



International Journal of  
**Medicinal Chemistry & Analysis**

[www.ijmca.com](http://www.ijmca.com)

e ISSN 2249 - 7587

Print ISSN 2249 - 7595

**EXPERIMENTAL STUDIES ON NUTRITIONAL AND MEDICINAL  
ROLE OF GARDEN CRESS SEED ON ANIMAL AND HUMAN  
BEING- A REVIEW**

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**ABSTRACT**

Garden cress (*Lepidium sativum* Linn) is a polymorphous species, considered to be originated primarily in Europe and Western Asia. The seeds are important as medicinal crops and are cultivated in Arabia, Albania, Tibet, Syria, Greece and India. Garden cress is fast growing edible plant. All the parts of garden cress, i.e., seeds, leaves and roots are of enormous economic importance, however, the crop is mainly cultivated for seeds. The seeds are good source of protein, fat, calcium, iron and phosphorous. The properties of the seeds are described as rubifacient, tonic, laxative, aphrodisiac, diuretic, mucopurulent and galactogogue. The seeds are also used in the treatment of diarrhoea, diabetes, high blood pressure, respiratory disturbances, rapid fracture healing, hypercholesterolemia and anaemia. The present comprehensive review work is specially focused on nutritional evaluation and medicinal properties of garden cress seeds for better application in various therapeutic research.

**Keywords:** *Lepidium sativum*, Galactogogue, Antianaemic, Antihypertensive.

**INTRODUCTION**

Garden cress seeds (*Lepidium sativum* Linn) do not belong to the group of common food stuffs but these are cultivated as a salad plant throughout India [1]. The seeds of the indigenous plant have essential medicinal, physiological and nutritional role [2].

**Medicinal Importance of the seeds**

The medicinal importance of garden cress seeds was known to Arab, Albania, Serbia, Greece, India etc. as rubifacient, galactogogue, emmenagogue, laxative, tonic, aphrodisiac and diuretic. They are used as poultices for hurts and sprains. The seeds have been used as rapid bone fracture healing [3,4]. The seeds are also used in the treatment of diarrhoea, respiratory disturbances, cough, bleeding piles and to enhance sexual desire [5]. The seeds on steam distillation yield a volatile oil which showed pronounced estrogenic activity in immature rats when it was given in the diet [6].

**Macroscopic structure of the seeds**

Garden cress seeds are small oval shaped, pointed and triangular at one end, smooth, about 2-3

mm long, 1-1.5 wide, slightly broader at base and notched at apex, dorsiventrally bulging, a furrow present on both surfaces extending up to two thirds downward, a slight wing like extension present on both the edges of seed, when mixed with water the seeds become swollen and slippery by absorbing water and after boiling they form a gel like substance which has strong adhesive properties. A narrow, longitudinal shallow groove runs from the apex up to 1/3<sup>rd</sup> to 1/2 portions of the seed on both the surfaces. Hilum is a whitish protruding spot in the notch at the apex and micropyle lies adjacent to it. The colour is reddish brown, taste bitter, oily and a pungent odour is produced on crushing characteristic [7-9].

**Chemical analysis of the seeds**

The seeds contain alkaloids (Sinapine, Choline ester of Sinapic acid) - 0.19%, Glucoside (glucotropaeolin) - 5%, Mucilage matter - 0.8% Cellulose - 18.3%, Yellowish oil - 25.3g (Palmitic, stearic, Arachidonic, Oleic and Linoleic acid).

Diwakar & co- workers have shown that the seeds contain 25.5% yellowish oil with Palmitic acid–1.27%, Stearic acid– 6.01%, Arachidonic acid–1.54%, Behenic –1.73%, Lingoceric–0.20%, Oleic-61.25% Linoleic–28% [10].

#### Chemical constituents of the seeds

Garden cress seeds mainly contain alkaloids such as lepidine, glucotropaeolin, N, N'-dibenzyl urea, N, N'-dibenzylthiourea, sinapic acid and Sinapin i.e. choline ester of sinapic acid [11]. Isolation and fractionation of the glucosinolate content of *L. Sativum* seed revealed the isolation and identification of glucotropaeolin and 2- phenyl thyl glucosinolate contents of *Lepidium sativum* seeds revealed the isolation and identification of glucotropaeolin and 2-phenyl ethyl glucosinolate [12]. Five diametric imidazole alkaloids lepidine B,C,D and F in addition to the known imidazole alkaloids lepidine and two new monomer in imidazole alkaloids semiledinoside A and B also have been isolated and the structure elucidated on the basis of spectroscopic evidence [13].

Mucilage content of the seed isolated by 95% ethanol precipitation showed the presence of carbohydrate and uronic acid, the general constituents of mucilage, while tannins, chloride and sulphate were absent.

#### Nutritive value of the seeds

Garden cress seed (*Lepidium sativum* Linn) is categorized under nuts and oil seeds by ICMR. Nutritive value of the seeds show: protein 25.5g%, fat 24.5g%, carbohydrate 33.0g%, calcium 377 mg%, phosphorous 723 mg%, iron 100mg%, fibre 7.6g%, carotene 27mg%, thiamine 0.59mg%, riboflavin 0.61mg%, niacin 14.3mg% (2). It is the highest iron containing plant source ever known with better bioavailability [14].

#### Toxicity Test of the seeds

Toxicity test showed that the administration of ethanolic extract of *Lepidium sativum* Linn in single doses of 0.5 to 3.0 g/kg did not produce any adverse effects or mortality in mice, whereas the animals treated with similar extract (100mg/kg/day) for a period of three months in drinking water showed no symptoms of toxicity except statistically insignificant higher mortality rate in mice [15].

The review presents the scientific information of garden cress seeds and to create concentration toward *Lepidium sativum* which has good nutritional and therapeutic properties and to provide a direction for further research.

#### Anti diabetic Effect

The major components of *Lepidium sativum* seed total alkaloid fraction are lepidine and semilepidine, a rare group of imidazole alkaloid. Antidiabetic profile of the seeds total alkaloid (50, 150, 250 mg/kg) was injected

intraperitoneally on alloxan induced diabetic rats for continuous treatment of 21 days. *Lepidium sativum* seed total alkaloid at dose 250 mg/kg significantly ( $p < 0.001$ ) suppressed blood glucose level in diabetic rats. The results revealed that total alkaloid extract of garden cress seeds at dose 250 mg/kg potent hypoglycemic activity and the *L. sativum* alkaloid have potential antidiabetic effect [16].

Administration of *Lepidium sativum* seed total alkaloid extract effectively prevented the increase in blood glucose levels without causing a hypoglycemic state. It may be due to restoration of the delayed insulin response and slow absorption of carbohydrate (glucose). The possible mechanism by which the extract of garden cress seeds brings about its anti-hyperglycemia action may be by potentiation of pancreatic secretion of insulin from the remaining islets of B cells. Other probable mechanism by which the alkaloid of *L. sativum* lowered blood glucose levels in diabetic rats might be by increasing glycogenesis, inhibiting gluconeogenesis in the liver or inhibiting the absorption of glucose from the intestine or these might have improved insulin resistance [17].

#### Antihypertensive and Diuretic Activity

Mohamed and co-workers reported that daily oral administration of aqueous extract (20mg/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 treatment [18].

Umang et al reported that the aqueous and methanol extracts of *L. sativum* seeds were administered to experimental rats orally at doses of 50 and 100 mg/kg p.o. Urine volume was significantly increased by the two doses of aqueous and methanolic extracts in comparison to control group. The excretion of sodium was also increased by both extracts. Potassium excretion was only increased by the aqueous extracts. There is no significant change in pH in urine [19].

#### Fracture Healing Property

*Lepidium sativum* seeds mixed with normal diet were fed to the experimental rabbits after the surgery of induced fractures in the mid shaft of the left femur whereas no seeds were given to the control group. X-rays of the induced fractures were taken 6 and 12 weeks postoperatively to assess the healing of the fractures and documenting the healing by direct measurements of callus formation in millimeters at the longitudinal medial (LM) and longitudinal lateral (LL) and circumferential (CM) areas. The test group had a statistically significant increase in healing of fractures compared with the control group. This important finding signifies the fracture healing property of garden cress (*L. sativum*) seeds [20].

#### Antidiarrhoeal Activity

Monohar and co-workers reported antidiarrhoeal

activity of the methanolic extract of *Lepidium sativum* in three experimentally induced diarrhoea models i.e. Castor oil induced diarrhoea, Prostaglandin E2 (PG-E2) induced enteropooling in rats and Charcoal meal test in mice. In Castor oil induced model *Lepidium sativum* extract (50,000 and 200 mg/kg p.o.) showed significant dose dependent reduction of cumulative wet fecal mass. In PG-E2 induced enteropooling model, the same extract of (50, 100, 2000 mg/kg p.o) inhibited PG-E2 induced secretions. Similarly in Charcoal meal test *Lepidium sativum* extract (50,100 and 200 mg/kg p.o) decreased the movement of charcoal indicating its anti-motility activity. It was observed that methanol extract of garden cress seeds possess significant anti-diarrhoeal activity [21].

#### **Antihypercholesterolemic effect**

Amawi and Aljamal reported that daily oral administration of aqueous extract of *Lepidium sativum* L. (20 mg/kg) for 4 weeks on hypercholesterolemia and alloxan treated rats showed a significant lower value of cholesterol, triglycerides, LDL and increase the value of HDL in comparison to corresponding control groups (22).

#### **Beneficial effect on respiratory function in bronchial asthma**

*Lepidium sativum* powder (1g) was given orally thrice a day for 4 weeks to 30 patients of either sex (15-18 years age groups) with mild to moderate bronchial asthma without any concurrent medicine. Spirometer was used for assessment of respiratory functions, prior to and after 4 weeks of treatment showed statistically significant improvement in various parameters of pulmonary functions in asthmatic attacks. No adverse effects were found in any patients [23].

#### **Anti-Oxidant effect**

Yogesh Chand and co-worker reported that ethanolic extract of garden cress seeds showed a potential nephrocurative, nephroprotectivity and antioxidant potential at 200 mg/kg and 400 mg/kg against Cisplatin (5mg/ kg, i.p) nephrotoxicity. The enzyme estimation of kidney tissue found that increase in malondialdehyde, superoxide dismutase catalase and reduced glutathione level [24].

#### **Antianaemic effect**

Thirty young adult girls ( 17-25 years age group) subjected to experiment were given 25gm of garden cress seed powder prepared 'Laddu' – a sweet palatable preparation with coconut kernel and molasses. Thirty girls of similar age group and body weight treated as control given a similar preparation without the seed powder. All the girls had a standard diet of similar energy, protein and fat content. Experimental feeding continued for 7 consecutive days.

On 8th day haemoglobin assayed by WHO approved method of both control and treated subjects. Significant rise of haemoglobin level ( $P < 0.05$ ) along with insignificant increase in body weight was recorded in the garden cress seeds fed group. Similar antianaemic effect was also noted on young adult laboratory rats with an average (160-180g) body weight given seed powder mixed with standard stock diet in the ratio of 1:1 in treated rats whereas control rats were maintained on stock diet only. Two experimental groups were maintained for 7 days and 21 days along with control groups who had stock diet only. In both the cases haemoglobin level increased significantly ( $P < 0.01$ ). Sarkar and Ghosh reported on adult lactating rats with an average body weight 200-220g were given *Lepidium sativum* seed powder mixed with standard diet in the ratio of 1:4 on treated rats for 7 days (Group I), 14 days (Group II), 21 days (Group III). Each group had its own control group reared on stock diet only. The garden cress seeds enhanced the haemoglobin (Hb) level of blood of treated rats of 7 days, 14 days and 21 days. Statistically as 99% level of significance over the untreated control lactating rats [25].

#### **Galactagogue Effect**

To find out the galactagogue effect of garden cress seeds (*Lepidium sativum* Linn) on thirty healthy lactating rats were equally divided into six groups, three kept as control for their respective treated groups given stock diet only and other three maintained on 20% seed powder mixed with stock diet for 7 days (Group-I), 14 days (Group-II), and 21 days (group-III) during their lactating Period. The galactagogue effects of garden cress seeds are evident from the enhanced development of mammary gland i.e. increase weight of mammary gland, proliferation of alveoli and increased accumulation of secretory material in treated lactating rats compared to their corresponding Control [25].

#### **Positive effect on the weight gaining of the pups:**

Experiments were carried out on 30 female lactating rats (200-220g) equally divided into two groups, both control and treated. Control rats were given stock diet for different phases i.e. 7 days, 14 days and 21 days where as treated rats were given experimental diet prepared with garden cress seed powder and stock diet in the ratio of 1:4 in the same pattern of time period, Drinking water was supplied ad libitum. Daily dietary intake of both the control and treated groups was not differ in amount and had no adverse side effects in case of experimental rats [26,27]. The pups of the control and treated group of rats fed mothers' milk for 7,14 and 21 days respectively. Body weight of all the pups was recorded after the completion of experimental period. In 2012, Sarkar and Ghosh reported that there was significantly higher weight gain in the treated pups whose mothers were fed garden cress seeds in

comparison to that of the control pups. The important finding signifies the galactogogue effect of garden cress seeds [28].

## CONCLUSION

Garden cress (*Lepidium sativum*) has been well known as an important medicinal plant since the Vedic era and cultivated as salad plant throughout the country. Even its seeds are highly nutritious and also have been widely used to treat a number of ailments in traditional system of medicine throughout India. The seed coats of germinating garden cress seeds contain mucilage, which has a phytochemical called lepidimoid. It also has antihyperglycaemic properties which help to control glucose level in diabetics. It has also been seen that garden cress seeds have antihypertensive property due to the diuretic property of the seeds. Due to presence of mucilage the seeds are used as laxative during constipation. It has been observed that methanol extract of garden cress seeds have significant antidiarrhoeal property. The parameters of the present review work has been stated that garden cress seeds have antihypercholesterolemic, nephrocurative, antioxidant property and have a significant influence on fracture healing. The seeds have

beneficial effect on respiratory function in bronchial asthma. Due to its high iron and folic acid content, it helps to prevent iron deficiency anaemia. The present review work has also been reported that the garden cress seeds have some positive physiological effects on experimental animals causing galactogogue property. Experimentally it has been found that the garden cress seeds have highly positive effect on the body weight of the pups whose mother has been treated with the seeds. The dose of garden cress seeds which has been used in the experiment does not show any toxic effect. Garden cress seeds are less familiar as well as neglected from our common food basket. But the present review shows certain wonderful beneficial effects on health. Hence this review may inspire the researchers for further investigation for the application of garden cress seeds as nutritional food as well as therapeutic agents.

## CONFLICTS OF INTEREST

Authors declare no conflicts of interest.

## ACKNOWLEDGEMENT

I acknowledge all the scientists who have done integrated research on Garden cress seed.

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