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RESEARCH ARTICLE

A PHARMACOLOGICAL COMPREHENSIVE REVIEW ON *CHENOPODIUM ALBUM* L

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ABSTRACT

Chenopodium album (L.) of the family *Chenopodiaceae* distributed worldwide including India includes about 250 species. On the basis of these herbal characters, the *Chenopodium* plant is traditionally used as herbal medicine to cure various disorders like abdominal pains, eye disease, throat troubles, piles, diseases of the blood, heart and spleen and biliousness etc. The plant is a source of the variety of phyto-constituents like flavonoid as phenolic amide, saponin, cinnamic acid amide, alkaloid chinoalbicin, apocortinoid, xyloside, phenols and lignans, protein, carbohydrates, suberin, glucoside, flavin and traces amount of oil and sugars etc. The plant extracts from the different parts having different pharmacological activities such as antioxidant potential, antimicrobial, antipruriticlaxative, aphrodisiac action, antinociceptive, anthelmintic, antinutritional and functional potential for human diet etc. This review article reveals the comprehensive account of the cytomorphological, phytochemical constituents, ethnobotanical inputs and pharmacological activities including the immense medicinal and functional food potential of this plant.

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INTRODUCTION

In agricultural fields, most of the weedy *Chenopodium* species are referred to as common lambsquarters (*Chenopodium album* L.). *Chenopodium album*, one of the worst weeds and widespread synanthropic plants, is also among the most polymorphic plant species (Clemants and Mosyakin, 2004). This plant falls under the genus *Chenopodium* which is distributed worldwide and includes approximately 250 species (Risi and Galwey 1984). In India, it is characterized by approximately 21 species, of which some are cultivated for an end use as vegetable and a few for the grains obtained from the plant (Yadav *et al.,* 2007). *C. album* has also been reported as successful competitor with many crops viz. wheat, barley, mustard, gram, maize and other crops (Khurana *et al.,* 1986; Bhattacharjee 2001). The weed is low growing while the cultivated plants are tall and leafy. The entire young plant is not only sorts of nutritious food, but also herbal medicine (Nayak *et al.,* 2010).Increased reliance on major food crops has been accompanied by shrinking of the food basket which humankind has been dependent on for generations (Prescott Allen 1990). Modern crop production predominantly involves only hundreds of them any thousands of the known food plants globally.

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Ethno-botanic surveys indicate that thousands of traditional species are largely ignored by scientific researches and food processors. *Chenopodium album* tender shoots are eaten raw in salad or with curd. They are also cooked asvegetable or the cooked shoots are mixed with curd and eaten. The dried herb is stored for future use. It is also used as fodder. The leaves are rich in potassium and vitamin C. Its use has also been reported for the treatment of hepatic disorders, spleen enlargement, intestinal ulcers and burns has also been documented (Sarma *et al.,* 2008). So, *C. album* is regarded as a prospective wild vegetable and is worth exploration and utilization.The phytochemicals like flavonoid, isoflavonoid, polyphenol etc, have garnered great interest for their potential role in the maintenance of human health particularly significant reduction in cancer risk (Prakash *et al.,*1993), prevention of several human diseases exerting a variety of biological actions such as free-radical scavenging, metal chelation, modulation of enzymes activity, atherosclerosis, antimutagenic and anticancer activities (Reddy and Aggarwal1994). The whole young plant has reported uses as food and herbal medicine.

Trade and common name: Bacon-weed, Common Lambsquarters, *Fat Hen*, Frost-blite; *Lamb's-quarters*, Meal weed, Pigweed, White goosefoot (Table 1).

Morphological descriptions: Fat hen (*Chenopodium album*) is an erect annual herbaceous plant, native to Europe that grows between 0.2 and 2 metres in height, and has rarely slender, angled, often striped green, red or purple stems. Leaves are Simple, 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 blade, 1 to 1.3 cm in length. The opposite leaves can be very varied in appearance. The first leaves, near the bottom of the plant, are toothed and roughly diamond-shaped, 3-7 cm long and 3-6 cm broad. It has been found in dark green colour with smooth under surface. The leaves are wax-coated, unwettable and mealy in appearance, with a whitish coat on the underside. Flowers are radial, symmetrical, green and white, in small clusters on a dense branched inflorescence, 10-40 cm long, contains shining black seeds and continuous along the stem (Table 2). The seed remains enclosed by flower segments at maturity (Agrawal *et al.,* 2014).

Cytological inputs: The *C. album* was cytologically well studied and reported as a complex of diploid (2n=18), tetraploid (2n=36) or hexaploid (2n=54) species with endopolyploidy and autopolyploidy as the origin of polyploidy (Devi and Chrungoo 2015).

Chemical constituents: The major phytoconstituents isolated from different parts of the plant included non-polar lipid, phenols, lignins, alkaloids, flavonids, glycosides, saponins, ascorbic acid, β-carotene, catechin, gallocatechin, caffeic acid, p-coumaric acid, ferulic acid, β-sitosterol, campesterol, xanthotoxin, stigmasterol, n-triacontanol, imperatorin, ecdysteroid (Priya *et al.,* 2010,Rastogi and Mehrotra1998), crytomeridiol (Cutillo *et al.,* 2004), ntransferuloyl- 4-O-methyl dopamine , β- sitosterol, lupeol and 3 hydroxynonadecylhenicosanoate (Cutillo*et al.,* 2006, Jhade *et al.,* 2009) (Table 4)

Nutritional content: The extensive literature survey revealed that *Chenopodium album* is an important medicinal plants with diverse pharmacological spectrum .The plant shows the presence of many chemical constituents .It is known as a rich source of vitamins and iron, zink, flavonoids and glycosides present in *Chenopodium album* might be medicinally important and nutritionally valuable .The plant is rich in carbohydrates, oleic and stearic. *Chenopodium album* L. is the major winter crops, specially wheat, barley, mustard and gram. It multiplies at a very fast rate because of large number of small seeds produced per plant. In many parts of India the weed is removed by employing manual labour and is thrown away as a waste. In few places, this is also consumed as green vegetable (Sa-ag). But most of it is still being thrown off. *Chenopodium album* contained very high degree of nitrogen, phosphorous, potassium, calcium, magnesium, iron and manganese. Its nutrient content declined with advancement in age of the plant (Shahi 1977).

Elemental analysis: The data obtained are cited in Tables 5 and 6. The results showed that *Chenopodium album* exhibits the highest concentration of the elements Mg, Si, S, Ca, Cl, K and Fe (Table 3). Kaneez *et al*. (2001) reported that Mg within the plant reduces the cholesterol level but alleviates heart diseases. Mg is being investigated in migraine headache and attention deficit hypersensitivity disorder. Mg plays a significant role in regulating the muscular activity of heart, maintaining normal heart rhythm and also converts blood sugar in to energy. Iron (Fe) deficiency is associated with myocardial infection. Calcium is needed in the development of bones and teeth, regulates heart rhythm, helps in normal blood clothing maintain proper nerve and muscle functions and lowers the blood pressure. Mn is essential for normal functioning of central nervous system and is a good antioxidant (Bibi *et al.,* 2006). The presence and concentrations of various elements in different plant depend on the composition of the soil, water and fertilizers used as well as permissibility, selectivity and absorbability of plants for the uptake of these elements. Hence, the observed variations in concentration of the elements are attributed to the nature of the plant as well as its surroundings (Udayakumar and Begum, 2004). Trace elements are essential for all forms of life and having wide range of clinical applications that play a key role in the treatment of various diseases (Kaneez *et al.,* 2001). The elements Fe, K, Mg, Na, Ca, Co, Mn, Zn and Cu are classified as essential elements, Ni, Cr are possibly essential while Cd, Pb and Li are non essential elements for the human body. Among the varied elements detected in several medicinal plants utilized in the treatment of various diseases, it is interesting to notice that some of the medicinal plants employed by local physician and customary people have high concentration within the range of ppm of Mn, Fe, Cu, Zn etc. The concentration of K and Ca are in the percentage level. Zn is vital in wound healing and also functions as an antioxidant. The researchers are trying to link the contents of the trace elements and medicinal values of the plants (Zafar *et al.,* 2010). The reviewed data will be useful in synthesis of new herbal drugs with various combinations of plants, which can be used in the treatment of different diseases at global level (Table 5and 6).

Pharmacological and biological activities: In traditional medicine, plants that are rich in secondary metabolites, called medicinal plants, are commonly used to counter and cure various ailments. Among plants, phytochemicals are responsible for both pharmacological and toxic activities (Table 6). These metabolites are known to be of benefit to a plant itself but may be harmful to animals, including humans.The presence of these chemical constituents in this plant is an indication that if properly screened the plant could yield pharmaceutical-relevant drugs. It is best explained by the fact that members of this plant's family have been known to engage in the management of different ailments in ethnomedicine. *Chenopodium album* Linn. (Bathua) belongs to the *Chenopodiaceae* family, and is a major medicinal plant in Ayurveda. This plant's medicinal property is primarily in the leaves and seeds. Leaves are rich in essential oil minerals, particularly potash salts, a considerable quantity of albuminoids, and other compounds are nitrogen. The plant is recommended by Hindu physicians for correction of hepatic disorders and splenic enlargement (Nadkarni1982). C. album is a rich source of nutrients, antioxidants and important dietary elements (Afolayan *et al.,* 2009). Therapeutic agents, it is used as laxative, antihelmintic against round and hook worms and blood purifier. Its use for the treatments of intestinal ulcers and burns has also been documented (Sarma *et al.,* 2008). All these phytochemicals possess good antioxidant activities and have been reported to exhibit multiple biological effects including anti-inflammatory and antitumor activities (Table 8).

Table 1. Classification and vernacular name of *Chenopodium album* L

Classification		Vernacular name	
Kingdom:	Plantae	Bengali:	*Chandanbetu*
Class:	Dicotyledonae	Hindi:	*Bathua sag*
Order:	Caryophyllales	Kannada:	Kaduoma
Family:	*Chenopodiaceae*	Malyalam:	*Katuayamoddakam*
Genus:	*Chenopodium* L.	Oriya:	Bathua
Species:	*Chenopodium album*	Sanskrit:	*Vastukah*
		Tamil:	*Parupukkirai*
		Telgu:	*Pappukura*

Table 2. Morphological features of *C. album* (L)

Part	Macroscopic features
Herb	Polymorphous, mealy white and erect herb which is 3.5m in height
Leaves	Simple, very variable, oblong or lanceolate, obtuse or acute, entire
Stems	Erect of ascending, often striped
Flowers	Grey to green clusters in spikes.These are without petals
Fruits	Membranous utricle, enclosed in the perianth, globose, 1.5-2.0 mm
Seed	Smooth, shiny, compressed, disc shaped with a notch, glossy black, brown or brownish green in color, 1.2-1.6 mm diameter, have thin papery covering

Table 3. Some key characteristic of *C. album* (L)

1.	Time of germination	Spring (peaking mid-late spring); through to summer and autumn
2.	Time of flowering and seed set	Late summer or early autumn (during spring in some conditions)
3.	Reproduction	By seed only
4.	Seed productivity	200-75,000 seeds/plant
5.	Seed viability	Up to several decades
6.	Optimum germination soil depth	2 mm to 50 mm
7.	Soil type/s	Cultivated calcareous soils favoured. Found on strongly acid to strongly alkaline soils
8.	Competitive advantages	Early emergence; rapid growth; long-term seed viability; high seed production; competes well with crops

Table 4. Chemical constituents /Types in plant parts of *Chenopodium album*

Plant parts	Chemical constituents /Types	References
Whole herb	Choline Polypodine B	Bernard *et al.*,1983 Rastogi and Mehrotra 1980-1984
Leaves	A. Alkaloids B. Carotenoids α-carotene C. Ecdysteroids 20-hydroxyecdysone, 20, 22, 23-monoacetonide compounds, poststerone. D. Essential oil Hydrocarbons (17.4%) oxygenatedmonoterpenes (18.1%) aromatic compounds (60.9 %) p-cymene, ascaridole, á-pinene, â-pinene, limonene, ethylcinnamate, á-terpineol and trace amounts of various othercompounds. E. Flavonoids 3-O-glycosides of quercetin, kaempferol and isorhamnetin Kaempferol-3-O-diglucoside,Kaempferol-3-Oarabinoglucoside, Quercetin-3-O-rhamnoglucoside F. Lignans Pinoresinol, syringaresinol, lariciresinol, its derivative compound and three sesquilignans G. Oxalic acid H. Phenolics 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. I. Phytic acid J. Sterols Sitosterol, Sitostanol, Stigmasterol, Avensterol, Spinasterol K. Saponins L. Tannins	Sood *et al.*,2012 Nambiar& Seshadri 1998 DellaGreca *et al.*,2005 Usman *et al.*,2010 Rahiminejad & Gornal 2004 Cutillo *et al.*,2006 Sood *et al.*,2012 Cutillo *et al.*,2006 Sood *et al.*,2012 Salt and Adler 1985,
Leaves oil	Tricyclene, α-thujene, αpinene, camphene, sabinene, β-pinene, myrecene, p-cymene, limonene, benzyl alcohol, 1,8-cineole, cis-ocimene, γ-terpinene, linalool, pinane-2-ol, alloocimene, citronellal, borneol, terpinen-4-ol, α-terpineol, citronellol, ascaridole, neral, linalyl acetate, geranial, borneol acetate, thymol, carvacrol, ethyl cinnamate, acetyl eugenol, elemicin, benzyl benzoate	Usman *et al.*, 2010

Continue ..

Stem	A. Phenols 4-vinyl phenol, 4-methyl benzaldehyde B. Sterols Sitosterol, Sitostanol, Stig	Cutillo *et al.*,2006 Salt and Adler 1985
Root	A. Amides Cinnamic acid amide alkaloid: Chenoalbicine B. Ecdysteroids 20-hydroxyecdysone, â-ecdysone C. Phenolic amide N-trans-feruloyl-4-O-methyldopamine D. Saponins 3 saponins have been isolated Secoglycoside E. Others Polysone, Polypodine B	Cutillo *et al.*,2004 DellaGreca *et al.*,2005 Horio *et al.*,1993 Lavaud *et al.*,2000, Sood *et al.*,2012
Seeds	Phytoecdysteroids: 20-hydroxyecdysone, 20-hydroxy-24-methylen ecdysone, 20,26-dihydroxyecdysone andphenolic glycoside	Nahar and Sarker 2005 Rastogi and Mehrotra 1990-1994
	A. Phenolic glycoside Chenoalbuside	
	B. Cryptomeridiol, 8-á-acetoxycryptomeridiol	

Table 5. Nutritional value of *C. album* leaves (per 100 g dry weight)

Ash (g/100g)	Moisture (g/100g)	Lipid (g/100g)	Crude protein (g/100g)	Carbohydrates (g/100g)	Crude fibre (g/100g)	Calorific value (kcal)	Reference
2.2	71.3	2.5	3.9	20	-	-	Khattak 2011
2.07	87.5	1.16	3.7	5.36	0.81		Singh *et al*. 2007
2.94	83	0.8	5.0	8.34	1.92	59.0	Odhav *et al* 2007
-	-	0.8	4.2	7.3	-	43.021	Kaur and Shri 2015
2.01	89.6	2.06	4.8	7.01	1.99	49.0	Mishra and Gupta 2016
20.44	88.55	0.19	18.56	8.65	1.70	425.33	Saha*et al.*, 2015
21.42	77.57	3.20	28.03	5.35	8.16	162.32	Chandra *et al* 2016
19.23	4.53	4.41	34.31	36.55	14.82	-	Bahadur *et al* 2011

Antioxidant: Several studies on metabolic extract have demonstrated antioxidant compounds, free radical scavenging and protective antioxidant effects on human and yeast cells (Adedapo *et al.*, 2011; Korcan *et al.*, 2013; Kaur and Kapoor 2002).

Antiviral: Two proteins, purified from the leaves of *C. album* induced systemic resistance against tobacco mosaic virus and Sunn-hemp rosette virus in both hypersensitive as well as systemic hosts. The proteins caused in vitro degradation of viral RNA **(**Dutt *et al.*, 2004).

Insecticidal Effects (Worms and pests): Methanolic extract of the whole c album plant was studied using mature earthworms, barber's pole worm (*Haemonchus contortus*) and their eggs and it was found to have anthelmintic activity **(**Amjad and Alizad 2012**).** The anthelmintic activity of *C. album* was evaluated in sheep naturally infected with a mixed species of gastrointestinal nematodes by administering crude powder extracts of c. album. They found it increased mortality of worms and inhibited the hatching of eggs (Jabbar *et al.*, 2007).

The insecticidal effect of extracts of *C. album* against malaria vector, Anopheles stephensi, showed that in influenced the early life cycle of anopheles stephensi by reducing the percentage of hatching, larval, pupal and adult emergence and lengthened the larval and pupal periods and reduced the growth index. (Sharma *et al.*, 2006). Secondary metabolites from the aerial parts of *C. album* against saw toothed grain beetle (*oryzaephilus surinamensis*) were studied. The results showed that the aqueous extract of *C. album* was effective, with a low percentage of survival of adult and larval stages **(**Russo *et al.*, 2011**)**

Muscle pain: Studies have indicated that it may be useful for muscular pain and spasms. (CABI 2019) fractions of *C. album* exhibited relaxation effects of intestinal muscles in rabbits (Ahmad *et al*., 2012).

Hepatoprotective: Studies have shown that *C. album* was as or more effective than, silymarin in restoring physiological integrity of hepatocytes **(**Nigam and Paarakh 2011; Pal *et al.*, 2011**).**

Male fertility: *C. album* shows interesting and somewhat conflicting effects in male fertility. Animal studies have shown that it increase sexual behaviour and performance and enhances sperm count, but also that it appears to have intra-vaginal spermicidal effects (Pande and Pathak 2008; Kumar *et al.*, 2008; Kumar *et al.*, 2007; Baldi and Gupta 2013).

Breast cancer: *C. album* (leaves) demonstrated a significant inhibition against the growth of oestrogen dependent and oestrogen independent human breast cancer cell lines (Khoobchandani *et al.*, 2009).

Contraindication and adverse effects: *Chenopodium album* was an allergenic plant. Some preparations of its extracts were used for diagnosis and immunotherapy of patients. The allergic extract of *Chenopodium album* pollen has been prepared and examined in skin prick testing in comparison with a commercial product in Iran (Mousavi *et al.*, 2003). Sun exposure after oral intake of *Chenopodium album* can lead to sunburn-like rashes owing to its furocoumarin content. Many studies recorded that patients developed dermatitis with edema, erythema and necrosis on the face and dorsum of the hands when they exposed to sunlight after eating *Chenopodium album* (Ozkol *et al.*, 2012; Bilgili *et al.*, 2011).

Table 6. Mineral content of C. album leaves

Mineral content															References
Mg	Ca	K	P	Na	Fe	Zn	Cu	Mn	Al	Si	S	Cl	Ti	Rb	
2.54[a]	3.85[a]	3.65[a]	1.55[a]	0.30[a]	0.93[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	Bahadur *et al.* 2011
0.72[a]	2.17[a]	6.93[a]	0.32[a]	0.37[a]	255[a]	50[a]	13[a]	118[a]	ND	ND	ND	ND	ND	ND	Adedapo *et al.* 2011
112.10 [b]	98.70[b]	ND	46.30[b]	ND	4.70[b]	1.30[b]	ND	0.90 [b]	ND	ND	ND	ND	ND	ND	Khattak *et al.* 2007
112.17[b]	178.75 [b]	855.29 [b]	46.37 [b]	4.14 [b]	4.79 [b]	0.75 [b]	0.04[b]	0.55 [b]	ND	ND	ND	ND	ND	ND	Yildirim *et al.* 2001
ND	ND	ND	ND	ND	ND	0.26[a]	ND	0.14[a]	0.48[a]	1.44[a]	1.44[a]	1.00[a]	0.08[a]	0.06[a]	Saha *et al.* 2015
109-211[a]	220-330[a]	ND	ND	ND	2.1-6.1[a]	1.3-18.5[a]	ND	1.8-4.6[a]	ND	ND	ND	ND	ND	ND	kruger *et al* 1998, Odhav *et al* 2007, Afolayan and Jimoh 2009
112[a]	155.7-265[a]	848[a]	ND	ND	4.7-5.4[a]	1.3-8.4[a]	0.47-1.22[a]	0.9[a]	ND	ND	ND	ND	ND	ND	Pradhan *et al* 2015, Raghuvanshi *et al* 2001, Sultan *et al* 2009
112-393[a]	236-438[a]	855-1444[a]	ND	ND	4.79-5.80[a]	ND	0.040-0.330[a]	0.550-1.590[a]	ND	ND	ND	ND	ND	ND	Aliotta and pollio 1981, Guil-Guerrero *et al* 1997a, Guil-Guerrero and Torijaisasa 1997c, Bianco *et al* 1998 and Yildrim *et al* 2001
[a] mg/100 g dry weight basis; [b] mg/ 100 g fresh wt. basis															

Table 7. Vitamins content of C. album **leaves**

Vitamins (mg/100g)				References
β- carotenoid	B3	C	K	
9.54	-	14.70	-	Bahadur *et al.* 2011, Saha *et al.* 2015
-	-	137-171	-	Aliotta and pollio 1981, Guil-Guerrero *et al* 1997a, Guil-Guerrero and Torijaisasa 1997, Bianco *et al.*, 1998 and yildrim *et al*., 2001
-	0.71	33.6-43.7	-	Kattach *et al.*, 2011, Pradhan *et al* 2015, Raghuvanshi *et al* 2001, Sultan et al., 2009
-	-	31	-	kruger *et al* 1998, odhav *et al* 2007, Afolayan and Jimoh 2009

Table 8. Pharmacological and biological activities of phytochemicals in *C. album* L

Phytochemicals	Pharmacological and biological activities	References
Alkaloids	Good spasmolytic and anesthetic agents	Adedapo *et al*.,2011
Saponin	Helps in boosting the immune system, in lowering cholesterol levels in the blood and reducing the risk of getting intestinal cancer. Increase membrane permeability, thus enabling use for increased food intake at the intestinal level or even for drug assimilation.	Gupta and Wagle 1998 Gee *et al.*, 1993
phenolic compounds	Contribute to quality and nutritional value in terms of modifying color, taste, aroma, and flavor and also in providing beneficial health effects. Provide the plants with defense mechanisms to neutralize reactive oxygen species (ROS) to survive and prevent molecular damage and damage by microorganisms, insects, and herbivores.	Vaya *et al.*, 1997
tannin	Provide some health benefits including antioxidant and radical scavenging properties, anticarcinogenic, antibacterial, and anti-enzymatic effects.	Vattem *et al.*, 2005
Tannins+ (A). proline rich protein irreversible complexes (B) protein	Inhibition of cell protein synthesis. Treatment of inflamed or ulcerated tissues, Treating intestinal disorders such as diarrhea and dysentery.	Shimada 2006 Parekh and Chanda 2007 Dharmananda 2003
flavonoids	Show a wide range of biological activities such as inhibition of cell proliferation, induction of apoptosis, inhibition of enzymes, and other antibacterial and antioxidant effects.	Cook and Samman 1996; Middleton and Kandaswami 1992

Table 9. Part basis details of pharmacological activities of *Chenopodium album* (L)

Pharmacological activities	Parts	Extraction/possible chemical constituents	Screening method	Possible mechanism of action/Result
Anticancer Activity	leaves	Ethanolic and aqueous extract	The cells were seeded with both the extracts and then allowed to grow for 24 hrs, the cell growth was inhibited and apoptotic bodies were formed within 24 hrs.	Control of cell's growth (Joshi and Chauhan 2012).
Anti-Ulcer Activity	leaves	Alcoholic extract	Evaluate the antiulcer activity by using three models, i.e., pyloric ligation, ethanol and cold restraint stress induced ulcers.	Significantly decreases volume of gastric secretion, pH, free acidity, total acidity and ulcer index. (Nigam and Paarakh 2011).
Anti-Inflammatory Activity	leaves	essential oil	GC and GC/MS analyses of the oil revealed that the bulk of the oil was constituted by aromatic compounds such as; limonene, linalool, linalyl acetate and α-pinene.	The percentage reduction in the ear edema in mice increases with increase in concentration of the oil. (Usman L.A. *et al.,* 2010)
Hepatoprotective Activity	leaves	Acetone and methanol extracts	Histopathological studies	More effective hepato-protective activity against paracetamol intoxication in rats because of its flavonoid bearing capacity. (Pal *et al.*, 2011)
Antidiarroheal Activity	leaves	Hydro-alcohol (30:70)	Castor oil induced diarrhoea in rats ⟩PGE2 enteropooling model ⟩Intestinal	Administration of extract caused significant reductions in faecal output and frequency of droppings as compared with castor oil treated rats. ⟩Significant lyretardation of PGE2 induced enteropooling was observed with reduction of volume. ⟩At the dose of 200 and 400 mg/kg there was significant inhibition of volume of intestinal content. ⟩The plant extract decreased the propulsion of the charcoal meal through the gastrointestinal tract as compared to control. (Nigam and Paarakh 2013).
Antibacterial activity	leaves	Aqueous and methanol extracts	Aqueous as well as methanol leaf extract on tested pathogens (Viz. *Escherichia coli, Salmonella typhimurium, Staphylococcus aureus, Proteus vulgaris* and *Pseudomonas aueruginosa*) using paper disc diffusion method	The aqueous extract revealed strongest antibacterial activity on *Staphylococcus aureus*and methanol leaf extract showed strongest antibacterial activity on *Pseudomonas aeruginosa.* (Amjad and Alizad 2012; Singh *et al.*, 2011)

However, *Chenopodium album* can cause lethal intoxication in ruminants because it accumulated high nitrate levels (although it can also accumulate soluble oxalates). Levels of 2,500 ppm nitrate-nitrogen were reported in *Chenopodium album* hay associated with mortality in cattle (Ozmen *et al.,* 2003).

Conclusion

Chenopodium album is naturally grow widely available as a weed and is used for different purposes like, medicinal, food, forage and other usages. The manifestations can be made on the basis of this comprehensive perusal of literature, that the *Chenopodium album* used traditionally, due to immense therapeutic potential to treat/cure various diseases. The plant is a rich source of bioactive compounds like, Isolariciresinol 4-O-β-D-glucopyranoside (1), (7'S, 8R, 8'R)-Isolariciresinol (2) and (7'S, 8R, 8'S)-Isolariciresinol (3)(Wei Zheng 2017)etc. with a wide range of moderate antioxidant and anti-inflammatory activities for health benefits. Cytomorphological data show that there is an immense need to define new cytomorphotypes for further germplasm maintenance and evaluation, because no one has been working on these critical aspects until today. Based on the phyto-chemical data, it is concluded that the chemo types for further formations of herbal and allopathic drugs need to be identified. There is an enormous need and possibilities to isolate new active components from this Indian species. Based on the phyto-chemical data, it is concluded that the chemo types for further formations of herbal and allopathic drugs need to be identified. There is an enormous need and possibilities to isolate new active components from this Indian species. Many studies have shown important anti-inflammatory, anti-cancer, anti-asthmatic, anti-diabetic, anti-bacterial, etc. behaviours that are recorded from the extracts of various parts and their phyto-constituents. As per the recorded data it is clear that this species have been extensively studied on different parameters, but needs to do further extensive bioactivities on this species. The pharmacological studies reported in this review confirm the therapeutic value of *Chenopodium album*. Much less information is available, however, regarding this plant's phytoanalytical properties. There have been reports of phytochemical studies but it still needs to progress. The ethnobotanical statements are properly tested; it can provide effective remedies and can assist the human race in various illnesses and commercial expoilation.

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