



AMERICAN JOURNAL OF FOOD SCIENCE AND TECHNOLOGY (AJFST)

VOLUME 1 ISSUE 1 (2022)



Indexed in



PUBLISHED BY: E-PALLI, DELAWARE, USA

Nutritional Significance and Usage of Garden Cress Seeds (*Lepidium sativum* L.)-A Review

Vaijayanthi Kanabur¹, Sharavathi V^{1*}

Article Information

Received: August 14, 2022

Accepted: August 22, 2022

Published: September 09, 2022

Keywords

Cress Seeds, Nutritive Value, Usage, Traditional Dish

ABSTRACT

Garden cress seeds are traditionally used in some geographic regions as functional food. In some parts of India, it is given to pregnant and lactating mothers as milk-based beverage. It is used in salads, soups and smoothies in western countries. Although garden cress seeds packed with nutrients, comprehensive research on all the nutrients information (both macro and micro nutrients) was needed. Understanding the nutritional benefits can help in development of food products and extending the usage to other geographical areas. The present review tries to explore the nutritional composition of this less familiar food. 100 g of garden cress seeds provide 445.18 kcal of energy, 24.11 g protein, 24.12 g fat, 9.01g fiber. In addition, Garden cress seeds also provide calcium (320.45mg/100g), magnesium (353.87mg/100g), phosphorus (619.82mg/100g), potassium (1141.67mg/100g) and iron (11.70mg/100g). Many food scientists have incorporated the seeds in local recipes and they are found to be acceptable by the sensory panel. Scaling up and commercialization of these products is needed to popularise the usage of these seeds. As garden cress seeds are rich in micronutrients and help in combating micro nutrient deficiency.

INTRODUCTION

Garden cress is an annual, fast-growing edible herbaceous plant that belongs to the Brassicaceae family and hence shares many characteristics with mustard and watercress¹. There are 12 different species of garden cress seeds of which *Lepidium sativum* L is commonly used². Garden cress plant is cultivated in India, North America, parts of Europe and it is native to southwest Asia and Egypt³. Garden cress can be grown and harvested at any time of year, but the months of January, February, and November are the best for sowing in a Mediterranean climate⁴. Garden cress grows very quickly in the early spring season⁵. The plants are ready to cut in 15 to 20 days after seeding⁶. It's a glabrous, upright, branching

plant. Seeds are small, oval-shaped, pointed, triangular at one end, smooth, about 2-3 mm long and 1-1.5 mm wide, reddish-brown, with an arrow present on both surfaces, reaching up to two-thirds downwards, and slight wing-like extension present on both edges of seed when soaked in water (Fig 1)⁷. Micropyle and groove in between can be observed in the lateral and dorsal aspects of the seeds⁸. Seeds display testa, radical, and cotyledon in both transverse and longitudinal sections⁹. The cotyledon, radical, and superior portion lobes of the cotyledon are visible in the embryo. The crop is mostly grown for seeds¹⁰. The methodology used for this study was online search from the secondary sources. Research publications of last 20 years were reviewed for the study.

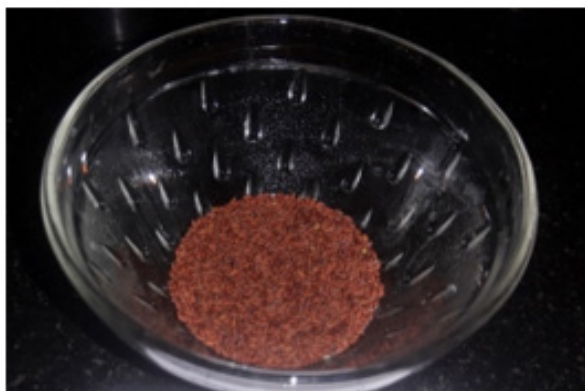


Figure 1: Dry Garden Cress Seeds & Soaked Garden Cress Seeds for 12-hours

Nutritional Composition of garden cress seeds Macronutrient Composition

The macronutrient composition of garden cress seeds is presented in Table 11. On an average garden cress seeds provide 445.18 kcal/100g of energy². The protein content varies from 22 to 25.5g/100g³. It is also a good source

of fat (24.12g/100g) and dietary fiber (9.01g/100g)⁴. The low moisture content is responsible for its stability, quality, and also good shelf life⁵. Macronutrient composition varies depending upon plant variety, agronomic practices and stage of harvest, climatic and geographical condition of the area from where seeds are collected⁶.

¹ Department of Food and Nutrition and Research Center; Smt. V.H.D Central Institute of Home Science; Maharani Cluster University, Bangalore, Karnataka, India

* Corresponding author's e-mail: sharavenkatesh6@gmail.com

Table 1: Macro Nutrient Composition of Garden Cress Seeds

Sl.no	Macro Nutrient	Per cent of macronutrient composition/100g						
		Kumar Neeraj et.al. (2016)	Sanchita Sarkar et.al. (2014)	Baswathi Lahiri et.al. (2020)	Tanu Jain et.al. (2016)	Varsha Rani et.al. (2020)	IFCT (NIN 2017)	Average Value
1.	Moisture (%)	2.88 ± 0.1	NA	2.9	NA	NA	4.60	3.75
2.	Energy (Kcal)	428.4	454.5	NA	454	442	447	445.18
3.	Carbohydrate (g)	30.74 ± 1.2	33.0	30.7	NA	33.66	33.66	32.76
4.	Protein (g)	24.19 ± 0.5	25.5	24.2	22-26	23.36	23.36	24.11
5.	Fat (g)	23.19 ± 0.2	24.5	NA	24.5	23.74	23.74	24.12
6.	Dietary fiber (g)	11.9 ± 0.4	7.6	11.9	NA	8.27	8.27	9.01

Amino Acid Composition

The amino acid composition of garden cress seeds is presented in Table 2¹. Both essential and non-essential amino contents per 100g are shown in Table 2². The glutamic acid varies from 19.33 to 24.29g/100g and aspartic acid varies from 9.76 to 12.07g/100g³.

In addition, studies have shown that it aids in digestion and acts as a fat burner⁴.

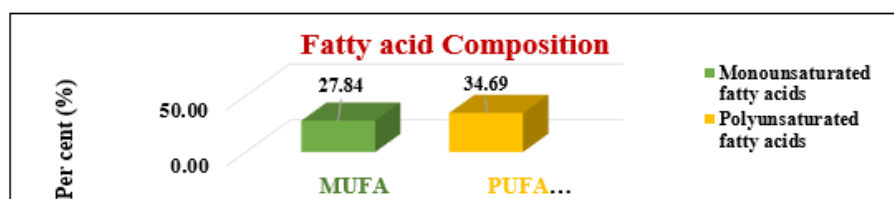
Research has shown that the amino acid content was reduced on heating and there was maximum retention of amino acids in the case of soaked garden seeds (Tanu Jain et.al 2016)⁵.

Fatty acid composition

Fig 2 shows that garden cress seeds have a good amount of Mono Unsaturated Fatty Acids (27.84 per cent) and Poly Unsaturated Fatty Acids (34.69 per cent)²².

Table 2: Amino acid Composition of Garden Cress Seeds

Sl.no	Amino Acid	Per cent of amino acid composition (g/100g)				
		Kumar Neeraj et.al. (2016)	Baswathi Lahiri et.al. (2020)	Varsha Rani et.al. (2020)	IFCT (NIN 2017)	Average Value
1.	Histidine (g)	3.87	3.87	NA	2.62	3.45
2.	Isoleucine (g)	4.19	5.11	NA	3.75	4.35
3.	Leucine (g)	7.03	NA	NA	6.58	6.81
4.	Lysine (g)	5.98	6.26	6.26	3.85	5.59
5.	Methionine (g)	0.51	0.97	0.97	1.85	1.08
6.	Tryptophan (g)	0.92	NA	NA	1.24	1.08
7.	Phenylalanine (g)	5.39	5.67	5.65	3.89	5.15
8.	Threonine (g)	3.76	2.66	NA	3.15	3.19
10.	Valine (g)	6.21	3.04	NA	4.69	4.65
11.	Alanine (g)	4.59	4.83	NA	5.33	4.92
12.	Arginine (g)	3.44	4.51	NA	10.67	6.21
13.	Aspartic acid (g)	12.07	9.76	NA	10.29	10.71
14.	Cystine (g)	0.21	NA	NA	1.23	0.72
15.	Glutamic acid (g)	24.29	19.33	NA	21.34	21.65
16.	Glycine (g)	5.08	5.51	NA	5.22	5.27
17.	Proline (g)	4.63	5.84	NA	4.37	4.95
18.	Serine (g)	4.18	4.96	NA	4.99	4.71
19.	Tyrosine (g)	2.88	2.69	NA	3.47	3.01


Figure 2: Fatty acid composition of the garden cress seed oil.

Vitamin Composition

The Vitamin composition of garden cress seeds is presented in Table 31. It provides B-complex vitamins². On an average the biotin content is 8.66 mg/100g and

folate content is 30.92 µg/100g³. Riboflavin content varies from 0.51 to 14.3mg/100g and niacin content varies from 0.61 to 14.3mg/100g⁴.

Table 3: Vitamin Composition of Garden Cress Seeds

Sl.no	Vitamin	Per cent vitamin composition of garden cress seeds (mg and µg /100g)						
		Kumar Neeraj et.al. (2016)	Sanchita Sarkar et.al. (2014)	Baswathi Lahiriet. al. (2020)	Tanu Jain et.al. (2016)	Varsha Rani et.al. (2020)	IFCT (NIN 2017)	Average Value
1.	Thiamine B1 (mg)	NA	0.59	NA	0.59	NA	0.52	0.57
2.	Riboflavin B2 (mg)	NA	14.3	NA	0.61	NA	0.15	5.02
3.	Niacin B3 (mg)	NA	0.61	NA	14.3	NA	5.67	6.86
4.	Pantothenic acid B5 (mg)	NA	NA	NA	NA	NA	0.28	0.28
5.	Total B6 (mg)	NA	NA	NA	NA	NA	0.05	0.05
6.	Biotin B9 (mg)	NA	NA	NA	NA	NA	8.66	8.66
7.	Folate (µg)	NA	NA	NA	NA	NA	30.92	30.92
8.	Carotene (µg)	NA	27	NA	NA	NA	NA	27

Mineral Composition

The mineral composition of garden cress seeds is presented in Table 41. The amount of ash content shows that seeds are a good source of minerals². On an average it is evident that garden cress seeds contain a good amount

of potassium (1141.67 mg/100g), phosphorous (619.82 mg/100g), magnesium (353.87 mg/100g), and calcium (320.45 mg/100g)³. The Iron content varies from 8.31 to 17.20 mg/100g⁴. The quantities of these minerals vary based on species⁵.

Table 4: Mineral Composition of Garden Cress Seeds

Sl.no	Mineral	Per cent mineral composition of garden cress seeds (mg/100g)						
		Kumar Neeraj et.al. (2016)	Sanchita Sarkar et.al. (2014)	Baswathi Lahiriet. al. (2020)	Tanu Jain et.al. (2016)	Varsha Rani et.al. (2020)	IFCT (NIN 2017)	Average Value
1.	Ash	7.1 ± 0.1	NA	7.1	NA	6.37	6.37	6.61
2.	Calcium (mg)	266.35	377	266.35	377	318	318	320.45
3.	Iron (mg)	8.31	12.1	8.31	12.1	12.20	17.20	11.70
4.	Magnesium (mg)	339.23	NA	339.23	430	NA	307	353.87
5.	Manganese (mg)	2.00	NA	2	NA	NA	2.87	2.29
6.	Copper (mg)	5.73	NA	5.73	NA	NA	0.51	3.99
7.	Phosphorus (mg)	608.63	723	608.63	NA	NA	539	619.82
8.	Zinc (mg)	6.99	NA	6.99	NA	4.83	4.83	5.91
9.	Selenium (mg)	NA	NA	NA	NA	54.41	54.1	54.26
10.	Potassium (mg)	1236.51	NA	1236.51	NA	NA	952	1141.67
11.	Sodium (mg)	19.65	NA	19.65	NA	NA	21.84	20.38

Usage of garden cress seeds

Traditionally in parts of South India, it is consumed as a milk-based beverage by pregnant and lactating mothers¹. Tanu Jain *et.al.* (2016), Tanu Jain and Kiran Grover (2017), Shekhara Naik R *et.al.* (2020) have incorporated garden cress seeds in pinni, a Punjabi dessert prepared using wheat flour, green gram flour, and jaggery, panjiri a Punjabi dessert prepared using wheat flour and jaggery, chikki prepared using peanut and jaggery syrup, burfi prepared using bengal gram flour and sugar syrup, laddoo prepared using wheat flour, Bengal gram flour, and

ground sugar, biscuits prepared using wheat flour and butter, burfi prepared using coconut, milk, and jaggery². Snehal Mohite *et.al.* (2012) have developed a healthy drink prepared using skimmed milk with varying levels of garden cress seed powder (1-5 per cent) concentration³. Angel and Vasanthi Devi (2015) have developed laddu prepared using rice flakes, bajra, roasted bengal gram dal, samai, and jaggery and garden cress seeds⁴. Varsha Rani *et.al.* (2020) have developed muffins by incorporating garden cress seeds⁵. Germinated garden cress seeds incorporated in local side dishes such as a sandwich,

raitha, soup, salad, bhujia were developed by Mamta Sharma (2015) were evaluated by a sensory panel⁶. Mathri, a Rajasthani snack, flaky biscuits prepared using wheat flour, pearl millet flour, and rice flakes were developed by Priyanshu Tripathi *et.al.* (2017) by incorporating 10 to 30

per cent garden cress seeds⁷. The level of incorporation and maximum accepted level of incorporation of garden cress seeds (per cent) in dessert/side dish/snack products are shown in Table 5 and Table 6⁸. The products were found to be acceptable by the sensory evaluation panel.

Table 5: Garden Cress Seeds Incorporated in Traditional Drink/Desserts

Sl.no	Desserts	Level of incorporation of garden cress seeds (Per cent)	Maximum Accepted Level of Incorporation (Per cent)
1.	Health drink (SnehalY Mohite <i>et.al.</i> 2012)	1-5	3
2.	Ladoo (M. Angel and K.P Vasantha Devi 2015)	10	10
3.	Pinni (Tanu Jain <i>et.al.</i> 2016)	5, 10,15	10
4.	Panjiri (Tanu Jain <i>et.al.</i> 2016)	5, 10,15	10
5.	Laddu (Tanu Jain <i>et.al.</i> 2016)	5, 10,15	10
6.	Burfi (Tanu Jain <i>et.al.</i> 2016)	5, 10,15	10
7.	Chikki (Tanu Jain <i>et.al.</i> 2016)	15, 20,25	10
8.	Biscuits (Tanu Jain <i>et.al.</i> 2016)	5, 7.5, 10	25
9.	Chikki (Tanu Jain and Kiran Grover 2017)	25	7.5
10.	Burfi (Shekhara Naik R <i>et.al.</i> 2020)	5	25
11.	Muffins (Varsha Rani <i>et.al.</i> 2020)	10,20,30	5

Table 6: Garden Cress Seeds Incorporated in Traditional Side dish/Snack Products

Sl.no	Side dish/Snack Products	Level of incorporation of garden cress seeds (Per cent)	Maximum Accepted Level of Incorporation (Per cent)
1.	Sandwiches (Mamta Sharma 2015)	7,10,12	10
2.	Soup(Mamta Sharma 2015)	12,15,18	15
3.	Salad (Mamta Sharma 2015)	17,20,22	20
4.	Bhujia(Mamta Sharma 2015)	20,25,30	25
5.	Raita(Mamta Sharma 2015)	8,10,12	10
6.	Mathri(Priyanshu Tripathi <i>et.al.</i> 2017)	10,20,30 (powder)	10

Processing Methods

The common methods of household processing in case of garden cress seeds include soaking, boiling, and roasting (Table 7¹). Gurpreet Kaur *et.al.* (2016) studied the influence of processing on nutritive value. They found that soaking increased protein content, while it was reduced by boiling and roasting². Boiling and roasting raised the fat content but soaking reduced fat content³. Boiling increased fiber content followed by soaking, and roasting decreased the fiber content⁴.

Soaking increased the ash content, while roasting and boiling reduced it⁵. When garden cress seeds were roasted and boiled, the calcium content was increased, but when

the seeds were soaked the calcium content was decreased⁶. Roasting increased the iron content of garden cress seeds followed by soaking and boiling⁷.

The processing methods such as roasting and germination was shown in Table 8⁸. Rajashri and Haripriya (2018) found that nutrient profile and development of muffins by germinated garden cress seed powder were better accepted compared to roasted seeds⁹.

Different processing methods such as soaking, germination, boiling, and roasting have been used in preparing garden cress seed-based products such as burfi¹⁰. Shekhara Naik R *et.al.*(2020) found that soaking and germination of the seeds were more acceptable compared to boiling and roasting¹¹.

Table 7: Effect of Processing Methods for Garden Cress Seeds

Garden Cress Seeds (Gurpreet Kaur <i>et.al.</i> 2016)	Per cent of amnio acid composition (g/100g)					
	Energy (kcal)	Protein (g)	Fat (g)	Carbohydrate (g)	Iron (mg)	Calcium (mg)
Soaking	459.28	23.29	23.13	39.49	31.25	356.37
Boiling	458.28	22.07	23.79	40.90	30.38	368.89
Roasting	460.40	22.37	23.59	41.61	31.67	372.03

Table 8: Effect of Processing Methods for Garden Cress Seed Powder

Garden Cress Seed powder(Rajashri VS and HaripriyaA 2018)	Per cent of amnio acid composition (g/100g)						
	Energy (kcal)	Protein (g)	Fat (g)	Carbohydrate (g)	Fiber (mg)	Iron (mg)	Vitamin C(mg)
Roasting	460	25.0	16.31	53.25	2.06	21.41	77.22
Germination	404.5	25.42	5.57	60.47	3.00	33.55	137.0

Table 9: Nutritive Value of Maximum Accepted Garden Cress Seeds Incorporated Traditional Products

Sl.no	Name of the Product	Macronutrient (Per 100g)				Micronutrient (Per 100g)	
		Energy (kcal)	Carbohydrate (g)	Protein (g)	Fat (g)	Iron (mg)	Calcium (mg)
1.	Health drink (Snehal Y Mohite et.al. 2012)	65.63	10.30	3.44	NA	2.90	127.20
2.	Ladoo:						
a)	Prepared using wheat flour, bengal gram flour, and ground sugar (10 per cent) (M. Angel and K.P Vasantha Devi 2015)	376.0	NA	12.80	NA	10.0	96.0
b)	Prepared using rice flakes, bajra, roasted Bengal gram dal, samai, and jaggery (10 per cent) (Tanu Jain et.al. 2016)	483.46	64.94	6.55	21.93	3.46	37.60
3.	Pinni (Tanu Jain et.al. 2016)	488.75	56.74	8.56	25.23	4.06	63.25
4.	Panjiri(Tanu Jain et.al. 2016)	474.04	64.30	5.46	21.56	4.97	64.30
5.	Burfi:						
a).	10 per cent(Tanu Jain et.al. 2016)	569.89	48.46	8.06	38.19	4.08	34.57
b).	5 per cent(Shekhara Naik R et.al. 2020)	481.8	45.64	2.81	32	16.5	251.10
6.	Chikki:						
a).	25 per cent (Tanu Jain et.al. 2016)	470.7	58.68	14.14	19.73	6.43	117.27
b).	25 per cent (roasted) (Tanu Jain and Kiran Grover 2017)	482.03	57.13	14.47	21.0	NA	NA
7.	Biscuits (Tanu Jain et.al. 2016)	456.44	58.4	6.46	21.88	3.33	36.08
8.	Muffin(Varsha Rani et.al. 2020)	410.57	43.13	13.23	20.57	4.83	91.32
9.	Sandwiches (Mamta Sharma 2015)	276	36.1	7.7	11	11	65.7
10.	Soup(Mamta Sharma 2015)	230.3	21.48	5.4	13.7	15.52	33.74
11.	Salad (Mamta Sharma 2015)	114.8	11.43	5.8	5.02	26.6	93.3
12.	Bhujia(Mamta Sharma 2015)	300.5	29.3	8	16.2	25.4	105.2
13.	Raita(Mamta Sharma 2015)	99.4	6	5.29	6.05	10.18	145.2
14.	Mathri(Varsha Rani et.al. 2020)	356.04	NA	12.43	4.35	17.24	NA

Nutritive value of Garden Cress Seeds incorporated products

Nutritive value of maximum accepted garden cress seeds

incorporated traditional products shown in Table 9¹. The energy content varies from 65.63 to 569.89g/100g and protein content varies from 2.81 to 14.47g/100g². Garden cress seeds are a good source of iron and calcium³

Effect of Garden Cress Seeds

A study was conducted by Angel and Vasantha Devi (2015) on the effect of supplementation of garden cress seed incorporated product on moderate anaemic adolescent girls (12-15 years)¹. Ladoo a traditional Indian sweet prepared using rice flakes, bajra, roasted bengal gram dal, samai, and jaggery with 10 per cent garden cress seed was used along with Vitamin C-rich gooseberry². The duration of supplementation was 6 months³. After the supplementation, there was an improvement in hemoglobin level from 8.67 to 12.47 g/dl⁴.

CONCLUSION

Garden cress seed is an annual herb grown as a culinary seed in Asia and Europe. These seeds are loaded with good amount of macro and micro nutrients such as energy (445.18 kcal/100g), protein (24.11g/100g), fat (24.12g/100g), carbohydrate (32.76g/100g), calcium (320.45mg/100g), phosphorous(619.82mg/100g), potassium (1141.67mg/100g),magnesium (353.87mg/100g) and it is also a good source of fiber (9.01g/100g) and iron (11.70mg/100g). Different products have been developed by incorporating garden cress seeds in traditional local recipes. 10-25 per cent level of incorporation has been found to be acceptable by the sensory panel. These products are yet to be commercialized.

REFERENCE

- Angel, M., & Vasantha Devi, K.P. (2015). Therapeutic impact of garden cress seeds incorporated among the selected anaemic adolescent girls (12-15 years). *Journal of Drug Discovery and Therapeutics.*, 3(25),18-22.
- Jain, T., Grover, K., & Kaur, G. (2016). Effect of processing on nutrients and fatty acid composition of garden cress (*Lepidium sativum*) seeds. *Food chemistry*, 213, 806-812.
- Longvah, T., Ananthan, T., Bhaskarachary, K., & Venkaiah, K. (2017). Indian Food Composition Tables, National Institute of Nutrition (Indian Council of Medical Research). *Hyderabad, India: Department of Health Research, Ministry of Health and Family Welfare, Government of India.*
- Lahiri, B. & Rani, R. (2020). Garden Cress Seeds: Chemistry, medicinal properties, application in dairy and food industry: A review. *Life Sciences Research.*, 6(2).Mamta Sharma, (2015). Formulation and Sensory Evaluation of Food Products Developed by incorporating Germinated Garden cress seeds (*Lepidium sativum* L.). *International Journal of Sciences: Basic and Applied Research.*, 23(1), 181-188.
- Minaxi R Prajapati and Dr.Preeti H Dave, (2018). Therapeutic and nutritional importance of garden cress seed. *Journal of Pharmacognosy and Phytochemistry*, 7(5), 140-143
- Priyanshu Tripathi and Khushbu Gujar, (2017). Development of Iron Rich Flour Using Garden cress seeds. *International Journal of Applied and Natural Sciences (IJANS)*, 6, 155-162
- Rajshri VS and Haripriya A, (2018). Effect of processing on the selected nutrient profile of garden cress seeds and development of garden cress seed-based muffins. *International Journal of Academic Research and Development.*, 3(2), 1542-1547.
- Shail, Dwivedi Manjari, Kumar Neeraj Gupta LN, (2016). Nutritional importance of *Lepidium sativum* L. (Garden Cress/Chandrashoor): A Review. *International Journal of Pharmacy and Analytical Research.*, 5(1).
- Shekhara Naik R, Sharada R, Prakruthi M, Devaki CS, and Mahesh MS, (2020). Effect of different processing methods on the acceptability and keeping quality of burfi prepared from Graden cress seeds (*Lepidium sativum* Linn). *The Pharma Innovation Journal.*, 9(7), 117-122
- Singh, C. S., Paswan, V. K., Naik, B., & Reeta. (2015). Exploring potential of fortification by garden cress (*Lepidium sativum* L.) seeds for the development of functional foods- A Review. *Indian Journal of Natural Products and Resources.*, 6(3), 167-175.
- Snehal Doke and Manisha Guha, (2014). Garden Cress (*Lepidium sativum* L.) Seeds – An Important Medicinal Source: A Review. *Central Food Technological Research, India.*, 4 (1), 69-80.
- Shehal Y. Mohite, Dhanashri B. Gharal, Rahul C. Ranveer, Akshay K. Sahoo, and Jai S. Ghosh, (2012). Development of Healthy Drink Enriched with Processed Garden Cress (*Lepidium sativum* L.) Seeds. *Journal of Food Technology.*, 7(9), 571-576.
- Tanu Jain, Kiran Grover and Inderjit Singh Grewal, (2016). Development and sensory evaluation of ready-to-eat supplementary food using garden cress (*Lepidium sativum*) seeds. *Journal of Applied and Natural Science*, 8(3), 1501-1506.
- Tanu Jain and Kiran Grover, (2017). Nutritional Evaluation of Garden Cress Chikki. *Agricultural Research & Technology Journal.*, 4(2).
- Vaishnavi, Radhna Gupta and Preeti Choudhary, (2020). Botanical description of garden cress (*Lepidium sativum* L.) plant and physical characteristics of its seeds. *Journal of Pharmacognosy and Phytochemistry.*, 9(5), 2424-2428.
- Vaishnavi and Radhna Gupta, (2020). Effect of processing treatments on the nutritional profile of garden cress (*Lepidium sativum* L.) seeds. *International Journal of Chemical Studies.*, 8(4), 2