's Multiple Range Test ($P < 0.05$).

The results of above table revealed that the mean score obtained for colour of V2 and V3 were found to be maximum score (8.00 ± 0.12^a and 6.22 ± 0.12^a) than control and V1. Mean score of texture was high (7.82 ± 0.26^{ab}) in V2 compared to control and other variations. The results revealed that the mean score obtained for flavour of V2 was found to be superior (8.64 ± 0.28^c) compared to control and other variations. Variation 2 had the maximum mean scores of 6.89 ± 0.36^a for mouth feel, thus confirming that addition of garden cress seed powder at 10gm is more acceptable whereas V1 and V3 had scored lower than V2 due to the less addition of other ingredients which affected the mouth feel of the end product. Mean taste scores of control chapatti prepared with whole wheat flour were low (4.61 ± 0.46^{bc}) with variation 1, 2 & 3 (4.55 ± 0.38^a , 6.58 ± 0.24^a & 6.42 ± 0.38^a) respectively. As an overall result, the overall acceptability of the garden cress seed powder incorporated (10gm) chapattis of variation 2 was high (8.12 ± 0.26^c) on hedonic scale.

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 food products consumed by adolescents as they help in enhancing the nutritive quality of the diet without compromising on the sensory attributes, all sensory attributes are highly accepted for this study. 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 food products can be tried by the incorporation of Garden cress seeds at home. The similar findings were noticed by Parameshwari and Nazni [19]. Results on Duncan Multiple Range test showed that there was a significant difference ($p < 0.05$) between control and the different variations of the garden cress seed powder incorporated chapattis on colour, texture, flavour, mouth feel, taste and overall acceptability. Hence based on the overall acceptability the nutrient analysis, antioxidant analysis and glycaemic index were carried out for variation 2.

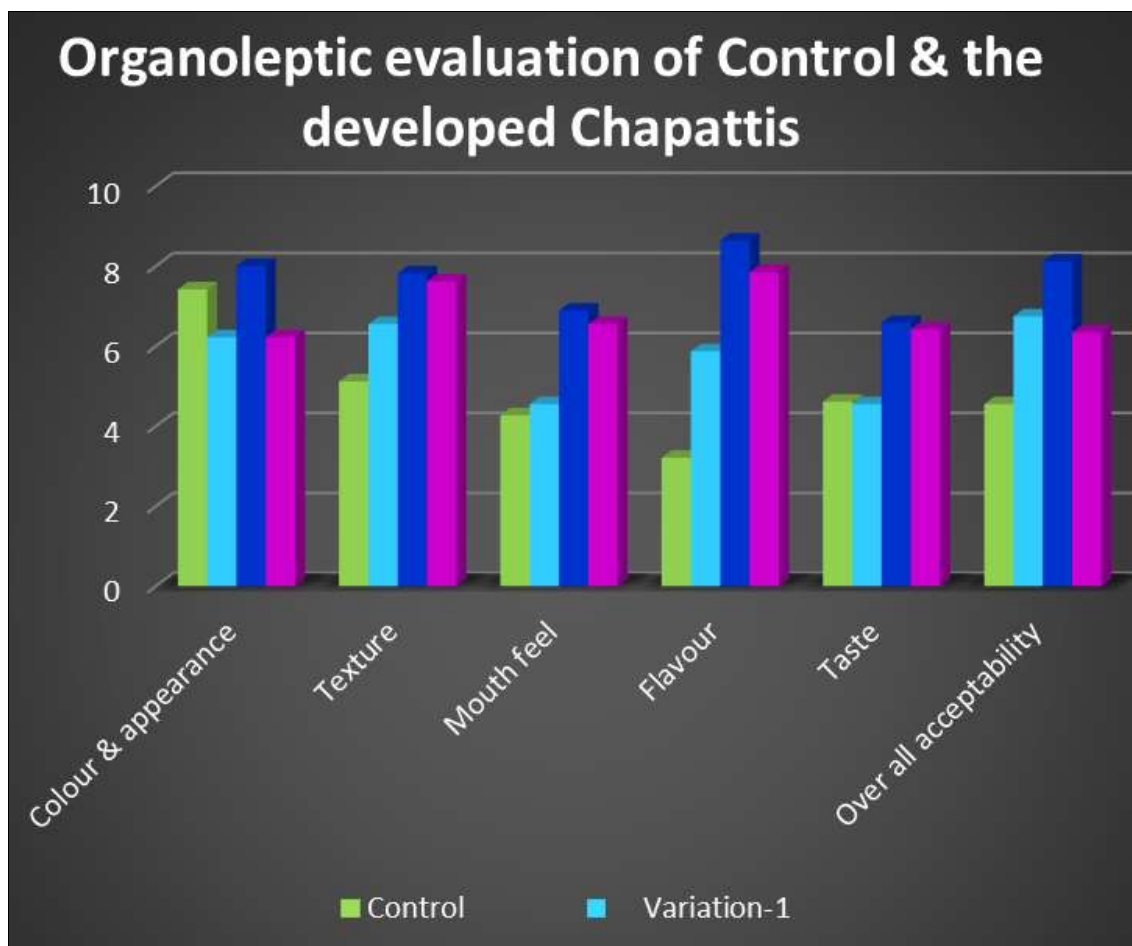


Fig 1: Organoleptic Evaluation of Control Chapattis and the Developed Chapattis

3.2 Proximate composition of accepted variation of chapattis

Based on the colour and appearance, texture, mouth feel and other sensory attributes it can be concluded that the variation 2, that is the food product (chapattis) developed by incorporating

10% of garden cress seed powder was highly acceptable. Hence based on the overall acceptability the nutrient analysis and antioxidant and glycaemic index were carried out for variation 2. The proximate composition of control chapattis and chapattis enriched with 10% of garden cress seed powder are shown in table -3.

Table 3: Proximate composition of accepted variation of chapattis

Nutrients	Control Chapattis	Garden cress seed powder incorporated chapattis (10%)	Deficient or excess
Moisture (%)	32.29	3.45	-28.84
Energy(Kcals)	341	345.33	+4.33
Carbohydrate (g)	73.9	50.00	-23.9
Protein (g)	8.74	7.52	-1.22
Dietary Fibre (g)	1.2	5.64	+4.4
Soluble Fibre (g/100g)	-	2.12	+2.12
Insoluble Fibre (g/100g)	-	3.52	+3.52
Vitamin A (mg/100g)	0.03	0.15	+0.12
Vitamin C (mg/100g)	-	2.16	+2.16
Vitamin E (mg/100g)	0.2	0.84	+0.64
Calcium (mg/100g)	10.4	8.93	-1.47
Potassium (mg/100g)	68.2	62.15	-6.05
Magnesium (mg/100g)	28.6	28.44	-0.16
phosphorus (mg/100g)	76.9	72.59	-4.31
Iron (mg/100g)	1.1	1.46	+0.36

The above table reveals the nutrient content of the accepted variation of the food product (10g of garden cress seed powder incorporated chapattis- V2) and the control chapattis. Here it shows the moisture content of the garden cress seed powder incorporated chapattis was 3.45% which is lower than the control chapattis. The amount of calories

present in the garden cress seed powder incorporated chapattis is 345.33 kcal and it is slightly higher than the control chapatti. The carbohydrate and the protein content of the accepted food product is slightly lower than the control chapattis that is 50.00 g of carbohydrate and 7.52g of protein in the garden cress seed powder incorporated

chapattis and 73.9g of carbohydrate and 8.74g of protein in control chapatti. The amount of dietary fibre content in the accepted variation of food product was improved due to the presence of high fibre in garden cress seed. The dietary fibre in accepted variation of food product is 5.64g whereas 1.2g in control chapattis. The soluble fibre (2.12mg) and insoluble fibre (3.52mg) content is rich in garden cress seed powder incorporated chapattis whereas soluble fibre helps in stabilizing blood sugar (glucose) level and reducing the risk of cardiovascular disease. Insoluble fibre helps in preventing constipation and may help to reduce the risk of haemorrhoids (piles) and diverticular diseases. The vitamin content of the accepted variation chapattis is slightly higher than the control chapatti.

3.3 Antioxidant activity of the accepted chapattis

Table 4: Antioxidant activity of the accepted chapattis

Antioxidant	Control Chapattis	Garden cress seed powder incorporated chapattis (Variation 2)	Deficient or excess
Beta carotene (mg/100g)	0.12	43.10	+42.98

The antioxidant activity of the accepted variation of the chapattis are rich in Beta carotene 43.10mg. Beta carotene as an Antioxidant

The amount of vitamin A in the garden cress seed powder incorporated chapattis is 0.15mg and 0.03 mg in control chapattis. The control chapattis does not have vitamin C but the garden cress seed powder incorporated chapattis contains 2.16mg of vitamin C in it. Vitamin C helps in absorption of iron which helps in prevention of anaemia. The iron content of garden cress seed powder incorporated chapattis is about 1.46mg of iron and iron content plays an important role in strengthening the immune system. The combination of Iron and vitamin C promotes haemoglobin which provides oxygen to damaged cells, tissues, and organs. And the vitamin E is about 0.84mg in the garden cress seed powder incorporated chapattis and 0.2mg in control chapatti.

Helps in boosting immune systems, protect against free radicals, and lower the risk of developing cancer and heart disease.

3.4 Glycemic Index of the accepted chapattis

Table 5: Glycemic Index of the accepted chapattis

Parameters	Control Chapattis	Garden cress seed powder incorporated chapattis	Deficient or excess
Glycemic Index (mg/100g)	44.6	0.89	-43.61

The above table reveals the glycemic index of the accepted variation of the chapattis was 0.89mg per 100g which is completely lower. According to the glycemic index classification (GI) High GI >70 and Low GI <55, the result from the present study indicates that the chapattis prepared with incorporation of 10% of garden cress seed powder having low glycemic index, hence this product can be suggested to diabetic patients.

4. Conclusion

Hence the present study concluded that 10% of garden cress seed powder incorporated chapattis were highly acceptable, it contains good quality of nutrients, rich in fibre and vitamins. The antioxidant activity of garden cress seed powder incorporated chapattis are rich in Beta carotene which helps in boosting immune systems, protect against free radicals, and lower the risk of developing cancer and heart disease. The enriched garden cress seed powder incorporated chapattis were suggested may be used as a dietary supplement for Diabetes, CVD, Hypertension and Chronic Inflammation. Because it contains high amount of nutrients in it and it also low in Glycaemic Index.

It is concluded that, garden cress seed powder incorporated chapattis are very much affordable with high potential for nutrients, dietary fibre and antioxidants, so garden cress seed powder fortified chapattis would be a good choice of supplementary food for children and adults with optimal health benefits. Based on the generated results, novel chapattis could be formulated by value added to wheat flour with garden cress seed powder which may prove a boon to malnourished population.

5. Acknowledgments

The authors are highly thankful to the Department of Nutrition and Dietetics, Periyar University, Salem for provided necessary facilities and support to carry out this research work.

6. Competing Interests

The authors have declared that no competing interests exist.

7. References

- Saraswathi G, Vidya KM, Laxminarayan Hegde, Mukesh L Chavan, Vijay Kumar BM. *p*-Physiological parameters and quality of garden cress (*Lepidium sativum* L.) Plant Archives. 2014; 14(1):455-459.
- Sharma RK, Vyas K, Manda H. International Journal of Phytopharmacology. 2012; 3(2):117-120
- Dhiman AK. Ayurvedic drug plants. Daya Publishing House, Delhi, India, 2006, 97-99.
- Mahassni SH, Al-Reemi RM. *p*- Apoptosis and necrosis of human breast cancer cells by an aqueous extract of garden cress (*Lepidium sativum*) seeds. Saudi J. Biol. Sci. 2013; 20:131-139.
- Mohite SY, Gharal DB, Ranveer RC, Sahoo AK, Ghosh JS. *p*-Development of health drinks enriched with processed garden cress (*Lepidium sativum* L.) seeds. Am. J. Food Technol. 2012; 7:571-576.
- Doke S, Guha M. *p*- Garden cress (*Lepidium sativum* L.) seed- an important medicinal source: a review J. Nat. Prod. Plant Resour. 2014; 4(1):69-80.

7. Gopalan C, Sastri BVR, Balasubramanian SC, Rao BSN, Deosthale YG, Pant KC, *et al.* Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India, 2011.
8. Minaxi R Prajapati, Dr. Preeti H Dave. *p*-Therapeutic and nutritional importance of garden cress seed, *Journal of Pharmacognosy and Phytochemistry*. 2018; 7(5):140-143
9. Kirtkar KM, Basu BD. *Indian medicinal Plants*. 2005; 1:174.
10. Dannehl D, Huyskens-Keil S, Wendorf D, Ulrichs C, Schmidt U. *p*- Influence of intermittent-direct-electriccurrent (IDC) on phytochemical compounds in garden cress during growth. *Food Chem*. 2012; 131:239-246.
11. Jain T, Grover K, Grewal I. *p*- Development and Sensory Evaluation of Ready To Eat Supplementary Food Using Garden Cress (*Lepidium sativum*) Seeds. *Journal of Applied and Natural Science*. 2016; 8:1501-1506.
12. Jain T, Grover K, Kaur G. *p*- Effect of Processing on Nutrients and Fatty Acid Composition of Garden Cress (*Lepidium sativum*) Seeds. *Food Chemistry*. 2016; 213:806-812.
13. Amerine MA, Pangborn RM, Roessler EB. *Principle of sensory evaluation of food*. Academic Press, New York, 1965.
14. AOAC. *Official methods of analysis*, 13th edition, Association of Official Analytical Chemists. Washington DC, 2000.
15. AOAC. *Official methods of analysis*. 16th Ed. Association of Official Analytical Chemists. Arlington, VA. AOAC, 2000.
16. AOAC. *Official Methods of Analysis*. Howitz (ed.), 1980, 734-740.
17. Wolever TMS, Vorster HH, Björck I, Brand-Miller J, Brighenti F, Mann JJ, *et al.* *P-Determination* of the glycaemic index of foods: inter laboratory study, *European Journal of Clinical Nutrition*. 2003; 57:475-482.
18. SAS. *Statistical Analysis System. SAS User's Guide Release 6.04*, Edition Statistics SAS Institute. Inc. Editors, Cary, NC, USA, 2004.
19. Parameshwari S, Nazni P. *p*-Application of Response Surface Methodology in the development of Omega 3 rich snack food, *International Journal of Current Research*, 2012; 4 (11):240-246.