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Nutritional importance of *Lepidium sativum* L. (Garden cress/ Chandrashoor): A Review

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ABSTRACT

Lepidium sativum (Garden cress) belonging to Cruciferae family, widely grown in India, Europe and US. It has been considered as an important medicinal plant since the Vedic era. Garden-cress seeds are used as a medicine in Ayurvedic System of Medicine. *Lepidium sativum* description is available in the Ayurvedic classical text with the name as Chandrasoora, Chandrika, Vasapushpa, and the seeds, known as hurf or halim in local language in India. In Ayurvedic Medicine prescribed to prevent postnatal complications. Also, it has health promoting properties which can be used as a functional food. It is also useful in the treatment of dysentery, pain in the abdomen, blood and skin disorders, injuries, tumors, and eye diseases. Garden cress may stimulate the production of breast milk and prevent postnatal complication. Garden cress seeds are bitter. A Galactagogue is a substance that promotes lactation in humans and other animals. The effects of the germinating seeds were studied to determine the potential for slowing down the hydrolysis of starch to glucose in diabetic persons. Garden cress is genetically related to watercress and mustard, sharing their peppery, tangy flavor and aroma.

Keywords: Garden cress (*Lepidium sativum*), Galactagogue, Medicinal Plant, Nutritional Importance.

INTRODUCTION

Importance of herbal medicines

In spite of the great advances of modern scientific medicine, traditional medicine is still the primary form of treating diseases of majority of people in developing countries, including India; even among those people using one form or another of complementary or alternative medicine is rapidly

increasing worldwide. Increasing knowledge of metabolic processes and the effect of medicinal plants. According to the World Bank in 1997, (technical paper number 335), it is apparent that the significance of plant based medicines has been increasing all over the world. Nearly 50 % of medicines in the market is made of natural basic materials. Remarkably, the market demands for

medicinal herbs are likely to remain high because many of the active ingredients in medicinal plants cannot yet be prepared synthetically. *Lepidium sativum* Linn. an annual herb, growing as a weed in and around cultivated fields throughout India commonly known in Sanskrit as ‘Chandrashoor’ in various Ayurvedic texts of medieval India .It is highly reputed for various therapeutic properties and is prescribed in cases of hiccough, diarrhea and also used as a tonic. The most reputed formulations which are commercially available is “Chaturbeeja”; which claims to possess a number of therapeutic properties including anti-inflammatory and analgesic activities. The most common Sanskrit name, although not the earliest, as we shall see, is candrasura, which may well be a sanskritization of the vernacular name cansur. The first text

describing it as candrasura is the Bhavaprakasanighantu (haritakyadivarga 96 – 97). The same text mentions it as one of the four ingredients of a compound substance called caturbija (haritakyadivarga 98 – 99), which indicates that especially the seeds were esteemed for their medicinal properties. The total phenolic compounds, which are known to be one of the most important groups of natural antioxidants that accumulate in minimally processed vegetable tissues, are responsible for a high antioxidant capacity. Seeds of *L. sativum* are claimed to possess varied medicinal properties like galactagogue, aperient, diuretic, alterative, tonic, demulcent, aphrodisiac, carminative and emmenagogue. Seeds were largely used for the treatment of hypertension and renal diseases.

Plant description

Botanical name:	<i>Lepidium sativum</i> L.
Family	Brassicaceae=Cruciferae
Common names	English: cress, common cress, garden cress, land cress, pepper cress; Spanish: mastuerzo, mastuerzo hortense, lepidio, berro de jardín (Spain), berro de sierra, berro hortense (Argentina), escobilla (Costa Rica); Catalan: morritort, morrisà, Portuguese and Galician: masturco, mastruco, agrião-mouro, herba do esforço.

Garden cress in agriculture

Cress sprouts are a touch of green that can be grown in our own flat at any time of the year. It is worth remembering, though, that garden cress is not only about sprouts. Garden cress leaves are just as delicious, so it's worth the thought of growing it in your garden. This annual plant can reach a height of 60 cm (~24 inches), with many branches on the upper part. The white to pinkish flowers are only 2 mm (1/12 of an inch) across, clustered in branched racemes. It is referred to as ‘Aliv’ in Marathi and ‘Halim’ in Hindi. The leaves, roots, as well as the seeds of this plant are used in cooking as they are extremely nutritious and also therapeutic in nature. The flowers of this plant are either white or light-pink in color. Garden cress is

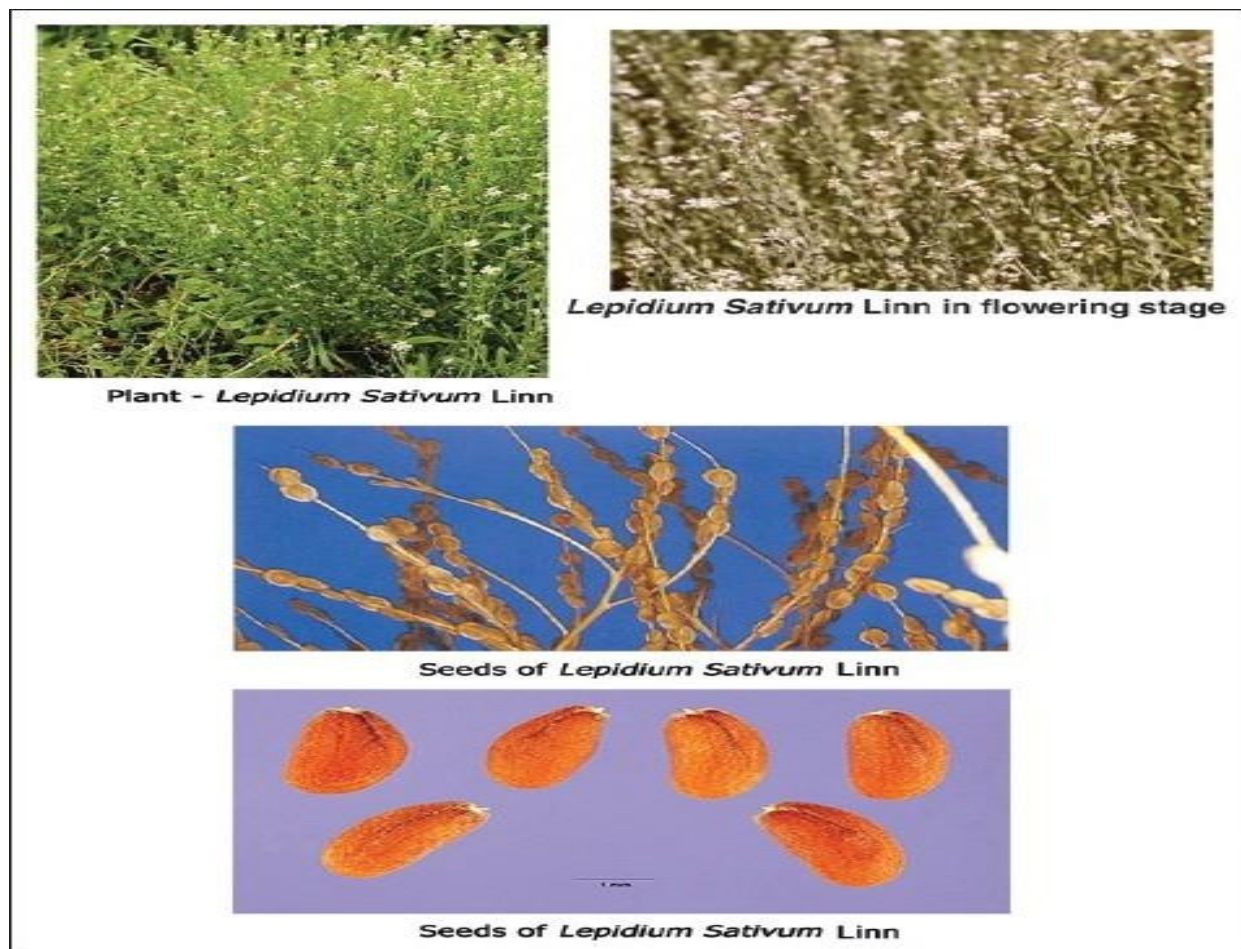
commercially grown in England, France, the Netherlands and Scandinavia. Cultivation of garden cress is practical on both mass scales and on the individual scale. Garden cress is suitable for hydroponic cultivation and thrives in slightly alkaline water. In many local markets, the demand for hydroponically grown cress can exceed the available supply, partially because cress leaves are not suitable for distribution in dried form, so can be only partially preserved. Consumers commonly acquire cress as seeds or (in Europe) from markets as boxes of young live shoots. Edible shoots are typically harvested in one to two weeks after planting, when they are 5–13 cm (2 - 5 inches) tall.

Effect on Doshas

Chandrashoor pacifies the Vata and Kapha Doshas; so it is very useful in diseases of Vata-Kapha origin.

Rasa	Guna	Virya	Vipaka
Katu, Tikta	Laghu, Snigdha, Pichchila	Ushna	Katu

Images of garden cress



In recent years, human diet makes such a way that it acts as a medicinal food so that the increased diversity of disease can be decreased. Garden cress (*Lepidium sativum*) is an annually growing herbaceous, which is known to possess various medicinal properties. It can be grown easily throughout the year with pest resisting properties. Generally, garden cress is taken as cooking material and salad. From a human health perspective, isothiocyanates are quite important because they are major inducers of carcinogen-detoxifying enzymes the most potent inducers are

benzyl isothiocyanate (BITC) present in garden cress (*Lepidium sativum* L.). GC seeds have been used in traditional medicine since ancient times in India (Mali et al 2007). The seeds are aperients, diuretic, tonic, demulcent, aphrodisiac, rubefacient, carminative, galactagogue and emmenagogue (Nadkarni, 1954). It is supplemented in the diet of lactating women to increase the milk secretion during the postnatal period (Sahsrabudde & De, 1943) and recommended for diarrhea and dysentery (Kirtikar & Basu, 1981). The leaves of this plant are diuretic and gently stimulant. The seeds are

aperient, diuretic, tonic, demulcent, aphrodisiac, carminative, Galactagogue and emmenagogue. The effectiveness of this plant in the treatment of bronchial asthma, hiccups, cough with expectoration and bleeding piles has been reported. Seeds of *L. sativum* are prescribed by many Ayurvedic practitioners in bronchial asthmatic patients. Garden cress oil has a balanced amount of polyunsaturated fatty acids (PUFA) (46.8%) and monounsaturated fatty acids (MUFA (37.6%) and also contains natural antioxidants viz., tocopherols and carotenoids which protect the oil from rancidity. It was also reported cress seeds contain 22.5% protein, 27.5% fat, 30% dietary fiber, and 1193 mg/100 g potassium. Hence, it was assumed that these seeds can be used as a functional food. Moreover, Moser et al. found that the oil content of dried cress seeds was 22.7% and the primary fatty acids found in cress oil were oleic (30.6%) and linolenic acids (29.3%). Cress oil contained high concentrations of γ - (1422 ppm) and (356 ppm) tocopherols. However, Gokavi et al. reported that the primary fatty acids found in cress oil were oleic (C18:1; 30.6%), linolenic (C18:3; 29.3%), palmitic (C16:0; 9.4%), linoleic (C18:2; 7.6%), erucic (C22:1; 3.0%), stearic (C18:0; 2.8%), and arachidic (C20:0; 2.3%) acids among the minor fatty acids found in cress oil. Hence, its seed oil and powder contain significant amounts of protein, fat, minerals, fibers, phytochemicals which are incorporated into many functional beverages and foods. Fruit and vegetable juices are a rich source

of vitamin and minerals, but lacks the high amount of protein and fat. For the compensation of these components, garden cress extracts or powder can be added. As garden cress acts as a thickening agent, the combination of both juices and extract may lead to the formation of health promoting beverages having great sensory attributes and nutritional properties. Mymen singh in 2012 developed a beverage by combining lime juice and saccharin, honey and garlic for the compensation of proteins and fat. Similarly, Mohite et al. in 2012 designed a health drink by combining cress seed powder with skim milk powder.

Nutrient profile: Garden cress (*Lepidium sativum* L.)

Garden cress is an important source of iron, folic acid, calcium, vitamins C, E and A. The seed contains arachidic and linoleic fatty acids. The seeds are high in calories and protein, whereas the leaves are an excellent source of vitamin A, C and folate.1 Serving of Raw Garden Cress contains 32 calories and has 2.6 milligrams of protein, 4.4 milligrams of sugar, 0.7 milligrams of fat, 1.1 milligrams of fiber and 0 milligrams of cholesterol. Raw Garden Cress contains the following vitamins and minerals: Vitamin A, Vitamin B1, Vitamin B2, Vitamin B3, Vitamin B5, Vitamin B6, Vitamin C, Calcium, Magnesium, Potassium, Zinc, Iron, Phosphorus, Manganese, Selenium, Copper and Sodium.

Physicochemical Properties of Garden Cress (*Lepidium sativum* L.) Seed

Parameter	<i>Lepidium sativum</i>
Color	Dirty Yellow
Refractive index	1.47
Specific gravity	0.82
Unsaponifiable matter	0.57
Acid value	1.04
Saponification value	179.03

[Diwakar, B. T. and Pinto Kumar, in 2010]

Chemical composition of garden cress (*Lepidium sativum*) seeds and its fractions and use of bran as a functional ingredient

Proximate chemical composition of seeds (%)

Nutritional compounds	% amounts
Moisture	2.88 \pm 0.1

Crude fat	23.19 \pm 0.2
Crude protein	24.19 \pm 0.5
Crude fiber	11.9 \pm 0.4
Ash	7.1 \pm 0.1
Total carbohydrate	30.74 \pm 1.2

Table. 2 Percentage composition of amino acids in seeds

Amino acid	Percentage
Isoleucine	4.19
Leucine	7.03
Lysine	5.98
Methionine	0.51
Phenylalanine	5.39
Threonine	3.76
Tryptophan	0.92
Valine	6.21
Arginine	3.44
Histidine	3.87
Alanine	4.59
Aspartic acid	12.07
Cystine	0.21
Glutamic acid	24.29
Glycine	5.08
Proline	4.63
Serine	4.18
Tyrosine	2.88

Table 3 Mineral content in Garden cress seeds

Minerals	mg/100 g
Calcium	266.35
Copper	5.73
Iron	8.31
Magnesium	339.23
Manganese	2.00
Phosphorus	608.63
Potassium	1236.51
Sodium	19. 65
Zinc	6.99

[Source Gokavi SS, et al. in 2004]

Studies on Pharmacological activity of *Lepidium sativum*

S.No.	Studies	Short Discription
1	Anti-inflammatory effect of <i>Lepidium sativum</i>:	Leaves and seeds extracts were found to have anti-inflammatory effect. To reduce inflammation and rheumatic pain. (S. Wadhwa1;et al. in 2012)

2	Bone fracture healing effect of <i>Lepidium sativum</i>:	According to the authors of several articles on this aspect, clinical observations were supportive for this use. Among the studies, which aimed to investigate the validity of the plant for this use.(G.L.Viswanatha :et al in 2014)
3	Hepato-protective effect of <i>Lepidium sativum</i>	<i>Lepidium sativum</i> seed extracts has proved hepato-protective effects against CCl ₄ induced liver damage. induce antioxidant effect and a decrease in free radical formation from CCl ₄ , which is the main trigger of hepatotoxicity (S. Wadhwa;et al in 2011
3	Antihypertensive effect of <i>Lepidium sativum</i>:	Rats with normotensive (WKY) and spontaneously hypertensive (SHR) were used to study the antihypertensive and diuretic effects of aqueous extract of <i>Lepidium sativum</i> . (Maghrani M ; et al in 2005)
4	Antimicrobial activity of <i>Lepidium sativum</i>:	The antimicrobial activity to <i>Lepidium sativum</i> was tested by using The Agar well diffusion method. The plant extract is prepared using petroleum ether solvent. Bacterial suspension of (Staphylococcus aureus, Escherichia coli, etc; After incubating the plate under the appropriate condition, Growth inhibition observed. (Shama I.;et al in 2011) us extract of Lep
5	Anti-diabetic effect of <i>Lepidium sativum</i>	Studies has proved a hypoglycemic effect independent to insulin secretion(Prakash Om;et al in 2015)
6	Chemoprotective effects of <i>Lepidium sativum</i>	<i>Lepidium sativum</i> was also investigated for its chemoprotective properties toward 2- amino-3-methyl imidazo quinolin (IQ)- genotoxic effects and in colonic periplastic lesion reduction. (Fekadu Kassie ;et al in 2002)
7	<i>Lepidium sativum</i> use in treating bronchial asthma	A clinical experiment was done on either sex patients, in range of 15-80 years old, with mild to moderate asthma with no previous medication. (Paranjape AN; et al in 2006)
9	<i>Lepidium sativum</i> effects on milk production and composition	In one of the studies that was carried to evaluate <i>Lepidium sativum</i> effect on milk , the dried plant extract (DPE) of and brassica juncae seeds were incorporated in the drinking water of Awassi ewes. DPE effects on chemical composition, nutritional properties and yield of their milk were analysed. As a result, <i>Lepidium sativum</i> and brassica juncae improved the quality of Awassi ewis milk through enhancing milk composition. (M. Alkharfyc ;et al in 2011.)
10	Laxative effect of <i>Lepidium sativum</i>	Garden cress seed contains a mucilaginous matter which consist of a mixture of cellulose (18.3%) and uronic acid containing polysaccharides which in the presence of water in the GI tract swell. The size of the cellulose micelles chain length and theproportion of hydrated polyuronides all determine the extent of mucilaginous matter dispersion. (M. Alkharfyc ;et al in 2011.)

HEALTH BENEFITS OF GARDEN CRESS SEEDS

For women's Health

Emenagogue

Garden cress has mild oestrogenic properties. It helps to regulate the menstrual cycle.

Galactagogue

Kheer made of garden cress seeds increases milk production and secretion in lactating mothers. Because of its high iron and protein content, it is often given post-partum to lactating mothers. (Pattnaik, 2003)

For anemia

Garden cress seeds are the richest source of non-heme iron [iron found in hemoglobin, which is an easily absorbed dietary iron.] Help to increase the hemoglobin levels. When taken regularly, it helps to alleviate anaemia. (Adam SE) It is advisable to have vitamin C half an hour after consumption of these seeds as it enhances iron absorption. (Zanvar 2007)

Galactagogue: (An agent that induces milk secretion)

According to Ayurvedic medicine, garden cress displays the following properties: hot, bitter, tonic, and aphrodisiac. It is also useful in the treatment of dysentery, pain in the abdomen, blood and skin disorders, injuries, tumors, and eye diseases. Garden cress may stimulate the production of breast milk and prevent postnatal complication. A Galactagogue (from Greek = milk + leading) is a substance that promotes lactation in humans and other animals. It may be synthetic, plant-derived, or endogenous. Garden cress seeds are bitter, Galactagogue, and diuretic.

Lactation inducing remedies are commonly used by the nursing mothers to meet the nutritional requirement of their children. Some of the Galactagogue are plants that are found commonly growing in the wild while others are cultivated plants, however easily available. There are lactation herbs and medications that are used to increase lactation or stimulate milk production in a lactating mother. It is mostly used for increasing breast milk supply, but is sometimes used to induce lactation by those mothers who want to breastfeed their adopted babies. Herbal galactagogues are medicinal plants that are used to augment milk production in animals as well as nursing mothers. Several herbal galactagogues have galactogenic effect. It is rich in trace minerals and vitamins, the dried aerial parts of which are used as a lactogenic agent. It stimulates prolactin production and is used by nursing mothers to increase milk supply. Garden cress given to because of its high iron and protein content, it is often given post-partum to lactating mothers.

The leaves are used to increase milk supply and also believed to moderate estrogen levels. These herbal galactagogues need the tissue reactions. Several indigenous herbs possesses galactogenic

properties and can safely be used to enhance milk production. These herbal agents have been tested in human medicine and also have proven Ayurvedic strategies (Pattnaik, 2003). They are believed to exert action through the adrenal-hypothalamo-hypophyseal-gonadal axis. Though the exact pharmacodynamics of mammogenic effects of these plants have not been authenticated, these have been used for long in human medicine. After the bitter experience of antibiotic and chemotherapeutic agents by the scientists worldwide, now it is the turn of Ayurveda again to restore tissue functions in a natural way within the microenvironment of body physiology. There are many plants available with galactogenic and progenic properties. Yet others are mammogenic to tune the productive performance and have trophic effects. In this context, it is essential that these plants with galactogenic properties need identification and subsequent pharmacological characterization for a better understanding of their use in veterinary medicine in general and in ruminant lactation physiology in particular. Galactagogues are reported to potentiate or maintain milk production. Most of them exert their pharmacological effects through interactions with dopamine receptors, resulting in increased prolactin levels and thereby augmenting milk production. Metaclopramide, domperidone, chlorpromazine, Bovine Somatotropin (BST), thyrotrophic releasing hormone and oxytocin have got the galactogenic activities. All these chemical compounds are commonly used as galactagogues by the goal as to increase milk yield. They might induce adverse effects on the neuroendocrine axis of lactation physiology. They may also bring about changes in the biochemical reaction of animal tissues. In our country, many participants of a case study was seen to enhance the flow of milk (Riordan and Auerbach, 1998). It is used along with fennel by wet nurses in the Southern United States (Duke, 1997). There are also reports of fenugreek's use as a galactagogue in Sudan, Egypt and other parts of Northern Africa, Iraq and Argentina (Bingel and Farnsworth, 1991). Fenugreek is an important medicine in India's Ayurvedic tradition, where it is used to treat a variety of digestive and mucosal conditions (Passano, 1995; Escot, 1994/95). Because it is rich source of essential fatty acids (Mowrey, 1986).

Side-effects

It is an abortifacient (A substance that induces abortion), if had in excess. It contains goitrogens that prevent iodine absorption in the thyroids and hence can lead to hypothyroidism. If large quantities of garden cress are consumed, the mustard oil it contains may cause digestive difficulties in some people who are sensitive to it. Therefore, garden cress should be eaten in moderation Pregnant women should avoid taking Garden Cress in any form because it has the ability to induce uterine contractions and thereby trigger a spontaneous abortion. Also, since it is goitrogenic in nature, it may not be suitable for patients suffering from hypothyroidism. (Jamwal KS; et al in 1962). The oil derived from Garden Cress seeds is edible and can therefore be used as a cooking medium; however, some people may experience symptoms of indigestion due to its use. Such individuals should discontinue using this oil or mix it with some other edible oil, so as to dilute it and reduce its adverse effects. (<http://womens-nutrition.knoji.com/garden-cress-and-its-natural-health-benefits-for-women/>)

Justification, Conclusion and future aspects

Garden cress is known for as medication for skin ulcers; it disinfects the mouth and digestive system. Garden cress seeds are bitter, thermogenic, depurative, rubefacient, galactagogue, tonic, aphrodisiac, ophthalmic, antiscorbutic, antihistamines and diuretic. It should be included in the menu of pregnant women and children, as well as those suffering from physical exhaustion. Excessive consumption is not recommended, since it has strong diuretic properties. The plant Chandrashura is being used for the treatment of

Amavata, Sandhivata, and Katishula successfully. Here, an attempt is made to study on Garden cress because of its high iron and protein content, it is often given post-partum to lactating mothers. The leaves are used to increase milk supply and also believed to moderate estrogen levels.

The main objective of this paper to make emphasis on the nutritional properties of Garden Cress. The edible whole seed is known to have health promoting properties, hence; it was assumed that these seeds can serve as raw material for functional foods, sharing its peppery, tangy flavor and aroma. Since, it is rich in proteins, carbohydrates and certain essential minerals like calcium, iron and phosphorous along with crude dietary fibre . It will be used as a health drink with milk as its base. The present study shows that the seeds of Garden cress could be used as food supplement in the human diet as it contains a considerable amount of iron and calcium. Presence of high carbohydrates, macro and micro elements and antioxidant properties would increase its utilization. The very low anti nutritional factors in the tubers may not hamper its nutritional value. Garden cress seeds are evaluated in present study may be used to help the human body to reduce oxidative damage when the natural mechanism of antioxidant protection becomes unbalanced by factors such as ageing, deterioration of physiological functions may occur resulting in diseases like cancer, cirrhosis, various inflammatory diseases etc. and accelerating ageing of mixed or balanced diet may show rich nutritional as well as because of its high iron and protein content, it is often given post-partum to lactating mothers.

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