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Therapeutic and nutritional importance of garden cress seed

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Abstract
Garden cress seed has been used in curing many health related complications by our ancients. It has been used in the treatment of many health problems such as hypertension, kidney diseases, prevention of cancer and mild glycemia. Garden cress seed are widely used to heal fractures and to increase milk secretion during lactation. Garden cress seed also possesses wide range of antioxidant. Fatty acids of Garden cress seed oil helps in preventing coronary heart diseases.

Keywords: garden cress seed, medicinal, glycemia, diuretic, antianaemic

Introduction
Garden cress seed belongs to Brassicaceae family and its scientific name is *Lepidium sativum.* Common names of Garden cress seed includes Common Cress (English), Halim (Bengali), Aseliyo (Gujrati), Chansur (Hindi), Allibija, Kapila (Kannada), Alian (Kashmiri) Asali (Malayalam), Ahaliva, Haliv (Marathi), Allivirai (Tamil) and Adityalu, Aadalu (Telugu) [6]. Garden cress seed and its leaves are used in various food preparations. It is also used as house hold remedy to treat some health problems. Ethiopia is the origin of Garden cress. Winter is best for growing Garden cress seed, though it can be grown around the year [30]. Plant seed, leaves and roots, all these parts possess economic importance. However, plant is cultivated for seed. Leaves of the plant can be consumed in salads, cooked with other vegetables or used to garnish food. Garden cress seed are oval in shape, it has dark brownish color. In spite of great medicinal value, seed has not received much attention. Only few studies are available which describe chemical composition of seed [8, 29, 23]. As per scientific investigations, seed comprising of 80–85% endosperm, 12–17% seed coat and 2–3% embryo. Seed contain 25% protein, 14-24% lipids, 33-54% carbohydrates and 8% crude fiber [19, 7]. Garden cress seed possess various pharmacological properties [32]. In traditional medicinal system, Garden cress seed have been widely used in treating number of disorders in India [5] such as hypertension, diabetes and kidney diseases [15] and in prevention of cancer, cardiovascular diseases and mild glycemia in diabetic patients. Essential fatty acids of seed work as memory boosters [13].

Morphology of garden cress seed
Garden cress seed are smooth, small and reddish brown in color. Shape is oval with point and triangular at one end. Seed length is about 3-4 mm and wideness is 1-2 mm. When seed is soaked in water seed coat swells and gets covered with transparent, colorless, mucilage and give mucilaginous taste [6, 13].

Microscopic characters of Garden cress seed
Endosperm of seed is composed of thick walled polygonal cells and embryo is enclosed by endosperm cells. The cells of embryo are minute in size with polygonal shape. Color of seed powder is creamish yellow, seed powder shows uniform thick walls, oily endosperm with few reddish-brown fragments of seed coats and reddish coloring matter [6, 9].

Chemical composition of Garden cress seed
Garden cress seed can be divided in to two major fractions i.e. endosperm (72%) and bran (28%) [28]. Chemical composition and amino acid profile of endosperm, bran and whole meal of Garden cress seed is given in Table 1 and 2 [15].

Table 1: Chemical composition of endosperm, bran and whole meal of Garden cress seed (%dwb)

Nutrients/chemicals	Whole meal (Mean±SD)	Endosperm (Mean±SD)	Bran (Mean±SD)
Moisture	4.14 ± 0.05	2.58 ± 0.01	4.27 ± 0.01
Protein	22.47 ± 0.78	27.74 ± 0.02	12.58 ± 0.21
Fat	27.48 ± 0.14	33.06 ± 0.16	6.34 ± 0.19
Carbohydrate (By difference)	34.24 ± 0.92	28.45 ± 0.21	50.31 ± 0.08
Ash	4.65 ± 0.09	4.06 ± 0.08	6.19 ± 0.01
Crude fiber	7.01 ± 0.08	4.00 ± 0.13	14.29 ± 0.06
Insoluble fiber	28.49 ± 0.38	13.10 ± 0.62	74.07 ± 1.48
Soluble fiber	1.51 ± 0.09	0.50 ± 0.01	0.93 ± 0.01
Mineral content			
Potassium	1193.95 ± 10.51	945.15 ± 5.81	1934.57 ± 18.82
Phosphorous	514.59 ± 10.67	652.81 ± 14.59	209.92 ± 0.70
Magnessium	315.25 ± 3.63	334.95 ± 3.16	303.63 ± 1.37
Calcium	296.60 ± 1.04	210.51 ± 1.08	556.32 ± 3.03
Sulphur	293.02 ± 14.27	149.31 ± 3.48	239.48 ± 10.47
Sodium	24.64 ± 0.02	15.34 ± 1.04	57.06 ± 2.69
Iron	7.62 ± 0.04	8.31 ± 0.06	6.61 ± 0.12
Copper	5.53 ± 0.09	2.21 ± 0.03	1.63 ± 0.04
Zinc	5.05 ± 0.07	5.31 ± 0.02	2.98 ± 0.41
Aluminium	2.82 ± 0.13	2.55 ± 0.05	4.82 ± 0.05
Manganese	2.57 ± 0.04	3.03 ± 0.05	1.87 ± 0.03
Boron	1.41 ± 0.03	1.17 ± 0.03	1.98 ± 0.06
Molybdenum	0.43 ± 0.08	0.33 ± 0.16	0.58 ± 0.10

Table 2: Amino acid profile of garden cress seed

Non-essential amino acids	g/100g protein
Aspartic acid	9.76±0.03
Glutamic acid	19.33±0.19
Serine	4.96±0.09
Essential amino acids	g/100g protein
Histidine	2.66±0.09
Threonin	4.51±0.03
Arginine	8.04±0.03
Valine	5.67±0.02
Metheonine	0.97±0.02
Phenyl Alanine	5.65±0.03
Isoleucine	5.11±0.03
Leucine	8.21±0.01
Lysine	6.26±0.39
Total (%)	47.08
Essential Amino Acid score (%)	28.53

A unique composition of Garden cress seed make it highly nutritious. Seed is high in fiber content, which suggests its usefulness in the treatment of constipation and diabetes. Garden cress seed reduced the starch hydrolysis rate *in vitro* and blood glucose in diabetic subjects [26]. It was also reported that mucilage of Garden cress seed exhibited better emulsifying property than gum acacia [25]. Mineral profile of seed shows high content of potassium and low content of sodium in all fractions which make it beneficial for the patients of high blood pressure and also can be recommended to athletes [17]. In the similar study, amino acid profile shows the total essential amino acid percentage of seed is 47.08% which suggests that seed can be a source of supplying of essential amino acids in the diet with good fatty acid profile [16].

Chemical composition of garden cress seed oil

Composition of seed oil is given in Table 3. Data show a high content of triacylglycerols i.e. 90.00 ± 0.62 g/100g in oil. High number of free fatty acids in oil may cause rancidity in oil which can be produced as a result of hydrolysis either due to chemicals or may be due to presence of lipolytic enzymes. Lower free fatty acid value of oil (0.58 ± 0.35 g/100g) indicates a low degree of hydrolysis and hence the seed oil can be considered of good quality. It also suggests that oil is rich in triglycerides [21].

Table 3: Lipid profile / fatty acid profile composition of garden cress seed oil

Oil class	Garden cress seed
Hydrocarbons + waxes	0.30 ± 0.04^{a}
Steryl esters	0.70 ± 0.07^{a}
Triacylglycerols	90.00 ± 0.62^{a}
Free fatty acid	0.58 ± 0.35^{b}
Diglycerols	0.60 ± 0.58^{a}
Monoglycerols	0.10 ± 0.63^{b}
Polar lipids	1.70 ± 0.21^{b}
Phospholipids	1.40 ± 0.36^{b}
Unidentified	4.63 ± 0.67^{a}

Data are expressed as the mean ± standard deviation; values in the same row having different letters differ significantly (p<0.05).

Fatty acid profile of garden cress seed oil

It is observed that the unsaturated fatty acids are present in higher amounts in oil (Table 4) Among all fatty acids, Palmitic acid was observed highest i.e of 10.3 ± 0.12 g/100g. Value of palmitoleic acid was observed lowest i.e. 0.70 ± 0.30 with comparatively high content of α-linoleic acid (32.18%) and oleic acid (30.5%) [21]. Number of studies has claimed that higher intake of oleic acid is linked with decreased risk of coronary heart disease caused by high blood cholesterol level [11].

Table 4: Fatty acid profile of Garden cress seed

Fatty acid	Amount (%)
Palmitic acid (16:0)	10.30 ± 0.12^{b}
Palmitoleic acid (16:1)	0.70 ± 0.30^{b}
Stearic acid (18:0)	1.90 ± 0.19^{b}
Oleic acid (18:1)	30.50 ± 0.16^{a}
Linoleic acid (18:2)	8.60 ± 0.38^{b}
α-Linolenic acid (18:3)	32.18 ± 0.59^{a}
Arachidic acid (20:0)	2.10 ± 0.57
Eicosaenoic acid (20:1)	13.40 ± 0.66

Data are expressed as the mean ± standard deviation; values in the same row having different letters differ significantly (p<0.05).

Physico-chemical composition of seed oil

Physico-chemical properties are highly importance in seed oil storage, stability and choice of consumer. Study carried out by Muhammad Zia-Ul-Haq *et al.* [21] reported the physico-chemical composition of seed oil which is shown in Table No.5.

Table 5: Physico-chemical parameters of Garden cress seed oil

Parameter	Observation / Value
Color	Dirty Yellow
Refractive index	1.47 ± 0.08^{a}
Specific gravity	0.82 ± 0.06^{a}
Unsaponifiable matter	0.57 ± 0.02^{b}
Acid value	1.04 ± 0.05^{b}
Saponification value	179.03 ± 0.73^{b}

Data are expressed as the mean ± standard deviation; values in the same row having different letters differ significantly (p<0.05).

Medicinal properties of garden cress seed

Fracture healing property

Traditionally Garden cress seed are used in healing fracture or in accidental injuries. In some of the areas of India seed as such or its powder is mixed with water and applied on affected areas or consumed with water or warm milk to heal the fracture and internal injuries. Plant and seed are well known in the community of Saudi Arabia and some other Arabic countries as a good mediator for healing the fractured bones. To prove this effect a study was conducted on 6 adult New Zealand White rabbits. All are induced with fractures in the mid shaft of the left femur and divided into two groups. Garden cress seed mixed with normal diet and fed to the test group of rabbits while control group was given normal diet only. To assess the fracture healing, X-rays of the induced fractures were taken 6 and 12 weeks postoperatively. Results revealed that the test group had a statistically significant increase in healing of fractures compared to that of the control group. On the basis of results, it can be said that Garden cress seed possess fracture healing property [1].

Antianaemic effect

To check the antianaemic effect of seed, thirty adult girls were given 25g of seed powder incorporated in Laddu. Results of the study revealed significant rise in hemoglobin level (P<0.05) besides insignificant increase in body weight in the Garden cress seed fed group [2].

Antimicrobial Activity

Petroleum ether extract of seed in concentrations of 2.5%, 5% and 10% had active antimicrobial effect against six different pathogens together with powerful antifungal activity at the concentration of 2.5 and 10% [2]. Ethanolic extract of seed was found very effective against fungal growth (*Fusarium equiseta*, *Aspergillus flavus* and *Alternaria alternat*) at 2-8% of seed extracts [27].

Antidiabetic effect

Alkaloids of Garden cress seed were found effective against increase in blood sugar [10]. Consumption of Garden cress seed was also found associated with reduction in starch hydrolysis rate (41%) *in-vitro* and lowering of glycemic response in the subjects with NIDDM [26]. Significant decrease (p≤0.05) in fasting blood glucose levels, glycosylated haemoglobin, lipid profile, total cholesterol, triglycerides and lipoprotein fractions (LDL-c and VLDL-c) was observed with a significant raise in HDL-c levels was also observed in alloxan induced diabetic and hyperlipidemic male Wistar rats.

Antihypercholesterolemic effect

Protecting effect of Garden cress seed powder and extract was observed in hypercholesterolemic rats [33]. Daily oral administration of 20 mg/kg of aqueous seed extract for 4 weeks on hypercholesterolemia and alloxan treated rats significantly reduced cholesterol, triglycerides, LDL level besides increasing the value of HDL in compared to corresponding control groups [3].

Effect on respiratory function in bronchial asthma

A study conducted on 30 patients (male and female both) suffering from mild to moderate brochial asthma whose age was 15 years to 80 years excluding pregnant women. One gram of finely ground seed powder was given orally to the patients for thrice a day for 4 weeks without providing medicine. Respiratory functions were assessed with Spirometer before and after the experimental period and it was observed that there were significant improvements in different pulmonary functions. No any adverse effect was observed in any patients [24].

Anti-oxidant effect

Ethanolic extract of Garden cress seed possess possible nephrocurative, nephroprotectivity and antioxidant potential against nephrotoxicity produced by Cisplatin. Increase in kidney tissue enzymes malondialdehyde and superoxide dismutase catalase which have antioxidant effects and reduction in glutathione level was also observed [21, 34].

Safe level of garden cress seed as food

Although Garden cress seed used widely, there are very few reports available in the literature regarding safe consumption level of Garden cress seed for use as food. Datta PK *et al.* conducted a study on adult rats to assess the safety of Garden cress seed. For the acute toxicity study, rats were fed seed powder 0.5 –5.0 g/kg body weight mixed with standard diet and symptoms of toxicity and mortality were monitored for 72 hours. No toxicity and mortality symptoms were found in rats. To observe the subchronic toxicity effect of seed, rats were fed 1.0 – 10.0% seed powder mixed with standard diet for 14 weeks. No any adverse effect was found in any rats, after completing the experimental period. However, there were significant increase in the serum alpha linolenic acid (ALP) and serum glutamyl oxaloacetic transaminase (SGOT) in male rats receiving 5.0 and 10% of Garden cress seed. It was shown that acute and subchronic feeding of seed for 14 weeks do not produce any kind of toxic effects in both male and female rats [12].

Antihypertensive and antidiuretic effect

Daily oral administration of 20mg/kg aqueous seed extract for 3 weeks showed a significant decrease in blood pressure in spontaneously hypertensive rats beside no significant change in normotensive rats during the experimental period [20]. Another reported that oral administration of both aqueous and methanol extract of Garden cress seed increased excretion of sodium. Excretion of potassium was only increased in aqueous extract treated rats beside no significant change in urine P^{H} [31].

Cytotoxic effect on breast cancer

Aqueous extract of garden seed extract possess ability to inhibit growth of breast cancer cells MCF-7 [18].

Effects of garden cress seed on fertility

Oral supplementation of tocopherol extracted from seed can improve histoarchitecture of rabbit testis and could be used to improve the fertility of rabbits [22].

References

1. Abdullah H, Abdullah J. The effects of *Lepidium sativum* seed on Fracture – Induced Healing in Rabbits. Med Gen Med. 2007; 9(2):23-29.
2. Adam, SIY, Salih SAM, Abdelgadir WS. Asian Journal of Medical Sciences. 2011; 3(6):261-266.
3. Amawi K, Aljamal A. Effects of *Lepidium sativum* on Lipid profiles and Blood Glucose in Rats, J Phys & Pharm Adv. 2012; 2(8):277-281.
4. Anil Kumar D. Ayurvedic Drug Plants, Publisher: Daya Books, 2006, 97p.
5. Anonymous. The Wealth of Indian Raw Materials Publication and information Directorate, CSIR, New Delhi, 1972; 9:71-72.
6. Anonymous. Ayurvedic Pharmacopoeia of India, Part-1,1st ed, The drug controller of India, Government of India, Ministry of health and family welfare development of Indian system of medicine and homeopathy, New Delhi civil lines, Delhi. 2001; 1:26.
7. Arkroyd WR, Gopalan C, Balasubramanian SC. Nutritive value of Indian Foods and the planning of satisfactory diets. Indian Council of Medical Research, N. Delhi, 1960, 64p.
8. Bhakare HA, Kulakarni AS, Khotpal RR. Lipid composition of some seed of Central India. Journal of Food Science and Technology. 1993; 30:54-55.
9. Bigoniya P, Singh CS, Shukla A. Indian Journal of Natural Products and Resources. 2011; 2(4):464-471.
10. Eddouks M, Aghrani M, Emhadri A *et al*. Ethnopharmacological survey of medicinal plants used for the treatment of diabetes mellitus, hypertension and cardiac diseases in the south east region of Morocco (Tafilatel), J Ethnopharmacol. 2002; 2(3):97-103.
11. Corbett P. It is time for an oil change, Opportunities for high oleic vegetables oils. Inform, 2003; 14:480-481.
12. Datta PK, Diwakar BT, Viswanatha S, Murthy KN, Naidu KA. Safety evaluation studies on Garden cress (*Lepidium sativum* L.) seed in Wistar rats. International Journal of Applied Research in Natural Products. 2011; 4(1):37-43.
13. Dannehl D, Huyskens-Keil S, Wendorf D, Ulrichs C, Schmidt U. Influence of intermittent-direct-electric-current (IDC) on phytochemical compounds in garden cress during growth. Food Chem. 2012; 131:239-246.
14. Gokavi SS, Malleshi NG, Guo M. Plant Foods for Human Nutrition. 2004; 59(3):105-111.
15. Kirtkar KM, Basu BD. Indian medicinal Plants. 2005; I:174.
16. Laryea MD, Jiang YF, Xu, GL, Lombeck I. Fatty acid composition of blood lipids in Chinese children consuming high erucic acid rapeseed oil. Ann Nutr Metabol. 1992; 36:273-278.
17. Luft FC. Horticulture and human health: contribution of fruits and vegetables. In: Quebedeaux B, Bliss FA (eds), Proceedings of the 1st International Symposium on Horticulture and Human Health: Arlington, VA. 1987, 127-134.
18. Mahassni SH, Al-Reemi RM. Indian Journal of Traditional Knowledge. 2013; 12(4):605-614.
19. Mathews S, Singhal RS, Kulkarni PR. Some physicochemical properties of *Lepidium sativum* (Haliv) seed. Die Nahrung. 1993; 37:69-71.
20. Mohamed M, Naoufel A, Jean BM *et al*. Antihypertensive effects of *Lepidium ativum* L. In spontaneously hypertensive rats. J Ethanopharmacol. 2003; 100:193-197.
21. Muhammad Zia-Ul-Haq, Shakeel Ahmad, Luca Calani, Teresa Mazzeo, Daniele Del Rio, Nicoletta Pellegrini *et al*. Compositional Study and Antioxidant Potential of *Ipomoea hederacea* Jacq. And *Lepidium sativum* L. Seed. Molecules. 2012; 17:10306-10321.
22. Nada Saad Naji, Fakhir Magtoof Shumran. The Effects of Tocopherol Extraction from Lepidium Sativum Seed on the Histology of Testis, Epididymis, and Seminal Vesicles of Adult Male Rabbits. Journal of Biology, Agriculture and Healthcare. ISSN 2224-3208 (Paper) ISSN 2225-093X (Online). 2013, 3(6).
23. Olaofe O. Amino acid and mineral compositions and functional properties of some oilseed. J Agric Food Chem. 1994; 42:878-881.
24. Paranjape AN, Mehta AA. Iranian Journal of Pharmacology & Therapeutics. 2006; 5(1):55-59.
25. Patel MM, Chauhan GM, Patel LD. Mucilages of *Lepidium sativum* Linn. (Asario) and *Ocimum canum*. Sims. (Bavchi) as emulgents. Indian J Hosp Pharm. 1987, 200-202.
26. Patole AP, Agte VV, Phadnis MC. Journal of Medicinal and Aromatic Plant Sciences. 1998; 20:1005- 1008
27. Sharma RK, Vyas K, Manda H. International Journal of Phytopharmacology. 2012; 3(2):117-120.
28. Snehal Doke, Manisha Guha. Garden cress (*Lepidium sativum* L.) Seed – An Important Medicinal Source: A Review, J Nat. Prod. Plant Resour. 2014; 4(1):69-80
29. Sumangala SG, Malleshi NG, GUO M. Chemical composition of garden cress (*Lepidium sativum*) seed and its fractions and use of bran as a functional ingredient. Plant Foods Human Nutrition. 2004; 59:105-111.
30. The Wealth of India, Raw Material. CSIR publication, New Delhi, 1962, 6.
31. Umang P, Undale KM, Ashok B. Evaluation of Diuretic activity of Aqueous and Methanolic extracts of *Lepidium sativum* Garden cress (cruciferae) in Rats. Trop J Pharma Res. 2009; 8(3):215-219.
32. Vohora SB, Khan MSY. Pharmacological studies on *Lepidium sativum* Linn. Indian J Physiol Pharmac. 1977; 21:118-120.
33. Wafeka A, Al H. Protective Effect of *Lepidium sativum* L. Seed Powder and Extract on Hypercholesterolemic Rats. J American Sci. 2010; 6(11):873-879.
34. Yogesh Chand Y, Srivastav DN, Seth AK, Vipin S, Balaraman R, Tejas KG. *In vivo* antioxidant potential of *Lepidium sativum* L. seed in albino rats using cisplatin induced nephrotoxicity. Inter J Phytomed. 2010; 2:292-298.