INTRODUCTION

Chenopodium album is an annual shrub widely grown worldwide like in Asia, Europe, North America and Africa. It is commonly known as pigweed, father or lamb-quarters.\textsuperscript{[1-2]} Chenopodium album linn. is commonly used for food and medicinal values; it is known by various vernacular names like Bathu Sag in Hindi, Chandan bethu in Bengali and grows in waste places and as weed in wheat or with other crops around the world.\textsuperscript{[3]} It is a polymorphous, erect herb, up to 3.5m in height, found wild up to an altitude of 4,700 m, and cultivated throughout India. Stems rarely slender, angled, often striped green, red or purple; leaves rhomboid, deltoid to lanceolate, upper entire, lower toothed or irregularly lobed, extremely variable in cultivated forms, 10-15 cm long, petioles often as long as thick panicled, shining black seeds, possessing sharp margins. The weeds are low-growing while...
the cultivated plants are tall growing and leafy. They are cultivated for leaf and grain on the north-western hills in the Kullu Valley, at 1,500-2,100 m and in Shimla. The growth of this plant is highly stimulated by magnesium and may be an indicator for this element.\[4\]

**Traditional uses**
The herb is laxative, anthelmintic and cardiotonic. The powdered plant (25-50%), when mixed with normal food, was reported to suppress oestrus cycle. The plant is traditionally used as dysentery, diarrhoea, wound healing, hepatic disorder, skin diseases, Snake, animal bites, stimulant, tonic (for debility), sedative, laxative, antihelminthic (round and hook worm). It is useful in Vata- Kaph and eye disease. It is used in the form of pot herb in piles. The finely powdered leaves are used as a dusting powder about the external genitalia in children.\[7-13\]

**Chemical composition/Phytochemistry**
Different chemical components have been isolated and identified from *Chenopodium album* as phenols, lignan, and ecdysteroids, alkaloids and flavonoids (Table 1).

**Phenols and lignan**
These are compounds possessing one or more aromatic rings with one or more hydroxyl groups. Phenols are broadly distributed in the plant kingdom and are the most abundant secondary metabolites of plants, with more than 8,000 phenolic structures currently known, ranging from simple molecules such as phenolic acids to highly polymerized substances such as tannins.\[14\] Phenolic plant compounds may have both beneficial and toxic effects on human health.\[15-16\] Phenolic compounds are having reported anti-microbial, anti-inflammatory agents.\[17-18\] The analysis of the aqueous solution of the hydroalcoholic extract of leaves of *C. album*, after acetone precipitation, led to the isolation of cinnamic acid, 4-hydroxy-cinnamic acid, ferulic acid, methyl ferulate, sinapic acid, methyl 3-(4-hydroxy-3-methoxyphenyl) propanoate, 4-(1-hydroxyethyl)-2-methoxyphenol, vanillyl alcohol, 4-(hydroxymethyl)-2-methoxyphenol, 4-hydroxy-3-methoxybenzoic acid, 4-vinylphenol. The known phenols were identified by comparison with commercial samples, and with $^1$H-NMR and $^{13}$C-NMR data reported and methoxybenzoic acid\[19\], methyl-3-(4-hydroxy-3-methoxyphenyl) propanoate\[20\], methyl ferulate\[21\], 4-(1-hydroxyethyl)-2-methoxyphenol\[22\], and 4-vinylphenol.\[23\] *Threeo-guaiacylglycerol-β-O-4-syringaresinol ether* and two new sesquilignans *threeo-guaiacylglycerol-α-O-methyl-β-O-4-syringaresinol ether* and *threeo-syringylglycerol-α-O-methyl-β-O-4-syringaresinol ether* were also identified. The lignans were identified by comparison with previously reported spectroscopic data such as (±)-
pinoresinol\textsuperscript{[24]}, (−)-syringaresinol\textsuperscript{[25]}, (−)-lariciresinol\textsuperscript{[26]} and (±) 5,5′-dimethoxylariciresinol.\textsuperscript{[27]} The structures of compounds 18-20 were elucidated by consideration of respective spectroscopic data.

**Ecdysteroids**

Ecdysteroids have a wide spectrum of biological activities as insect, crustacean molting hormones, insulin regulator, display tonic, diuretic and anabolic properties.\textsuperscript{[28]} These are the five compounds isolated from the hydroalcoholic/methanolic extract of *Chenopodium album* leaves $C_{21}H_{23}O_5$, 3β-14α dihydroxy-5β-pregn-7-ene-2, 6, 20-trione, 20-hydroxyecdysone, 20-hydroxyecdysone 20, 22-monoacetonide, 20-hydroxyecdysone 2, 3-monoacetonide.\textsuperscript{[38]}

**Saponin**

Saponins are having reported antidiabetic, anticancer, anti-obesity and cardiovascular agents.\textsuperscript{[39-44]} Saponins isolated from root of *Chenopodium album* are 3-O-β-D-Glucuronopyranosyl oleanolic acid or calenduloside, 3-O-[β-D-glucuronopyranosyl]-28-O-β-D-gluco- pyranosyl oleanolic acid or chikusetsusaponin, 3-O-[3′-O-(2′″-O-glycolyl)-glyoxylyl β-D-glucuronopyranosyl] oleanolic acid.\textsuperscript{[2]}

**Flavonoids**

Flavonoids are a family of plants secondary metabolites of having more than 9000 individual molecules found in tissue and organs and are having antidiabetic, anticancer, cardiovascular diseases.\textsuperscript{[45-48]} From aerial parts of *C. album* six compounds have been isolated these are quercetin-3-O-(2″,6″-di-O-α-L-rhamnopyranosyl)-β-D-glucopyranoside, Kaempferol-3-O-(2″,6″-di-O-α-L-rhamnopyranosyl)-β-D-glucopyranoside, Quercetin-3-O-β-D-glucopyranosyl-(1″ 6″)-β-O-glucopyranoside, Quercetin-3-O-β-D-glucopyranoside, Kaempferol-3-O-β-D-glucopyranoside, rutin.\textsuperscript{[34]}

**Alkloids**

Zarrelli *et al.* (2004) have isolated an alkaloid moiety linked to cinnamic acid amide. The compound has been identified on the basis of spectroscopic features and named chenoalbicin. It is the only alkaloid that has been isolated from the *C. album* root extract.\textsuperscript{[57]}

**Preparations of Chenopodium album.**

**Homemade preparations**

Juice of *C. album* (Bathu) is given to drink two times in a day.\textsuperscript{[49]}
Homemade preparation

- Drink 15 grams of fresh bathu juice daily with an empty stomach without adding any salt or sugar to it.
- It is also recommended to take this juice for curing anaemia.

Marketed preparation

Sharbat Kasni

USE: Antiphlogistic for liver, curative for jaundice and refrigerant for liver.
DOSAGE: 25-50mL with 125 mL of water.

Sehat Bakhsh as an ingredient (Dhali Naturals)

USES: Initial stages of Tuberculosis and cancer, cough and fever
Dosages: 30 mL in the morning and evening.

Preclinical data supporting pharmacological effects

Anti-inflammatory activity\(^{[5]}\)

Usman et al. (2010) evaluated the anti-inflammatory activity of essential oil of *C. album* by using topical inflammatory assay. The reduction the inflammation may be due to the presence of α-pinene, linalool and linaly acetate in the oil. Essential oil of *C. album* can be used as anti-inflammatory agent.

Anthelmintic activity\(^{[50]}\)

Anthelmintic activity of crude aqueous methanolic extract (6, 12, 24 and 48 mg/mL) of the whole plant was determined using mature *Haemonchus contortus* and their eggs in adult motility assay and egg hatch test. LC\(^{[50]}\) was calculated and found to be 0.449 µg/mL.

Spasmolytic and analgesic activity\(^{[51]}\)

The plant extract displayed relaxant effect, highest relaxant effect was observed at 20 mg/kg dose, which was 92.86 %, but there was a decrease in the relaxant activity at 25 mg/kg dose (61.29%). Analgesic activity of the plant extract was tested in mice using tail flick method. The plant exhibited potent analgesic effect.

Anti-ulcer activity\(^{[52]}\)

*Paarakh et al. (2011) demonstrated that C. album* is having antiulcer activity. Antiulcer activity was carried out using ethanol induced ulcers, pylorus ligation induced ulcer tail flick
method. The alcoholic extract of the plant was most potent; it produced decrease in the gastric acid secretion, total acidity and ulcer index.

**Improvement of sexual function**[^53]

Pande *et al.* (2008) have evaluated aphrodisiac property of *Chenopodium album*. Ethanol extract of *C. album* at 100, 250, and 500 mg/kg were given per oral. Moreover 500 mg/kg, p.o. was found to be most effective.

**Hepatoprotective activity**[^54]

*Chenopodium album* is having reported hepatoprotective activity. Acetone and methanol extracts were tested, the (200 mg/kg) of the plant *C. album* possess more effective hepatoprotective activity against paracetamol intoxication in rats because of its flavonoid bearing capacity.

**Anticancer activity**

Srivastava *et al.* (2009) carried out cytotoxic activity of different solvent extracts (Pt. ether, EtOAc and MeOH) of *C. album* leaves was screened against human breast cancer cell lines MCF-7 and MDA-MB-468 with ten increasing concentrations (10–100 mg/mL) for 24 h first by the TBE (trypan blue exclusion) and then followed by MTT[3-(4,5- dimethyl thiazol-2-yl)-2,5-diphenyl tetrazolium] bioassay.[^56]

**Antidiarroheal Activity**

Parrakh *et al.* (2012) find out the antidiarroheal activity of *C. album*. Author have used the two models for antidiarroheal activity i.e. castor oil induced diarroheal and entero pooling assay by using dose of 200 and 400 mg/kg of *C. album*.[^55]

**Antipruritic and Antinociceptive effects**

Dai *et al.* (2002) have carried out anti-pruritic and antinociceptive activity of fruits of *C. album*. The models were used in the activity i.e. Scratching behavior induced by 5-Hydroxytryptamine, Writhing response induced by acetic acid, Hind paw swelling induced by 5-Hydroxytryptamine by oral administration of fruit extract (100-400 mg/kg).[^58]

**Toxicology**

The experimental information on the toxicity issue of *Chenopodium album* is very few. In the acute toxicity study, animals were observed continuously for any change in behavioural, neurological and autonomic profile or any other symptoms of toxicity, lethality and death.

[^53]: Pande *et al.* (2008) have evaluated aphrodisiac property of *Chenopodium album*.
[^54]: Acetone and methanol extracts were tested, the (200 mg/kg) of the plant *C. album* possess more effective hepatoprotective activity against paracetamol intoxication in rats because of its flavonoid bearing capacity.
[^55]: Parrakh *et al.* (2012) find out the antidiarroheal activity of *C. album*. Author have used the two models for antidiarroheal activity.
[^56]: Srivastava *et al.* (2009) carried out cytotoxic activity of different solvent extracts.
[^57]: Dai *et al.* (2002) have carried out anti-pruritic and antinociceptive activity of fruits.
[^58]: Toxicology study, animals were observed continuously for any change in behavioural, neurological and autonomic profile or any other symptoms of toxicity.
The dose of hydroalcoholic extract of 200 mg/kg and 400 mg/kg were selected for in vivo on the bases of toxicity study as the dose 1000 mg/kg do not produce any toxicity.\textsuperscript{[55]}

Table: 1 showing phytochemical constituents from Chenopodium album.

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Chemical component</th>
</tr>
</thead>
</table>
| Leaves essential oil | p-cymene(1), tricyclene(2), α-thujene(3), α-pinene(4), camphene(5), sabinene(6), β-pinene(7), myrcene(8), 1-8 cineole(9), cis-cimene(10), γ-terpinene(11), linalool(12), pinane-2-ol(13), allo ocimene(14), citronellal(15), borneol(16), terpinen-4-ol(17), α-terpineol(18), citronellol(19), ner phen(20), linalyl acetate(21), geraniol(22), borneol acetate(23), thymol(24), carvacrol(25)\textsuperscript{[5]}
| Leaves and twigs | Cinnamic acid(26), 4-Hydroxy cinnamic acid(27), Methyl Ferulate(28), Ferulic acid(29), Sinapic Acid(30), Methyl 3-(4-hydroxy-3-methoxyphenyl)Propanoate(31), 4-Vinyl phenol(32), 4-Methyl benzaldehyde(33), Vanilly alcohol(34), 4-(hydroxymethyl)-2-methoxyphenol(35), 4-(1-hydroxyethyl)-2-methoxyphenol(36), N-[2-(1-H-indol-3-y)ethyl]acetamide(37), Pinoresinol(38), Lariciresinol(39), 5,5-Dimethoxy lariciresinol(40), Threo-guaiacylglycerol-β-O-4-syringaresinol ether(41), Threo-guaiacylglycerol-α-O-methyl-β-O-4-syringaresinol ether(42), Threosyringylglycerol-[α-O-methyl-β-O-4-syringaresinol ether](43)\textsuperscript{[29]}, β-Carotene(44), α-Carotene(45), Lutein(46)\textsuperscript{[6]}
| Seed              | Cryptomeridiol(47), 8-α-acetoxy cryptomeridiol(48), Octatetracontane(49), Tetra-cos-1-ene(50).\textsuperscript{[30]}
| Seed and leaves   | Lupeol(51)\textsuperscript{[31]}, xanthotoxin(52)\textsuperscript{[37]}
| Aerial parts      | Quercetin-3-O-(2”,6”-di-O-α-L-rhamnopyranosyl)-β-D-Glucopyranoside(53), Kaempferol-3-O-(2”,6”-di-O-α-L-rhamnopyranosyl)-β-D-glucopyranoside(54), Quercetin-3-O-β-D-glucopyranosyl(1”6”)-β-D-glucopyranoside(55), Quercetin-3-O-α-L-rhamnopyranoside(1”6”)-β-D-glucopyranoside(56) Quercetin-3-O-β-D-glucopyranoside(57), Kaempferol-3-O-β-D-glucopyranoside(58)\textsuperscript{[34]}
| Flower            | Oxalic acid(59), Oleanolic acid(60), Sitosterol(61)\textsuperscript{[35-37]}
| Root              | 3-O-β-D-Glucuronopyranosyl oleanolic acid(62), 3-O-[β-D-glucuronopyranosyl]-28-O-β-D-gluc-pyranosyl oleanolic acid(63), 3-O-[3’-O-(2”-O-glycolyl)-glyoxylyl-β-D-glucuronopyranosyl] oleanolic acid(64)\textsuperscript{[2]} N-trans-feruloyl-4-O-methylidopamine(65).\textsuperscript{[32]}
| Leaves            | 3-β,14 α-dihydroxy-5β-pregn-7-ene-2,6,20-trione(66), 20-Hydroxyecdysone(67), 20-Hydroxyecdysone 20,22-monoacetone(68), 20-Hydroxyecdysone 2,3-monoacetone(69)\textsuperscript{[38]}
| Roots             | Chenalbicin(70)\textsuperscript{[57]}
Table 2: Showing pharmacological activity of *C. Album*

<table>
<thead>
<tr>
<th>Pharmacological activity</th>
<th>Part used</th>
<th>Dose</th>
<th>Models used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-inflamatory activity</td>
<td>Leaves essential oil</td>
<td>0.62, 1.25, 2.5 and 5 mg/ear</td>
<td>Topical anti-inflammatory assay</td>
</tr>
<tr>
<td>Anthelmintic Activity</td>
<td>Whole plant</td>
<td>6, 12, 24, 48 mg/mL</td>
<td>Egg hatch test</td>
</tr>
<tr>
<td>Spasmolytic and analgesic activity</td>
<td>Seeds and leaves</td>
<td>1, 5, 10, 15, 20, 25 mg/mL</td>
<td>Topical anti-inflammatory assay</td>
</tr>
<tr>
<td>Anti-ulcer activity</td>
<td>Aerial parts</td>
<td>400 mg/kg hydroalcoholic,</td>
<td>Ethanol induced ulcers, Pylorus ligation induced ulcer, Cold restraint stress induced ulcers</td>
</tr>
<tr>
<td>Aphrodisiac activity</td>
<td>Leaves</td>
<td>250, 500 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td>Hepatoprotective Activity</td>
<td>Leaves</td>
<td>200 and 400 mg/kg</td>
<td>Paracetamol induced hepatic injury</td>
</tr>
<tr>
<td>Cytotoxic activity</td>
<td>Leaves</td>
<td>10, 20, 30, 40, 50, 60, 70, 80, 90, 100 mg/mL</td>
<td>Trypan blue exclusion bioassay, MTT [3-(4, 5-dimethyl thiazol-2-yl)-2, 5-diphenyl tetrazolium] bioassay</td>
</tr>
<tr>
<td>Antipruritic and antinociceptive activity</td>
<td>Fruit</td>
<td>100-400 mg/kg</td>
<td>Scratching behavior induced by 5-Hydroxytryptamine, Writhing response induced by acetic acid, Hind paw swelling induced by 5-Hydroxytryptamine</td>
</tr>
<tr>
<td>Antidiarroheal activity</td>
<td>Aerial parts</td>
<td>200 and 400 mg/kg</td>
<td>Castor oil induced diarrhea, Entropooling assay.</td>
</tr>
</tbody>
</table>

**Structures**

![Structure 1](image1)

![Structure 2](image2)

![Structure 3](image3)
\[
R = H = 41 \\
R = Me = 42
\]
CONCLUSIONS

In India, traditionally plants are used as remedies that been used in the treatment of various diseases since from a very long time of civilization. According to the “Viadyas” plant have
the medicine values they are using from ancient time and created a different system medicine named *Ayurveda* and they called the plant as *Jadi-Buti*.

*C. album* is used to manufacture so many herbal preparations for different disease. Recent study has been carried out anti-inflammatory, antiulcer, anticancer, spasmolytic and analgesic activity on *C. album* with different parts. This study is an attempt to compile an up-to-date and comprehensive review of *C. album* that covers its phytochemistry, traditional uses, pharmacological, and toxicological study.

**Future prospective**

As a traditional medicine, it is very essential to find out the pharmacological based molecular mechanisms of the *C. album* of different diseases and also we can find receptor-molecular interaction by using Computer Aided Drug Design. Potentially active components should be isolated using bioactivity-guided fractionation strategies. And the possible mechanism of action as well as potential synergistic or antagonistic effects of derived from *C. album* need to be evaluate disintegrating pharmacological, pharmacokinetic, bioavailability-centered and physiological approaches. Further studies on *C. album* can lead to the development of new drugs and therapeutics for various diseases.

**REFERENCE**


36. Hegnauer R. Chemotaxonomy the plants, 8 Birkhauser, Basel, Switzerland. 1964.
44. Park JD, Rhee KD, Lee YH. Biological activities and chemistry of saponins from *Panax ginseng*. Phytochemistry Reviews, 2005; 4: 159–175.


