International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 6 Nov-Dec 2022, pp: 1404-1408 www.ijprajournal.com ISSN: 2456-4494

A Review study over: Pharmacognostic study, Phytochemical and Pharmacological studies over whole plant of Aerva lanata (L.)

Bandana Devi*, Dr. Kamal Jeet*, Dr. Vijay Nigam**
*Career Point University, Hamirpur, H.P.-15379 , India
** Daksh Institute of Pharmaceutical Science (DIPS), Chhatarpur- 471001, M.P., India

Submitted: 08-12-2022 Accepted: 17-12-2022

ABSTRACT
Aerva lanata (L.) (Amaranthaceae) locally known as 'bui' is an erect or prostrate under shrub with a long tap-root and many woolly-to mentose branches, found in the wild, throughout India. In traditional medicine the plant is used in cough, strangury (slow to be and painful discharge of urine), headache and urolithiasis. The photochemical constituents present in the plant include alkaloids (ervine, methylervine, ervoside, aervine, methylaervine, aervoside, ervolanine, and aervolanine), flavanoids (kaempferol, quercetin, isorhamnetin, persinol, persinosides A and B), methyl grevillate, lupeol, lupeol acetate benzoic acid, β-sitosteryl acetate and tannic acid.Pharmacological studies reported diuretic, anti-inflammatory, hypoglycemic, antidiabetic, antiparasitic, antimicrobial, hepoprotective, anti-urolithiasis, antiasthmatic, antifertility and hypolipidemic properties of Aerva lanata (L.) . This review article gives detailed information of the morphology, phytochemistry, and pharmacological aspects of Aerva lanata (L.) for further research.

Keywords: Aerva lanata (L.), ervine, ervoside, methylervine, amaranthaceae, morphoanatomic, gorakhabooti ,pashanbheda,canthin-6-one alkaloids,antiurolithiatic,metabolic enzymes

I. INTRODUCTION:

Aerva lanata (L.) (Amaranthaceae) locally known as 'bui' is an erect,prostrate under shrub and occurs throughout India as a common weed infields and waste places.The plant is diuretic, used in lithiasis. The root is demulcent, diuretic, useful in strangury(slow to be and painful discharge of urine). The roots are used in the treatment of headache. The plant is regarded as a demulcent on the Malabar Coast[1,2] . It is valued for coughin Ceylon; also as a vermifuge for children. The Meena tribals of the Sawaimadhopur district of Rajasthan give orally the juice of the roots to patients of liver congestion, jaundice, biliousness and dyspepsia. They also give decoction of the whole plant to cure pneumonia, typhoid and other prolonged fevers[3.]

Taxonomy:
Kingdom : Plantae (Plants)
Sub kingdom: Treacheobionta (vascular plants)
Division: Magnoliophyta (Angiosperms, flowering plants)
Class: Magnoliopsida (Dicotyledonous)
Subclass: Caryophyllidae
Order: Caryophyllales
Family: Amaranthaceae
Genus: Aerva
Species: Aerva lanata (L.)

Common names:
Ayurvedic: Paashaanabheda, Gorakshaganjaa, Aadaanpaaki, Shatkabhedi
Bengali: Chaya
Rajasthani: Bhui
Sindhi: Bhui, Jari
Punjabi: Bui-kaltan
Hindi: Gorkhabundi, Kapurijadi
Marathi: Kapurmadhura, Kapurimadhuri, Kapurphuti, Kumra

Morphology:

Herb, erect or prostrate with a long tap-root, branched from near the base; branches many, pubescent, and striate. Leaves alternate, 2-2 × 1-1.6 cm on the main stem, 6-10 x 5-6 mm on the branches, elliptic or obviate, or sub orbicular, obtuse or acute, entire, pubescent above, more or less white with cottony hairs beneath; petioles 3-6 mm long, often obscure. Flowers greenish white, very small, sessile, often bisexual, in small dense sub sessile axillary heads or spikes 6-13 mm long, often closely crowdedand forming globose clusters; bracteoles 1.25 mm, long, membranous, broadly ovate, concave, apiculate. Perianth 1.5-1.25 mm long; sepals oblong, obtuse, sometimes apiculate, silky-hairy on the back. Utricle broadly ovoid,

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Volume 7, Issue 6 Nov-Dec 2022, pp: 1404-1408 www.ijprajournal.com ISSN: 2456-4494

acute; stigmas two, seed 0.85 mm in diameter, smooth and polished, black[4]

Microscopic properties:

Powder microscopy of Aerva lanata (L.) roots: Powder microscopy was done according to the standard procedure mentioned. The powder microscopy revealed the following

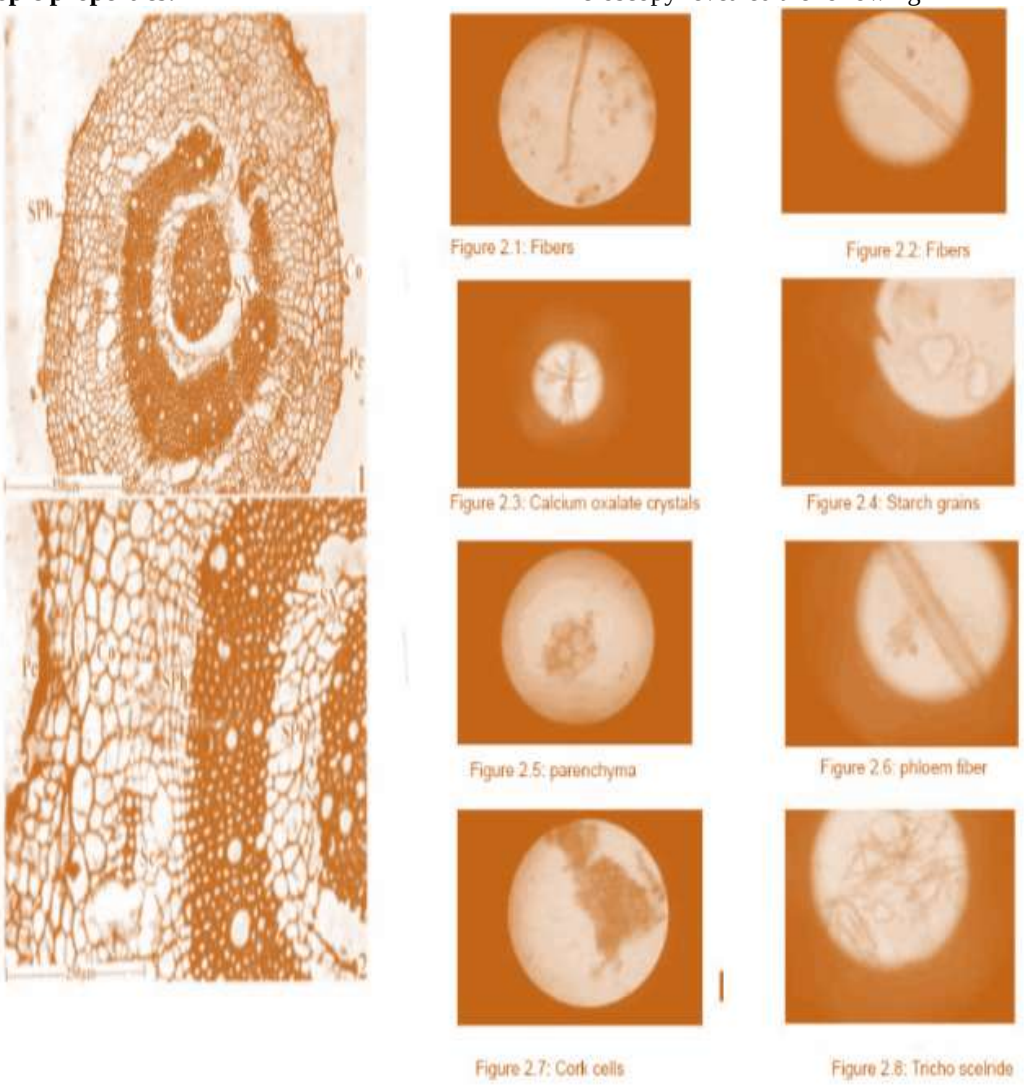

Figure : Microscopy of Aerva lanata (L.) roots

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Details of Figures:

a) Fibers: lignified and non-lignified, long, slender and cylindrical shaped (Figure 2.2).
b) Xylem vessels: it is lignified with bordered pits (Figure 2.2).
c) Calcium oxalate crystals: present in parenchymatous cells and scattered. The druces are 40 μm in diameters (Figure 2.3).
d) Starch grains: most are simple, oval or rounded without any striation (Figure 2.4).
e) Parenchyma cells are intermingled between the xylem elements (Figure 2.5).
f) Secondary phloem was dominant with phloem parenchyma with embedded fibers(Figure 2.6).
g) Cork cells were commonly reported (Figure 2.7).
h) Tricho scelrids are present (Figure 2.8)

Phytochemistry:

Alkaloids: Plant contains biological active canthin-6-one alkaloids such as 10-methoxycanthin-6- one, 10-hydroxy-canthin-6-one, 10-O-β-D-glucopyranosyloxycanthin-6-one, 10-hydroxycanthin-6-one (ervine), 10-methoxycanthine-6-one (methylervine), 10-β-Dglucopyranosyloxycanthin-6-one (ervoside), aervine (10-hydroxycanthin-6-one), methylaervine (10-methoxycanthin-6-one) and aervoside (10-β-Dglucopyranosyloxycanthin-6-one). Plant also contains alkaloids like β-carboline-1 - propionic acid, 6-methoxy-β-carboline-1-propionic acid, 6-methoxy-β-carbolin- lylpropionic acid (ervolanine), and aervolanine (3-(6-methyoxy-β-carbolin-1-yl) propionicacid)[6,7] .

Flavanoids: FlavanoidsAerva lanata (L.) is a rich source of fl avanoids such as kaempferol, quercetin, isorhamnetin, isorhamnetin 3-O-β-[4-p-coumaroyl-α- rhamnosyl(1→6) galactoside and fl avanone glucoside persinol, persinosides A and B, 5, 4'-hydroxy-3, 6, 7-trimethoxyfl avone, 5-hydroxy-3, 6, 7, 4-tetramethoxyflavone, 5-hydroxy 2', 3,5',6,7-pentamethoxyl flavone, 3,3',5,7-trihydroxy-4'-methoxyfl avone, apigenin 7-O-β- D- glucoside and 7-O-β-D- glucopyranoside[8,9].

Miscellaneous phytoconstituents: Aerva lanata (L.) also contains methyl grevillate, lupeol, lupeol acetate benzoic acid, β-sitosteryl acetate and tannic acid[10] .

Nutritive content: Leaves of Aerva lanata (L.) were found to be high in carbohydrate (26.6 g/100g), crude protein (22.6 g/100g) and ash (31.2 g/100g). Mineral composition (mg/100g) revealed that the leaves were high in PO4 (187), and moderately high in other minerals such as K(47.9), K (Poatssium) (39.4), Ca (Calcium) (51.7), Mg (Magnesium) (41.5), Zn (Zinc) (44.7), Fe (Ferrous).

Biological activities:

Diuretic activity of Aerva lanata (L.) flowers: The hydro-alcoholic extract of flowers of Aerva lanata (L.) was screened for its diuretic activity in rats. The diuretic activity studied in 5 and 24 hours and the extract showed increase of urine volume, Na+, K+, Cl+ ions as compared to normal saline. The hydro alcoholic extract of flowers of Aerva lanata (L.) upon phytochemical investigation revealed the presence of flavonoids, glycosides, carbohydrates, alkaloids and phytosterols[11].

Antihelmintic activity: The phyto constituents may be responsible to show a potent antihelmintic activity. Methanolic extract of aerial parts of Aerva lanata (L.) at concentration of 100 mg/ mlcaused paralysisin 7.5 min and death in 11.16 min, while aqueous extract showed paralysis in 13.83 min and death in 18 min against Pheritimapostuma[12].

Antibacterial activity: Ethyl extract of A. lanata shows antibacterial activity against Bacilllus cereus, Staphylococcus aureus, Shigellashiga, Klebsiella sp. and antifungal activities against Aspergillus niger, Candidaalbicans. The ethyl acetate extract shows more interesting antibacterial and antifungal properties than petroleum ether and methanolic extract[13].

Anti- HIV activity: Chloroform and methanol extraction of A. lanata shows highest inhibition of recombinant HIV-RT (91.0% and 89.0% respectively) at 2 mg/ml concentrate. At the concentration of 0.5 mg/ml to 2 mg/ml all extractions of Aerva lanata shows significant inhibition of recombinant HIV-RT[14].

Antioxidant activity: A. lanata extracts, in the dose of 100 mg/kg, improved the SOD, Catalase, and Peroxidase levels significantly, which were comparable with Silymarin. Methonolic extract of aerial parts of B. diffusa and methanolic extract of A. lanata whole plant showed significant dose dependent inhibition of lipid peroxidation with increasing concentration from 50-100 mg/kg. The extracts were found to inhibit lipid per oxidation[15].

Antinociceptive: Anti-nociceptive effect of A. lanata ethanolic extract has shown a significant dose dependent reduction in the number of abdominal writhes compared to the control values. Strong inhibition of this effect was observed at a dose of 100 mg·kg-1 and the activity is comparable

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with that of acetyl salicylic acid. In addition, pretreatment with non-selective opioid receptor antagonist naloxone has not antagonized the A. lanata (100 mg·kg-1) and acetyl salicylic acid induced analgesic activity[16].

Hepatoprotective activity: Hydroalcoholic extract of Aerva lanata (L.) is used against paracetamol induced liver damage in rats. The hydroalcoholic extract of Aerva lanata (L.) (600 mg/kg) was administered orally to the animals with hepatotoxicity induced by paracetamol (3 gm/kg). Silymarin (25 mg/kg) was used as the standard. All the test drugs were administered orally by suspending in 0.5% carboxy methyl cellulose solution. The plant extract was effective in protecting the liver against the injury induced by paracetamol in rats. This is due to significant reduction in serum enzymes alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphates (ALP) and bilirubin[17].

Anti fertility activity: Due the presence of α-amyrin in A. lanata, it is used as anti fertility activity. The study was carried out at two different doses of 200 and 400 mg/kg b/w. Corresponds to anti-implantation activity at a dose of 200 mg/kg b/w that shows only 20%, and 40%, respectively400 mg/kg b/w shows 30% pre-implantation loss. Similarly, in the abortifacient model, 200 and 400 mg/kg b/w show pregnancy failure of 30%.

Antimicrobial activity: Aerva lanata (L.) whole plant ethyl acetate and methanol extracts showed interesting antimicrobial activities against Bacillus subtilis, Bacillus cereus, Staphylococcus aureus, Escherichia coli, Shigella dysenteriae, Shigella shiga, Shigella sonnei, Shigella fl exneriae, Shigella boydii, Klebsiella, Aspergillus fumigatus, Aspergillus niger, Candida albicans, Hensinela californica and Rhizopus oligosporum and petroleum ether, ethyl acetate and methanol extracts showed significant cytotoxic properties.

Immuno modulatory and anti tumor: Petroleum ether extract of Aerva lanata (L.) showed significant cytotoxicity against Daltons lymphoma ascites (DLA) tumor cell lines in vitro and stimulated lymphocyte proliferation in in vitro and in vivo conditions. DLA-bearing animals when treated with A. lanata showed increase in lifespan compared to control animals. Partially purified fraction was also found to be hepatoprotective as evidenced from the normal levels of liver marker enzymes compared to the elevated levels of these enzymes in DLA alone inoculated animals. The partially thin layer chromatography-purifi ed fraction of the petroleum ether extract of Aerva lanata (L.) proved to be cytotoxic to DLA, Ehrlich ascites (EA) and B16F10 cell lines in vitro. Since partially TLC-purified fraction was found to be more cytotoxic to DLA cell lines, it was used to study the pharmacological effect and its potential to reduce solid tumor induced by DLA cell lines in mice[18].

Anti-diarrheal

Ethanolic and aqueous extracts of Aerva lanata (L.) were screened for anti diarrheal activity. All the extracts showed significant anti-diarrheal activity in charcoal meal test reduction of the intestinal transit is suggested as mechanism of action[19].

II. CONCLUSION:

Aerva lanata (L.) has been ethnomedicinally used as a therapeutic agent for a variety of diseases[20] .moreover numerous research works have proven its uses beyond the ethnomedicinal ones in experimental animals[21] .Alkaloids and flavonoids which were isolated from this plant may be responsible for its pharmacological activities. The road ahead is to establish specific bioactive molecules, which might be responsible for these actions. Therefore the cultivation, collection, and further pharmacological exploration of Aerva lanata (L.) are essential.

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Volume 7, Issue 6 Nov-Dec 2022, pp: 1404-1408 www.ijprajournal.com ISSN: 2456-4494

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