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A REVIEW ON PHARMACOGNOSTICAL STUDY OF *LEPIDIUM SATIVUM*

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ABSTRACT
Lepidium sativum has been considered as important medicinal plant since Vedic era. In many parts of the world seedlings of *Lepidium sativum* are used in salads because of their pungent taste. *Lepidium sativum* is a fast growing annual herb; in India it is commonly known as Chandrasoor. Whole fruits or seeds are used, fresh or dried, as a seasoning with a peppery flavor. Boiled seeds are consumed in drinks by Arabs, either ground in honey or as an infusion in hot milk. The seed oil can be used for illumination and soap making. In Ethiopia the seed and its oil are primarily used medicinally, but also as condiment and in baking.

Keywords: *Lepidium Sativum*, Medicinal, Pungent, Illumination.

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INTRODUCTION

Chandrasoor is commonly known as *Lepidium sativum* is belonging to family Brassicaceae. In English it is known as "Garden cress" etc. In India, the southern area is especially involved in the commercial production of chandrasoor. The main character of chandrasoor is that it can grow in any type of climate and soil condition. The scientific investigations show that, Ethiopia is the origin of chandrasoor and it is distributed in various areas from Ethiopia. About 150 species are found in the temperate and sub temperate areas. Chandrasoor is an annual plant whose height is 50 cm. It belongs to the family of mustard[1]. The figure of lepidium sativam plant and seeds are shown in fig. 1 & 2.

Fig: 1 *L*epidium sativam Plant

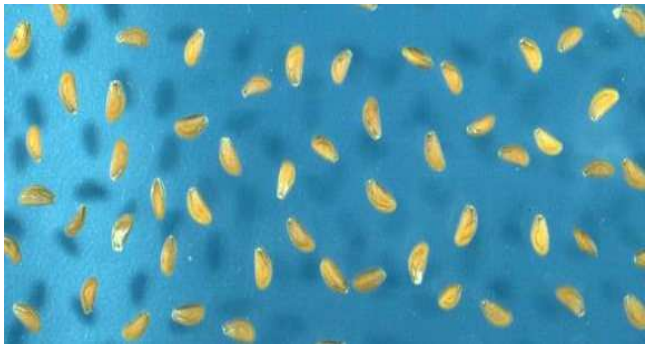

Fig: 2 *L*epidium sativam seeds

Xenophon (400 BC) mentions that the Persian used to eat this plant even before breed was known. It was also familiar to the Egyptians and very much appreciated by the Greeks and Romans who were found of banquets rich in spices and salads. Islamic scientists have reported its used for killing stomach worms. People of Mediterranean used chandrasoor for protection of crops from insects, pests etc. In 8th century a famous doctor Hebn AL-Bautas studied the medicinal uses of chandrasoor in detail; according to him, it increases the hunger and get rid of stomach worms[2,3]. The chandrasoor is successfully used in paralysis. If hairs are washed with holy water of chandrasoor the hair

becomes black. In the countries of Iran and Morocco seeds are used for sexual excitement. It is known to have a plant of perfume and sharp taste. Its salad is very popular. Generally fresh leaves are used in salad. It is eaten in the form of chatani along with bread in various parts of the word and germinated seeds and leaves are used for decoration of salad. The leaves of chandrasoor are mixed with curd and serves in a collomella named dish[4].

The cultivation of chandrasoor in elaborated in the 15th century and has achieved level of commercial crops upto 19th century. The climatic condition of India is much favourable for the cultivation of chandrasoor. The farmers of U.K. are cultivating commercially this crop in big green houses. Chandrasoor can also be grown like white mustard. The cultivation of chandrasoor is found to be beneficial to the farmers economically.

From ancient times India is known to have a country of spices in the world. Thousands of plant species are grown naturally which are used for the medicinal purpose. Among medicinal crops some crops are grown after under special processes and condition while some crops are cultivated easily using less irrigation equipments facilities and in comparatively weak soil without having special technical knowledge. Chandrasoor is among those crops, which can be grown successfully with less capital and less equipments[5].

General description: Garden cress is an annual erect herbaceous plant growing up to 50 cm. The basal leaves have long petioles and one lyreate Pinnatipartite; the coulinar leaves are lanceonate. The inflorescence is in dense racemes. The flowers have white or slightly pink petals, measuring 2 mm. The siliquae measure 5 to 6 mm, are elliptical elates from the upper half and glabrous, cress flowers in the wild state between March and June[6].

It is an allogamous plant with self-compatible and self-incompatible form and cut the various degrees of tolerance to prolonged autogamy. There are diploid from $2n = 2* = 16$ and tetraploid forms $2n = 4*=32$. A degree of variability is noted in the character of the basal leaves, which are cleft or split to a greater or lesser degree, a character, which is controlled by a single incompletely dominant gene[7,8].

Geographical Source: The exact origin of *Lepidium sativum* is unknown but is thought to be in Ethiopia and neighbouring countries or in western Asia. Domestication presumably took place in western Asia. Cultivation was already known from antiquity in Greece and Italy, possibly also in Egypt. At present it is cultivated all over the world, including most African countries, mostly on a small scale as a garden crop. It can also be found in the wild as an escape from cultivation, but it is not known whether it occurs anywhere truly wild[9].

Synonyms

Hindi - Halim, Aselio
English - Cress, Watercress
Assami - Halim-shak
Bangali - Halim-shak
French - Cressan alenois, Passerage cutivee
German - Gartenkresse
Gujarat - Asaliya
Italian - Agretto, cressione
Kannada- Allibija, Kurthika
Marathi- Aliv
Oriya - Hidamba saga
Punjabi - Halon, Tezak
Russian- Kress-Salat
Sanskrit- chandrika, Raktabija
Spanish- Lepido, Mastuerzo
Tamil - Ativerai
Telugu - Adiyalu, Addi
Urdu - Halim

Common species of *Lepidium*

1) ***Lepidium draba*:** It is found, as a weed of cultivation in the Panjab. It occurs is Persia, Mesopotamia, Caucasus, Europe and the mediterranean region. The plant is said to possess antiscorbutic properties, and to contract bleeding if used as raw. The seeds are used as a cure for flatulence, if seven or eight being taken at a time. In Waziristan it is used as a stomachic and tonic and in Europe also used as an antiscorbutic. Pods are transversely oblong tip entire values wingless[10].

2) ***Lepidium crassifolium:*** It is found in Baluchistan and the oriental region, spreading over the Europe. The seeds are prescribed internally in rheumatism and dropsy. The plants are employed as rubefacient in rheumatism. Pods elliptic are ovoid tip entire, values wing less the leaves are fleshy.

3) ***Lepidium latifallum:*** It is found in Kashmir. It is distributed in Europe and northern and western Asia. The plant is depurative and antiscorbutic. It is used in skin diseases. Pods elliptic are ovoid tip entire, values wingless the leaves and roots are fleshy.

4) ***Lepidium Ruderale:*** It is found in Kashmir at 7,000 to 3000 Ft. It extends through the oriental regions to Europe. It also occurs in Australia. The plant is used in impetigo.

5) ***Lepidium perfoliatum:*** It is found in Baluchistan and Afghanistan, whence through the oriental region it

extends to southern Europe. In Europe this plant is popularly believed to be a useful antiscorbutic[11,12].

CULTIVATION AND COLLECTION

Main characteristics for cultivation of chandrasoor

1. Animals cannot graze standing crop of chandrassor.
2. If irrigation is possible one of two times, then good yield can be obtained.
3. Chandrasoor can be cultivated in different types of soil, it can tolerate light acidity.
4. Its crop is not affected by insect.
5. It does not require more fertilizer.
6. It is a crop which needs less capital and comparatively good yield means benefit is more.
7. It is useful drug in the treatment of burn, digestion and urinary tract infections.
8. The growth of chandrasoor increases rapidly so weeds cannot develop. Thus weeds are self-controlled in the fields.
9. Chandrasoor uses in ayurvedic medicine like chandrasoor modak, chandrasoor yauogu, and chandrasoor kheer.

Cultivation: *Lepidium sativam* (Cress) is an easily grown plant with few requirements. It can be broadcast after the winter frosts or throughout the years in temperate climates. However Bontelou and Boutelon were already recommending sowing in shallow furrows which enables surplus plants to be tinned out and facilitates hoeing. Sowing has to be repeated every ten to twenty days so that there is no storage of young shoots and new leaves for salads. The leaves at earlier sowings begin to get tough and at no longer usable. The seed sprouts four or six days after sowing depending on the season and the leaves are ready for consumption after two or three weeks. The usual form of cultivation continues to be described with 15 to 20 cm between rows and the use of irrigation in the summers since they are lightly rooted seeding which can dry up in a few days. Its growth is very rapid and harvesting can begin in the same month as sowing; with yields reaching 6 tones per hectare[13].

Its cultivation is done in the season of rabbi crops. It is grown by spraying in the properly prepared field. It can also be cultivated in weak soil of water cannel capability[14]. After plaguing 3-4 times, seeds are grown in the field of 8-10 kg/ hectare. It is useful if irrigation is done one or two times[15].

Collection: The crop is ready within a period of 90-120 days. The cutting of crop started when the crops seems to be direct yellowish. This dried yellowish plant is cut with the help of hand and equipments and the material is dried for 2-3 days. It is packed in bags after cleaning and drying in the light shade. It is cultivated 14 to 16 quintal/ hectare quantity.

Macroscopic Characters: It is an erect annual herb up to 80 cm tall, more or less glaucous; stem terete or finely striate, profusely branched, glabrous. Leaves are alternate, irregularly pinnate, up to 12 cm × 9 cm; petiole up to 4 cm long; leaflets 5–11, in outline ovate or obovate, pinnatisect, the ultimate lobes usually irregularly toothed, sparsely hairy above, glabrous below, leaflets of higher leaves gradually becoming linear, upper leaves usually simple and linear, sometimes lobed or with teeth. Inflorescence a terminal or axillary raceme 1–3 cm long, accrescent to 25 cm when fruiting. Flowers bisexual, regular, 4-merous; pedicel 1.5–4.5 mm long, ascending; sepals ovate, 1–2 mm long; petals spatulate with short claw, up to 3 mm long, white or pale pink; stamens 6, anthers usually purplish; ovary superior, flattened, apex emarginate, style up to 0.5 mm long, stigma capitate. Fruit a round or ovate, flattened silique 4–6 mm × 3–5.5 mm, pale green to yellowish, margins wing-like, apex emarginate, dehiscing by 2 valves, usually 2-seeded. Seeds ovoid, flattened, 2–3 mm long, pale brown to almost black. Seedling with epigeal germination; cotyledons 3-foliolate, leaflets spatulate, lateral ones smaller than central one[16,17].

Other species are *L. comperstre and L. ruderale*, which also have edible leaves. Common cress with regard to the anatomy of leaf, steam and root has been divided into three botanical varieties vulgare, crispum and latifolium. The letter in the most mesomorphic, crispum is the most xeromorphic and vulgare is intermediate. Cress and its relatives species display a spicy aroma and a refreshing peppery pungent taste lasting only a few seconds[18,19].

Microscopic Characters: The transverse section of seed showed presence of testa, tegmen, alleurone layer, endosperm and embryo. Testa was thick, 1-2 layered and appeared yellowish brown whereas; tegmen layer was attached to inner side of testa layer and appeared as single layer. Endosperm was composed of thick walled polygonal cells. Embryo appeared as innermost structure surrounded by endosperm cells. The cells of embryo were small in size and polygonal in shape. In normal seed, the outer cover testa was present and the inner layer tegmen is attached to inner side of testa layer. Transverse section showed distinct endosperm layer from embryo provided with aleurone layer. Small embryo occurs in groves, consisting shield shaped cotyledon known as scutellum[20-21].

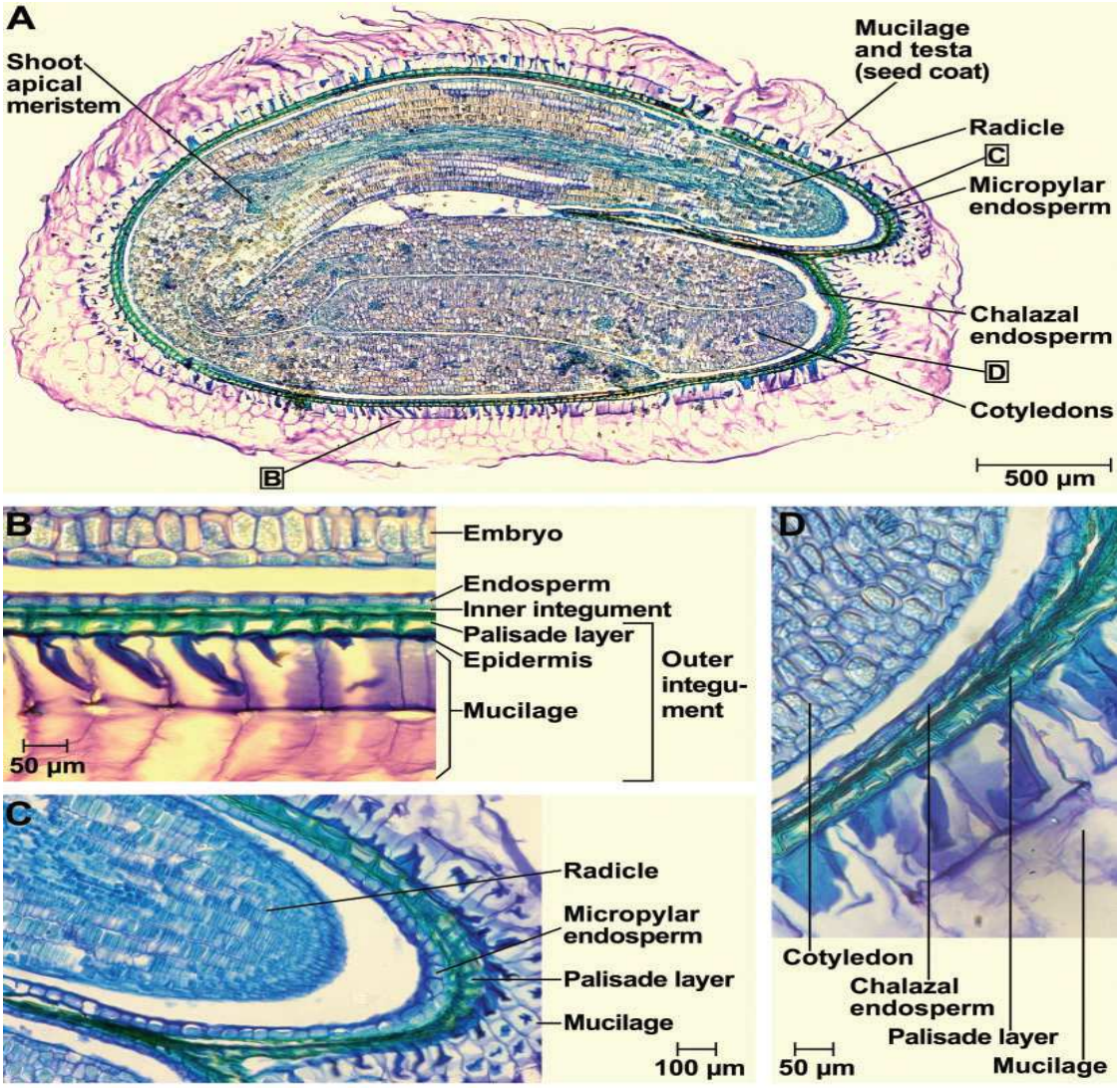

Fig. 3 Structure of a mature seed of Lepidium sativum. Bright field microscopy of longitudinal sections of seeds imbibed for 2–3 h stained with toluidine blue. (A) Entire seed, showing the mature and fully differentiated embryo, the endosperm and the testa (seed coat). The boxed letters refer to the positions of the close-up sections. (B) Structure of the seed-covering layers: endosperm, 1 cell layer; and testa (seed coat), composed of inner and outer integument. Note that the mucilage is generated from the outer testa upon imbibition. (C) Structure of the micropylar cap enclosing the radicle tip. The micropylar endosperm has 1–2 cell layers. (D) Structure of the chalazal seed region. Blue light filter (C, D); differential contrast (D). Size bars are given for each panel.

Chemical Composition

- Protein 5.8%
- Fats 1.0%
- Carbohydrate 87%
- Mineral matter 2.2%
- Calcium 0.36%
- Phosphorous 0.11 %

Trace Elements

- Iron 20.6mg./ 100 gm
- Nickel 40ug/Kg
- Cobalt 12ug/ Kg
- Iodine 1.6 ug/Kg

Vitamin A, thiamine, riboflavin, niacin and ascorbic acid have also estimated. There are reports on the presence of volatile oil, (Steam distillation) yield 0.115% colourless volatile oils, also called properites of Benzylisoticocyante and Benzyl cyanide, with a peculiar disagreeable odour is used in soap making[22].

Molybdenum is readily absorbed into cress or *Lepidium sativum*. Evomonosiede - the cytotoxic cardiac glyocside from *Lepidium sativum*." Chemical study of flavonal-3,7 diglyoside of lepidium perfoliation composition of root mucilage polyaccharides from Lepidium sativum[23,24]. Seeds of the plant mainly contains Alkaloids such as lepidine, glucotropaeolin, N,N'-dibenzyl urea, N,N'-

dibenzylthiourea, sinapic acid and its choline ester (sinapin); also contains carotene, cellulose, calcium, phosphorus, iron, thiamine, riboflavin, niacin, uric acid. Seed oil known to contain palmitic, stearic, oleic, linoleic, arachidic, behenic, lignoceric acids, benzyl isothiocyanate, benzyl cyanide, sterol and sitosterol. The leaf contains proteins, fat, carbohydrates, minerals – calcium and phosphorus, trace elements such as iron, nickel, cobalt and iodine, also contains various vitamins such as vitamin A, thiamine, riboflavin, niacin and ascorbic acid. The aerial parts of the plant contain stigmast-5-en-3β, 27-diol- 27-benzoate as one of the key chemical constituent. The plant also contains glucotropoeolin, 4-methoxyglucobrassicin, sinapine, sinapic acid, calmodulin, sinapoyglucose, esters of caffeic, pcoumaric, ferulic, quinic acids, protein, minerals, vitamins, 5-4'-dihydroxy-7,8,3',5-tetramethoxyflavone, 5-3'-dihydroxy-7,8,4'-trimethoxyflavone, 5-3'-dihydroxy-6,7,4'-trimethoxyflavone[25-29].

PHARMACOLOGICAL ACTIVITY

Molecular epidemiology and cancer prevention: The chemoprotective effect of garden cress (GC, ***Lepidium sativum***) and its constituents, glucotropaeolin (GT) and benzylisothiocyanate (BITC), a breakdown product of GT, towards 2-amino-3-methyl-imidazo quinoline (IQ)-induced genotoxic effects and colonic preneoplastic lesions was investigated in single cell gel electrophoresis (SCGE) assays and in aberrant crypt foci (ACF) experiments, respectively. Pretreatment of F344 rats with either fresh GC juice (0.8 ml), GT (150 mg/kg) or BITC (70 mg/kg) for three consecutive days caused a significant reduction in IQ (90 mg/kg, 0.2 ml corn oil/animal)-induced DNA damage in colon and liver cells in the range of 75–92%. Chemical analysis of GC juice showed that BITC does not account for the effects of the juice as its concentration in the juice was found to be 1000-fold lower than the dose required to cause a chemoprotective effect. Parallel to the chemoprotection experiments, the modulation of the activities of cytochrome, glutathione-*S*-transferase (GST) and UDP glucuronosyltransferase (UDPGT) by GC juice, GT and BITC was studied. Whereas GT and BITC did not affect the activity of any of the enzymes significantly[30,31], GC juice caused a significant ($P < 0.05$) increase in the activity of hepatic UDPGT-2. In the ACF assay, IQ was administered by gavage on 10 alternating days in corn oil (dose 100 mg/kg). Five days before and during IQ treatment, subgroups received drinking water which contained 5% cress juice. The total number of IQ-induced aberrant crypts and ACF as well as ACF with crypt multiplicity of ≥4 were reduced significantly ($P < 0.05$) in the group that received IQ plus GC juice compared with the group that was fed with IQ only. However, crypt multiplicity was not significantly different in these two groups when all ACF with all classes of crypt multiplicity were considered in the analysis. This is the first report on the inhibition of HA-induced DNA damage and preneoplastic lesions by a cruciferous plant. Our findings suggest that the chemoprotective effect of GC is mediated through enhancement of detoxification of IQ by UDPGT[32].

The effects of Lepidium sativum seeds on fracture-induced healing in rabbits: The *Lepidium sativum* plant and seeds are well known in the community of Saudi Arabia and some other Arabic countries as a good mediator for fracture healing in the human skeleton. However, there is no scientific proof for this phenomenon, except for the positive observation noted publicly by traditional medicine practitioners. In the laboratory by inducing fractures in the midshaft of the left femur of 6 adult New Zealand White rabbits divided into 2 groups (control, n = 3 and test, n = 3). The test rabbits were fed soon after surgery with *L sativum* seeds mixed with their normal diet, whereas no seeds were given to the control group. X-rays of the induced fractures were taken at 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 the healing of fractures compared with the control group ($P < .001$ for CM/6 weeks and $P < .004$ for CM and $P < .043$ for LM/12 weeks). They concluded that *L sativum* seeds had a *marked* influence on fracture healing in rabbits, clearly supporting their effects on human beings as a well-known natural element to promote fracture healing in traditional medicine[33].

Hepatoprotective Effect of *Lepidium sativum* Against Carbon *Tetrachloride* Induced Damage in Rats: The role of *Lepidium sativum* was investigated for the prevention of CCl_4 induced liver damage. Twenty albino wistar rats were allotted to four groups (control, CCl_4 induced hepatotoxicity and hepatotoxicity with *Lepidium sativum* treated with 200 and 400 mg/kg body weight (B wt)). Rats were sacrified after 10 days. Toxicity was performed using 12 rats. They were randomly divided into three groups (control and treated with 200 and 400 mg/kg (B wt) *Lepidium sativum*). Blood samples were collected for hemogram and serum analysis. Mean serum AST, ALT, ALP levels and bilirubin 4 concentration were significantly increased in CCl_4 induced hepatotoxic group of rats

compared to the control. However significant reduction in these parameters were found in groups treated with 4 *Lepidium sativum*. Anaemia was evident in the group received CCl_4. The severe fatty changes in the livers 4 of rats caused by CCl_4 were decreased in the treated groups[34]. Toxicity evaluation of similar doses of the plant revealed no alteration in the parameters measured above except in the higher dose few scattered fatty changes in the liver was present.

Antihypertensive effect of *Lepidium sativum* L. in spontaneously hypertensive rats: The antihypertensive and diuretic effects of the aqueous extract of *Lepidium sativum* L. (LS) were studied both in normotensive (WKY) and spontaneously hypertensive rats (SHR). Daily oral administration of the aqueous LS extract (20 mg/kg for 3 weeks) exhibited a significant decrease in blood pressure in SHR rats while in WKY rats; no significant change was noted during the period of treatment. The systolic blood pressure was decreased significantly from the 7th day to the end of treatment in SHR rats[35].

The aqueous LS extract enhanced significantly the water excretion in WKY rats ($p < 0.001$) but no statistically significant change was observed in SHR rats. Furthermore, oral administration of aqueous LS extract at a dose of 20 mg/kg produced a significant increase of urinary excretion of sodium, potassium and chlorides in WKY rats. In spontaneously hypertensive rats, the aqueous LS extract administration induced a significant increase of urinary elimination of sodium ($p < 0.01$), potassium ($p < 0.001$) and chlorides ($p < 0.001$). Glomerular filtration rate showed a significant increase after oral administration of LS in normal rats ($p < 0.001$) while in SHR rats, no significant change was noted during the period of treatment. Furthermore, no significant changes were noted on heart rate after LS treatment in SHR as well as in WKY rats[36].

ETHNOMEDICINAL USES OF *LEPIDIUM SATIVUM*

S. No.	Plant part	Uses	Method of preparation
1.	Whole herb	Asthma, Cough, Expectorant, Bleeding piles	The plant was crushed and made infusion with the water and taken twice a day. (For Asthma), whole herbs paste to be taken every 4 hours for cough and as expectorant.
2.	Leaves	Diuretic	The leaves are boiled with water and decoction to be taken three times a day.
3.	Root	Syphilis	Root powder is to be taken with luke cow's milk.
4.	Seed	Abortion	Seeds boiled with milk and taken within 45 days of conception.

According to Blonigberger, the plant in the Punjab administered in cases of asthma, cough with expectoration and bleeding piles. The root is used in secondary syphilis. Dried seeds and leaves are used as diuretic, aphrodisiac, good in inflammation, bronchitis, rheumatism and muscular pain and improve brain power. The leaves are stimulant and diuretic serviceable in scorbutic diseases. The fresh fruit is good for injuries, skin and eye diseases. Seeds are boiled with milk are administered to cause abortion. A powder of seeds mixed with fine sugar is used for diarrhea and dysentery. Seeds increase the milk secretion. A preparation made of seeds ghee and sugar is a common household remedy useful as a restorative in general debility[37]. Externally a leper paste made of seeds rubbed in water and applied to skin diseases caused by impurity of blood. It is more satisfactory rubefacient than mustard. A paste is made of the mixture of *Lepidium sativum* seeds 5 parts, carbonate of soda 5 parts, curcuma longa 4 parts and *Litsea sebifera* 5 parts ground together into a paste with water in an application recommended for sprains bruses and subluxation. It was used against insect bites & also as an insect repellent in the form of fumigant[37].

CONCLUSION

Herbs are the natural drugs used to regain the alterations made in normal physiological system by foreign organisms or by any malfunctioning of the body. In every ethnic group there exists a traditional health care system, which is culturally patterned. In rural communities, health care seems to be the first and foremost line of defense. The WHO has already recognized the contribution of traditional health care in tribal communities. It is very essential to have a proper documentation of medicinal plants and to know their potential for the improvement of health and hygiene through an eco friendly system. Thus importance should be given to the potentiality of ethnomedicinal studies as these can provide a very effective strategy for the discovery of useful medicinally active identity. A detailed and systematic study is required for identification, cataloguing and documentation of plants, which may provide a meaningful way for the promotion of the traditional knowledge of the herbal medicinal plants. The herb chandrasoor is used in treating various ailments. It elicits on all the aspects of the herb and throws the attention to set the mind of the researchers to carry out the work for developing its various formulations, which can ultimately be beneficial for the human beings as well as animals.

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