

Nourishing and healing prowess of garden cress (*Lepidium sativum* Linn.)– A review

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Received 3 April 2010; Accepted 13 July 2011

Garden cress has been considered as an important medicinal plant since the Vedic era. In Ayurveda, it is described as hot, bitter, galactagogue and aphrodisiac and claimed to destroy *Vata* (air) and *Kapha* (phlegm). In Unani system of medicine, seeds and leaves of this plant have been reported to possess diuretic, aperient and aphrodisiac properties and are recommended in inflammation, bronchitis, rheumatism and muscular pain. It is also reported to be useful in the treatment of asthma, cough and bleeding piles. The plant is also reported to possess antihemagglutinating, hypoglycemic, antihypertensive, diuretic and fracture healing properties. Garden cress (*Lepidium sativum* Linn.) seeds have a rich amount of protein to the extent of 25% and fat (16%). Its bran has a high water holding capacity due to high dietary fibre content (74.3%). In human quest for relieving the masses from the scourge of low nutritional status through non-conventional scarcely explored foodstuffs, some food products have been developed incorporating garden cress which not only support their nutritional status but also have a refreshing and rejuvenating effect.

Keywords: Protein, Galactagogue, Aphrodisiac, Diuretic, Hypoglycemic, Glucosinolate.

IPC code; Int. cl. (2011.01)—A61K 36/00, A61P 3/02, A61P 3/10

Introduction

Lepidium sativum Linn. (Family: Brassicaceae), popularly known as Garden cress in English and *Chandrashoor* in local language in India. It is a native plant of South West Asia which spread many centuries ago to western Europe (Xenophon 400 BC). It was used by the ancient Egyptians as a food source and became well known in various parts of Europe, including Britain, France, Italy and Germany in due course, where it is still used as a minor crop¹. Persian used to eat this plant even before bread was known². In some regions it is known as garden pepper cress, pepper grass or pepper wort and its other name, 'town cress,' refers to its cultivation in *tounnes* or enclosures. It was also known as passer age; from passer, or to drive away rages or madness, because of its reputed power to eradicate people of hydrophobia. It has been well known since vedic times as the different Sanskrit names of *Lepidium sativum*, as mentioned in old literature, include - *ashalika*, *bhadra*, *chandrashura*, *chandrika*, *dhrihabija*, *kalmesha*, *nandini*, *raktbija* and *vasuprisha*³.

It is a cool season annual plant, cultivated as salad throughout India⁴. It has long leaves at the bottom of the stem and small bright green feather like ones arranged on opposite side of its stalk at the top (Plate 1). There are plain broad leaf and curly leaf varieties that differ in texture but not taste. Garden cress can be harvested throughout the year whether grown indoor or outdoor and is cut when the sprouts are 5-10 cm tall. Cress grows plentiful in well worked soil with good drainage.

It flourishes in shade or semi shade and can tolerate a wide range of temperature. While preparing the soil, it should be dug and mixed with a well balanced fertilizer. The seed sowed thickly a 5-6 cm deep in wide rows, 45-60 cm apart to have a continuous crop. The leaves should not remain wet more than the requirement since the soil that lodges there when water splashes on them is impossible to washout damaging the leaf. Cress has no serious pest problem. Its growth is rapid and harvesting can begin in the same month as sowing with yields reaching as high as 6 tones per hectare. The plant prefers light (sandy), medium (loamy) and heavy (clay) soils. It can grow in semi shade (light woodland) or even without any shade. It requires moist soil and also some shade during the summer to prevent heat from running straight to seed. It can be grown at all elevations, the

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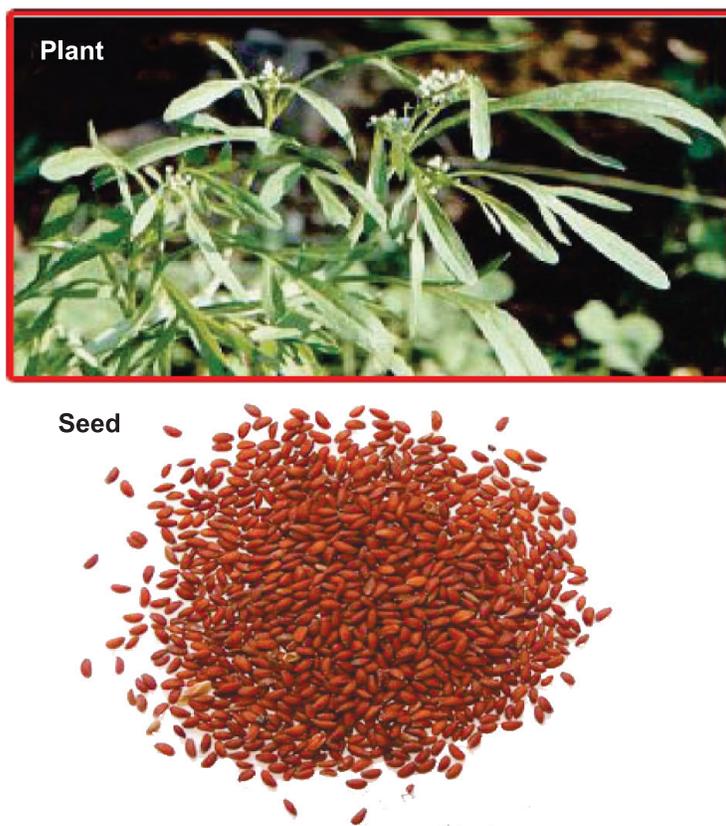


Plate 1—Garden cress plant and seeds

whole year around. However, the best crop is obtained in the winter season. Seeds are sown in the plains from September to February and on the hills, from March to September. They are sown thick and covered until germination begins. In a few days after sowing, the plants are ready for cutting. To get a continuous supply of leaves, sowing is done in succession at intervals of 8 days⁴. Garden cress leaves are consumed raw in salads; they are also cooked with vegetable curries and used as garnish. The plant is also used as fodder for horses, camels, etc. Firm and evenly colored rich green specimen should be selected for storage. Cress with any signs of slime, wilting or discoloration should be avoided. The cress can be stored under refrigeration in plastic for up to five days. Its stem should be stuck in a water filled glass, the glass bagged and refrigerated to prolong life. Until they are needed for use, the leaves should be left on the stem.

Chemical composition and utilization

Garden cress is found to contain significant amount of iron, calcium and folic acid in addition to vitamin A and C. It contains higher amount of protein (25%),

most abundant amino acid is glutamic acid (19.3%) and among the essential amino acids; leucine, the highest ($8.21 \pm 0.01\%$) and methionine, the lowest ($0.97 \pm 0.02\%$). The major fatty acid is linolenic acid (30.2%) with low amount of erucic acid (3.9%) is also present. Its bran has high water holding capacity and high dietary fibre (74.3%)⁵. Cress seed husk powder in presence of biological fluid in gastrointestinal tract absorbs water and swell. This swelling property of husk is mainly because of mucilaginous matter present in it. The mucilage consists of a mixture of cellulose (18.3%) and uronic acid containing polysaccharides. Thus in presence of water, the polyuronide chains containing ionisable carboxyl groups become hydrated and swell and the cellulose micelles become dispersed. The gel consists of a network of hydrated cellulose micelles, interspersed with more heavily hydrated uronide chains. The extent of dispersion ultimately depends upon the size of the cellulose micelle, the chain length and the proportion of hydrated polyuronides. Because of their high water content and rubbery nature, they resemble natural living tissues more than any other class of synthetic materials.

Garden cress leaves have following composition⁴: Water, 82.3; protein, 5.8; fat, 1.0; carbohydrate 8.7; mineral matter, 2.2; calcium, 0.36; and phosphorous 0.11 %; trace elements: iron (28.6 mg/100 g), nickel (40 µg/kg), cobalt (12 µg/kg), iodine (110 µg/kg); vitamins (in cooked leaves): vitamin A, 3.300IU; thiamin, 70 µg; riboflavin, 0.15 mg; niacin, 0.08 mg; and ascorbic acid, 39 mg/100g^(Ref. 4). The major secondary compounds of this plant are glucosinolates. It yields on steam distillation 0.115% of a colorless volatile oil (cress oil) with a characteristic pungent odour containing variable proportions of benzyl isothiocyanate and benzyl cyanide. The former is a hydrolytic product of the glucoside glucotropaeolin and is released by the action of myosin, which is normally present in plant, when the communicated material is subjected to steam distillation; the latter, benzyl cyanide is formed by the action of hot steam on the plant material and is the predominant constituent of the volatile oil when steam distillation is affected with prior combination of the material. The volatile products of crushed leaves show antibacterial activity against *Bacillus subtilis* and *Micrococcus pyrogenes* var. *aureus*; their activity against *Escherichia coli* is less pronounced⁴.

Analysis of cress seed yields the following nutrient and phytochemical values: Moisture, 5.69; protein, 23.5; fat, 15.91; ash, 5.7; phosphorous (P₂O₃), 1.65; calcium, 0.31 and sulphur 0.9%. The seeds contain alkaloid (0.19%), glucotropaeolin, sinapin (choline ester of sinapic acid), sinapic acid (4 hydroxy-3:5-dimethoxycinnamic acid, C₁₁H₁₂O₅, m. p. 192°C), mucilaginous matter (5%) and uric acid (0.108 g/kg). On steam distillation, they yield a volatile oil similar to that from the herb. The oil has pronounced estrogen activity; tests on immature rats receiving 3-4 drops of the oil with their diet consistently show better development and higher weights of the ovaries than control animals and exhibited several hemorrhagic follicles in the ovaries⁴. The seeds yield up to 25.5% of yellowish brown, semidrying oil with a peculiar disagreeable odour, used for burning and soap making. The oil has the following characteristics: sp. gr., 0.909; n 1.4695; acid val, 0.95, sapon val, 185.0; iodine val (Wijs), 131.4; acetyl val, 5.8; Reichert Miessel. val, 1.14; polenske val, 0.69; Hehner val, 93.8 and unsapon. matter, 1.8%. The percentage of saturated and unsaturated fatty acids in the oil is as follows: palmitic 1.27; stearic 6.01; arachidic, 1.54; behenic, 1.73; lignoceric, 0.2; oleic, 61.25 and

linoleic, 28.0. The unsaponifiable matter contains β-sitosterol and α-tocopherol (1830 µg/g oil). The oil possesses antioxidant properties; the optimum establishing concentration, when used as an additive for linseed oil is 10%. The seed mucilage, known as cress seed mucilage is used as a substitute for tragacanth and gum arabic. It allays the irritation of the mucous membrane of intestine in dysentery and diarrhoea. The mucilage consists of a mixture of cellulose (18.3%) and uronic acid containing polysaccharides whose acid hydrolysis yields L-arabinose, D-galactose, L-rhamnose, D-galacturonic acid and D-glucose⁴. The seed resemble some of the oil seeds morphologically with the dicotyledonous endosperm accounting to 80-85% of the seed matter, whereas the seed coat and the embryo account for 12-17% and 2-3% of the seeds, respectively. While the seed coat is of brick red to cream colour, the endosperm has yellow colour. Despite its great medicinal value, *L. sativum* has not received the attention it deserves⁶⁻⁸. Seven imidazole alkaloids, lepidine B, C, D, E and F (dimeric) and two new monomeric alkaloids semilipidene side A and B were found in seeds⁹. From the methanolic extract of defatted seeds, sinapic acid and sinapin were isolated¹⁰. The ethanolic extract revealed the presence of an array of active constituents including alkaloids, tannins, flavonoids, steroids and sugars¹¹. Presence of carotene has been reported in the leaves¹¹.

The main volatile constituents of the seeds are phenylacetone nitrile (52.9%), benzyl isothiocyanate (26.2%) and 1, 8-cincole (12.3%), while those of roots and non-flowering aerial parts were benzyl isothiocyanate (65.0% and 24.5%), α-pinene (11.8 and 13.9%) and hexadecanoic acid (9.1% and 18.0%), respectively. Total lipid content of *L. sativum* is 13.8 on dry weight basis. Neutral lipid content was found to be predominant (86.7%), while the glycolipids, (7.7%) and phospholipids (5.8%) were present in lower quantities. Glycolipids consisted of monogalactosyl diglyceride digalactosyldiglyceride, acylated steryl galactoside and steryl galactoside, while the phospholipids comprised of phosphatidyl choline, phosphatidylethanolamine, phosphatidylinositol (26.0%, candiolin) and phosphatidylglycerol (4.00%). Lysophosphatidylethanolamine (29.7%) and lysophosphatidylcholine (33.5%) are reported in small amount on dry weight basis.

The seeds contain alkaloids, cyanogenic glycosides (traces), flavonoids, tannins, glucosinolates, sterols

and triterpens. The flavonoid groups of compounds have been observed to possess anti-inflammatory activity¹². It has also been reported to treat migraine¹³. The plant contains glucosinolate and glucotropaeolin¹⁴. The plant is eaten and seed oils are used in treating dysentery and diarrhoea.

Four glucosinolate, glucotropaeolin, gluconain, gluconasturtin and glucobrassicinapin along with three new phytoconstituents-lepidiumsestenterenol, lepidiumterpenoid and lepidiumterpenylester¹⁵ were isolated from *L. sativum*. In addition, 4-methoxy glucobrassicin was isolated from the seeds of the plant. Previous studies on flavonoids of the aerial parts of *Lepidium* species showed a characteristic predominance of quercetin and kaemferol glycosides, although other glycosides of isorhamnetin were also present. Whereas coumarins (umbelliferone and herniarin) have been isolated from *L. ruderale* Linn. In general the presence of same alkaloid in *L. sativum* has also been reported. *L. sativum* is one of the most common plant species of genus *Lepidium* which is grown in Egypt for its important uses in the folk medicine for diabetes and antibacterial properties reported due to the presence of benzyl isothiocyanate.

Garden cress has been considered as an important medicinal plant since the Vedic era. In Ayurveda, it is described as hot, bitter, galactagogue and aphrodisiac and claimed to destroy *Vata* (air) and *Kapha* (phlegm). In Unani system of medicine, seeds and leaves of this plant have been reported to possess diuretics, aperient and aphrodisiac properties and are recommended in inflammation, bronchitis, rheumatism and muscular pain. It is also reported to be useful in the treatment of asthma, cough and bleeding piles¹⁶. The plant possesses anti-haemagglutinating, hypoglycemic, antihypertensive, fracture healing properties and significant bronchodilatory activities¹⁷⁻²⁰. *L. sativum* seeds are used in the management of diabetes mellitus with an average citation of 64 among 500 interviewed persons²¹. By administrating 15 g seeds per day the antidiabetic activity of *L. sativum* were tested on NIDDM as well as normal healthy subjects. In the treatment regimen spanning 21 days, hypoglycaemic activity was reported²². Studies have also demonstrated the protective effect of *L. sativum* against carcinogenic compounds²³. Growth inhibition of *Pseudomonas aeruginosa*, a bacteria strain with a potent antibiotic resistance has also been reported²⁴. Garden cress seed powder is also useful in improving

various parameters of pulmonary functions in asthmatic subjects with a treatment of 1 g, thrice a day orally²⁵. People are also accustomed to making comfits with cress seeds which are useful for expelling worm in old and young alike, for opening the mesenteric veins, for preventing apoplexy, for purifying blood and for expelling mucous and sand from the kidneys. Seeds are also used to keep hair strong and firm. For those, who have lost the ability to speak due to apoplexy are advised to chew seed often. Cardio stimulant action was also observed. Garden cress seeds are thermogenic, depurative, galactagogue, emmenagogue and aphrodisiac. They act as a tonic against diarrhoea, dyspepsia, eye disease, leucorrhoea, scurvy, asthma, cough, cold and seminal weakness. The seeds also possess significant anti-inflammatory, antipyretic, analgesic and coagulant activities²⁶. As per traditional wisdom, garden cress can help as a healer if, one part of seeds added to twenty parts of boiling water or ten parts of cold water and consumed orally for dysentery, diarrhoea and skin disease caused by impurity of blood. Powder of garden cress seed with sugar can also be used to cure diarrhoea, indigestion and dysentery¹⁶. Seeds are recommended for the dispersion of chronic enlargement of spleen. In Sikkim and West Bengal, the plant is used by the aboriginals in the treatment of asthma, bronchitis, dysentery, pain, pneumonia and stomachache.

The antihypertensive and diuretic effects of the aqueous extract of *L. sativum* were studied both in normotensive and spontaneously hypertensive. Daily oral administration of the aqueous extract (20 mg/kg for 3 weeks) exhibited a significant decrease in blood pressure in spontaneously hypertensive rats while in normotensive rats no significant change was noted, during the period of treatment¹⁸. The plant is also useful in reducing blood glucose level as depicted by a study which showed that at a dose of 10 mg/kg/h reduced blood glucose levels both in normal and diabetic rats ($P < 0.001$)²⁷. In India, the plant is regarded as a cure for asthma, dysentery, bleeding piles and menstrual disorders. The seeds have been reported to be a remedy of uterine tumors, nasal polyps and breast cancer. A recent survey of different regions of Saudi Arabia showed that the seeds are commonly used as febrifuge, antirheumatic and diuretic and are also used in menstrual and abdominal discomfort. They are also used to enhance sexual desire²⁸. In China and other far eastern countries, the

seeds are used for the treatment of abdominal colic, sexual debility, asthma, pleurisy and dropsy. It is considered as one of the better medicinal plants in various African countries, where the seeds are chewed to cure throat disease, asthma and headache and are useful for diuresis and rapid bone fracture healing. The seed extract is also reported to be hepatoprotective. It protects the liver from damage by toxic agents like carbon tetra chloride (CCl₄). The mechanism of the hepatoprotective action of the plant is uncertain but may be related to the ability of the plant to inhibit lipid peroxidation in the liver. The CCl₄ induced hepatotoxicity produced in rats leading to hepatic injury triggers the generation of toxic radicals which can be masked by using a correct antioxidant in adequate amount²⁹. The presence of flavonoids, triterpens, alkaloid, tannin and coumarins explains its role in hepatoprotection by inhibiting the free radicals mediated damage³⁰. Flavonoids, triterpens and tannins are antioxidant agent and may interfere with free radical formation^{31,32}.

Cress seeds are aperient, stimulant, tonic, demulcent, aphrodisiac, carminative, galactagogue, emmenagogue, a stimulant of bile function, and a cough reliever. The seeds are rubefacient and are applied as a poultice for hurts and sprains. The plant also shows teratogenic effect and antioviulatory properties³³. A tea spoon full of garden cress seeds boiled in 6 ounces of water for ½ hour and the decoction with a table spoonful of honey is given as an effective medicine to increase breast milk and sexual disorders. Likewise, juice of the seed is also valued as medicine; 1 teaspoon obtained by grinding with 1 ounce of water mixed with a glassful of tender coconut water given as a folk medicine to cure diarrhoea, dysentery, bleeding piles, scanty urination due to liver disorders and irritation of the intestinal mucous membranes. Seeds roasted in ghee and mixed with sugar are given as a tonic for general weakness in young girls and after child birth to increase breast milk. The oil extracted from seeds roasted in *til* oil is used as analgesic medicated oil in gout, rheumatism, glandular swelling, etc. It should be noted that this oil is counter irritant and therefore, care must be taken to use a little at a time³⁴.

Conclusion

L. sativum, known as garden cress or chandrashoor is a native plant of south west Asia which spread to Western Europe many centuries ago. The plant has been well known in India since vedic age and

cultivated as salad throughout the country. It can be harvested throughout the year whether grown indoor or outdoor and is cut when the sprouts are 5-10 cm long. It contains significant amount of protein, fat, calcium, iron, folic acid, vitamin A and C. Human quest for relieving the masses from low nutritional status and for providing refreshment through non-conventional and unexplored food stuff, some food products have been developed incorporating garden cress. Recipes like *garden cress soup la orange*, *citrus khus cooler* and *falooda* are the combinations of such ingredients which refresh people along with supporting their nutritional status. Garden cress has potential, both as a foodstuff and nutraceutical in plant as well as seed forms. It was widely used in many parts of the world in ancient time. It is high time, we reinvent and utilize its quality both as nutrient and medicinal stuff by developing both food products and curative agents. Garden cress has been known to be effective against a plethora of diseases ranging from diabetes mellitus, hypertension, kidney stones, inflammation, bronchitis, rheumatism and muscular pain. Being a member of Brassica family it also has a good anticancer potential. Its seeds are known to increase breast milk and are used as galactagogue. From all available accounts, *L. sativum* appears worthy of further scientific exploration and application as a nutritional and therapeutic agent.

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