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Review Article

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# Health Benefits of Garden Cres Seeds

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A B S T R A C T

Lepidium sativum is one of the therapeutic plants which is broadly cultivated in Asia, Australia, Africa, Northern, Europe, and Southern America, also known as garden cress and halim seed. Garden cress seed contained carbohydrates (35 to 54%), fat (14 to 26%), protein (27%), and fiber (8%). Garden cress seed had a significant quantity of calcium, phosphorus, iron, folic acid, vitamins A and C. Garden cress seed is known to consume as a stimulant for immune system, in treatment of anemia and also possess antidiarrheal, antidiabetic, antihypertensive, diuretic, antioxidant, anti-carcinogenic, anti-hypercholesterolemia, anti-osteoporosis, antibacterial, antifungal, anti-inflammatory. It also involves in contraction of heart and limbs muscle, and accelerate fracture healing. Hence, consumption of garden cress seed not only fulfil nutritional needs of body but also effective in the treatment of many health conditions.

**Keywords:** Garden cress, Lepidium sativum, anti-diabetic, anti-inflammatory, anti-diarrheal

## Introduction

*sativum* is one of the therapeutic plants belong to Brassicaceae family also recognized as garden cress and halim seed. It is extensively cultivated in Asia, Europe, Australia, Africa, Northern, and Southern America.[1] Its seeds, leaves, roots and oils are used for many health benefits. Garden cress seed contain carbohydrates (35 to 54%), fat (14 to 26%), protein (27%), and fiber (lignans 8%). Carbohydrates of *Lepidium sativum* contain non-starch polysaccharides (90%), starch (10%), α-linolenic acid (32 to 35%), seeds oil (20 to 25%), and essential amino acid (47.08%) [2]. Natural antioxidants present in garden cress seeds helped in protection from rancidity in oil and oxidation. Garden cress seed contained a significant quantity of vitamins & minerals [3] in table I.

Moreover, phytochemicals components that seeds contain was alkaloids, flavonoids as well as saponins.[4,5] The high concentration of phytochemicals in *Lepidium Sativum* was responsible for its medicinal properties. The active compound found in seeds was non-di-benzylthiourea, sinapic acid ethyl ester, lepidine, lepidimoide, phenolic compounds, glycosides, flavonoids, steroids, mucillagenous substance, uric acid and non-dibenzylurea.[6] Now a days, due to great beneficial effects against several diseases medicinal studies had great attention on accurate identification and documentation of medicinal plants seem like indispensable days.[7] Studies prove that garden cress seeds are safe to consume in nutritional composition at 10% level as it did not cause toxic effects on analytical parameters or growth.[6,8] Due to high nutritive value *L. sativum* seeds is recognized as a functional food and people consume it in noodles [9], biscuits [10,11], health drinks, flakes, cereals [12,13], ladoo [14], snacks [15], instant 'dhokla' mix [16], and nutria cookies [17,18]. Due to flavorful taste and health benefit the leaf of *L. sativum* is used in salads [19]. Seeds contain mucilage which is used as pharmaceutical excipient. [20,21]

### Health benefits of Lepidium sativum

Garden cress seed also used as an immune system enhancer and cure anemia among other medical conditions [22]. Additionally, seeds had anti-diarrheal, anti-hypertensive, anti-diabetic, antioxidant, diuretic, anti-carcinogenic properties [23,24 25], anti-bacterial, cardio-protective [26], anti-hypercholesterolemia [27,28], anti-fungal, anti-osteoporotic and anti-inflammatory property [29]. Garden cress seed also have an ability to protect liver from toxicity and cancer [30]. Studies have too shown that *L.*

**Table I: Vitamin & mineral in Garden cress seeds.**

| Vitamins | Percentage % of daily value | Mineral | % DWB± SD |
|---|---|---|---|
| Vitamin A | 138 | Potassium (K) | 4.63±5.16 |
| Vitamin C | 115 | Calcium (Ca) | 1.16±1.26 |
| Vitamin D | 0 | Phosphorus (P) | 2.87±2.62 |
| Vitamin B-6 | 10 | Iron (Fe) | 0.04±0.02 |

*sativum* seed help in regulation of thyroid hormone levels, menstruation, and milk production during lactation. [31,32]

**Anti-spasmodic and anti-diarrheal property**

Studies proved that the methanolic extract of *L. sativum* seed reduced severity and frequency of diarrhea as it decreases the intestinal motility by increasing reabsorption of NaCl and water. Additionally, extract contains alkaloids, saponins, and flavonoids which inhibited autacoid and prostaglandin, thus this inhibits secretion and motility. A study proved in his research that *Lepidium sativum* shown antispasmodic property through an increase in intestinal smooth muscles and reduced diarrhea by inhibiting intestinal motility as shows in the table 2.[33] Phytochemical examination of the aqueous extract of *Lepidium sativum* had shown presence of bioactive types of flavonoids and alkaloids. These components may be playing a role in the antidiarrheal mechanism of *Lepidium sativum* extract. The seed extract seems similarly inhibited spontaneously rhythmic and agonist-induced ilium smooth muscle contractions of the mice strep and noticeably decrease the motility of the intestine. These effects may be contributed to the promoted antidiarrheal effect. The anti-microbial effect of the seed extract might be contributing to the anti-diarrheal activity of the seed extract during induced infectious diarrhea. [33]

**Table II :** Effect of Lepidium sativum extracts phaytosome & syrup dosage form on diarrhea incidence percentage of bacterial induced diarrhea in mice.

| Groups | Doses mg/Kg BW | Percent of diarrhea incidence | % inhibition |
|---|---|---|---|
| $I_{control}$ | 0 | 100 ± 00 | 0.0 |
| II | 50 | 85.7 ± 2.13 | 2.0449 |
| III | 100 | 69.4 ± 3.20 | 9.3636 |
| IV | 150 | 37.2 ± 1.13 | 39.4384 |
| V | 200 | 0.20 ± 1.98 | 99.6004 |
| VI | 250 | 0.18 ± 3.75 | 99.6403 |
| VII | 200 | 0.21 ± 2.87 | 99.5804 |

## Anti-diabetic property

Numerous arguments supported the hypoglycemic properties of L. sativum, which is utilized for treatment of diabetes in conventional medicine. By enhancing defense enzymes, which increased the body's antioxidant emergency response in diabetic mice, a study demonstrated that L. sativum considerably lower blood glucose levels and improve blood lipid metabolism.[34] Rich amounts of flavonoids present in the L. sativum extract increase insulin sensitivity, inflammation, pancreatic cell integrity, and dyslipidemia.[35] Researches reveal that garden cress seeds contain trace elements that have anti-diabetic properties.[36] Lepidine, semi-lepidine, and imidazole alkaloids found in L. sativum seeds also have an anti-diabetic effect by increasing the amount of insulin secreted by the surviving islet -cells in the pancreas. The research demonstrates that the aqueous L. sativum extract reduces blood sugar levels by inhibiting renal glucose absorption.[37,38] These tests demonstrated that L. sativum has a crucial function in hypoglycemic action.[39] Lepidium sativum's linolenic acids lower blood sugar levels. According to study, L. sativum oil contains linolenic acids (29.3 wt.%) and oleic acids (30.6 wt.%). There are significant amounts of tocopherols in LS seed oil. However, campesterol, sitosterol, and avenasterol are the main phyto-sterols found in L. sativum.[40] The L. sativum extract's potential to stimulate the remaining cells in the islets of Langerhans to generate extra insulin may also contribute to the glucose-lowering effect.[41] L. sativum flavonoids and glycosides stimulate pancreatic beta-cells, which release insulin and improve glucose metabolism as shown in figure 1.[42,43]

Garden cress seed physiologically promoted glucose absorption through inducing insulin receptor kinase activity and auto phosphorylation of insulin receptor which results in enhanced glycogen synthase activity. Thus, results indicated that seeds contained insulin-lowering characteristics. Significant reduction was observed using acquis garden cress seeds [44,45]. As per the researches, extract of garden cress seed contained benzyl iso-thiocyanate, which prevent the formation of a ketosamine and also had powerful glycation inhibition effect of garden cress seed extract on synthesis of HbA1c [44-46]. The antioxidant activity of garden cress was revealed to inhibit the process of glycation that stop the production of **N (6)-Carboxymethyllysine** (CML) and reduced HbA1c levels . [44-47]

## Anti-inflammatory property

Linolenic acid, 11-octadecenoic acid, 7,10-hexadecadienoic acid, behenic acid, and 7,10,13-hexadecatrienoic acid are all present in 300 g/mL of L. sativum seed oil, which has been shown to have anti-inflammatory properties. By modifying the inflammatory mediators nitric oxide and leukotriene B4, it has the ability to reduce inflammatory disorders.[29] A test using three different doses (50 mg/kg, 100 mg/kg, and 200 mg/kg) of methanolic *L. sativum* seed extract on rats. Out of these, *L. sativum* seed extract at a dose of 50 mg/kg demonstrated the strongest anti-inflammatory activity.[44] The high content of flavonoids in L. sativum crude extract, including luteolin, quercetin, kaempferol, naringenin, apigenin, and naringin, has been shown to have anti-inflammatory effects in experimental animals. Another study discovered that polyphenols and organosulfur compounds are what provide *L. sativum* crude extract its anti-inflammatory and antioxidant properties.[48] A study on the effects of carrageenan on paw edoema. The crude extract of *L. sativum,* which has strong anti-inflammatory characteristics and inhibits fibroblast proliferation as well as

connective tissue modulation, reduces the yeast-induced hyperpyrexia.[49] Coumarin, alkaloids, triterpenes, flavonoids, isoflavonoids, tannins, phenol, acetamide, butylated hydroxytoluene, -linolenic acid, -tocopherol, oleic acid, and hexadecanoic acid are all present in *L. sativum*, and they all have anti-inflammatory, immunomodulatory, and antioxidant activities. Because of this, *L. sativum* and its components can be utilized for treatment and prevention of inflammatory diseases and disorders linked to higher oxidative stress. As *L. sativum* seed oil has anti-inflammatory and free radical (DPPH) scavenging activities, an in-vitro investigation by Alqahtani et al. demonstrated, its concentration dependence. The results demonstrate that *L. sativum* seeds oil suppresses DPPH by up to 21% at 300 g/mL, 11% at 200 g/mL, and 7% at 100 g/mL concentrations.[29] In female wistar rats, Diwakar *et al.,* proved the end product of *L. sativum* seed oil containing rich amount of α-linolenic acid (2·5, 5·0, and 10%, w /w) by peritoneal macrophages. This analysis illustrates a modulatory influence of α-linolenic acid on the lipid composition, inflammatory mediator production and spleen lymphocyte proliferation. The *L. sativum* seed oil reduced inflammatory mediators such as nitric oxide and leukotriene B4 [50]. Reddy *et al.,* revealed in his study on wistar rats that *L. sativum* seed oil (10% w/w) improved ulcerative colitis which is induced by dextran sulfate sodium. Results proved that the rats which is treated by *L. sativum* seed oil have decreased level of inflammatory mediators including tumor necrosis factor-α, leukotriene B4, and interleukin-1β. Researchers concluded that *L. sativum* seed oil decrease inflammatory mediators, alleviate oxidative stress, and reduce colon damage in ulcerative colitis rats.[51] Summary of immunomodulatory and anti-inflammatory effect of *Lepidium sativum* is represented in Figure 1.

## Anti-osteoporotic & Fracture healing activity

*L. sativum* has been shown to improve serum calcium, tartrate-resistant acid phosphatase (TRAP), bone architecture, bone-specific alkaline phosphatase (b-ALP), phosphorus, and albumin in experimental mice with glucocorticoid-induced osteoporosis. A study on adult white rabbits with fractures revealed that *L. sativum* has the ability to cure fractures in the left femur's mid shaft.[53]

## Cardio-protective property

According to a study on cat heart preparation, *L. sativum* ethanolic extract causes a considerable increase in blood pressure as well as an increase in the frequency and force of auricular and ventricular motions in an open chest. A cardio-stimulant effect of *L. sativum* extract on isolated rabbit auricles has also been documented. According to the study, *L. sativum* extract administered intraperitoneal to mice by doses ranging to 1000 mg/kg had no toxic or behavioral side effects.[54,55]

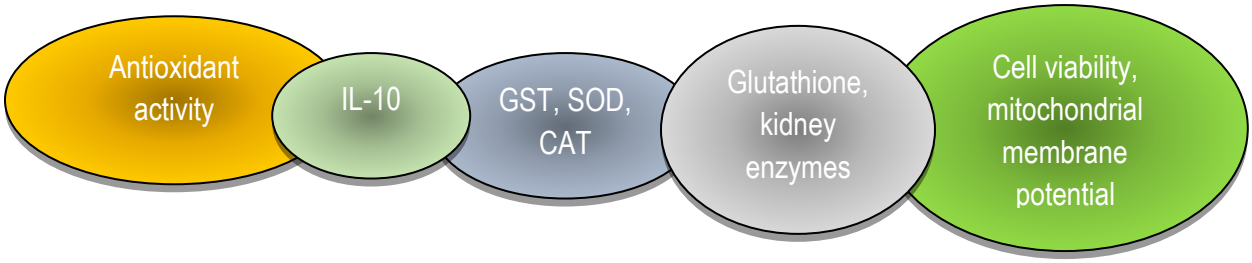
## Hepato-protective property

Since it is regarded as a functional food, *L. sativum* has been shown in numerous studies to have a variety of functions, including hepato-protective properties.[56] By lowering oxidative stress and cytotoxicity brought on by hydrogen peroxide in the human liver cell (HepG2), the *L. sativum* extract has been shown to exhibit hepato-protective action.[25] In an investigational research, the ethanolic extract of *L. sativum* remarkably reduced albumin and protein levels, oxidative stress indicators, and the mRNA expression of iNOS and HO-1. Additionally, it is found that *L. sativum* ethanolic extract simultaneously increases MPO activity and nuclear factor kappa-B (NFkB) DNA-binding impact.[34] *L. sativum* seed oil has hepato-protective properties by lowering bad cholesterol and enhancing liver enzyme activity. Abuelgasim et al. reported $CCl_4$ induced hepatotoxicity (increased the level of liver enzymes e.g. ALT, AST, and ALP) was reduced with methanolic extracts of LS seeds. The function of this extract has been attributed to the presence of coumarins, alkaloids, flavonoids, and tannins that inhibiting the free radicals. Phenolic compounds of LS seeds can improve the markers of lever. LS seeds may contained 3'-methylenedioxy-7-C-β-D-glucopyranosyl isoflavone (an isoflavone C-glycoside) 5'6-dimethoxy-2, that reduce lipid biomarkers in serum and also promote the proper function of liver in hepatotoxicity.[57-59]

## Regulation of menstrual cycle

The endocrinology of ovulation and the growth of visceral organs are affected by *L. sativum* seed eating in rat model. Results indicated that *L. sativum* supplementation could result

in an earlier, attenuated pre-ovulatory surge-like production of GnRH. In time. In all treatment groups, the pituitary gland's



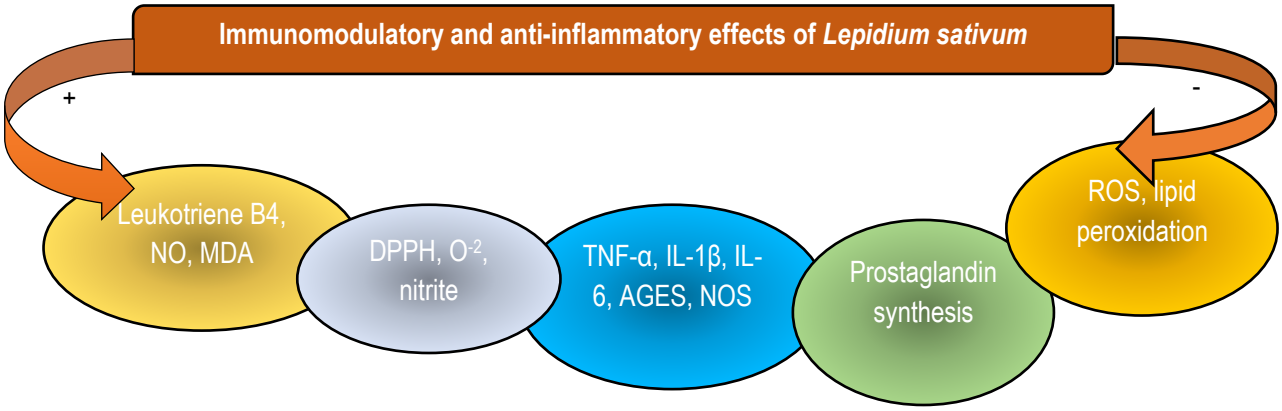



**Figure 1. Summary of immunomodulatory and anti-inflammatory effect of Lepidium sativum** [52]

output of luteinizing hormone (LH) temporarily fell as well. Follicle-stimulating hormone (FSH) typically reduced from time zero to around one-eighty minutes prior to *L. sativum* seed stabilization. *L. sativum* extract did not impact the ovariectomized, estrogen-primed, or progesterone-treated rats, but it dramatically increased average FSH output in the rats with ovariectomies and oestrogen priming.[60] As a supplement for healthy menstrual cycle management, *L. sativum* seeds had modest estrogenic properties. By increasing blood flow to the uterus and pelvic region, *L. sativum* seeds cause menstruation. Consumption of *L. sativum* boosted nursing women' milk secretion and output. Due to their high iron and protein content, *L. sativum* seeds are also utilized as a successful galactogogue in postpartum to encourage milk in nursing mothers. [57,58]

## Conclusion

The therapeutic benefits of Lepidium Sativum are caused by a higher concentration of phytochemicals. The seeds include active ingredients such as lepidine, lepidimoide, non-dibenzylthiourea, sinapic acid ethyl ester, alkaloids, glycosides, flavonoids, steroids, and non-dibenzylurea. Garden cress seeds have anti-diabetic, anti-hypertensive, diuretic, anti-carcinogenic, anti-high cholesterol, anti-bacterial, anti-fungal, anti-inflammatory and anti-osteoporotic result due to of its active components. Additionally, garden cress seeds may be able to treat liver damage and hepato-carcinoma. It has been determined that *lepidium sativum* seeds are useful in treatment of numerous ailments since they are rich in vitamins and phytochemicals.

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