

## A Review on Phytochemistry and Biological Activities of *Aerva*

Payal C\*, Gurlaganjeet K, Davinder K, Gagan S, Amit C and Dhawan RK

Khalsa College of Pharmacy, Amritsar, Punjab, India

### Abstract

*Aerva* known as 'bui' is an under shrub with a long root, found in the wild, desert area belongs to the family Amaranthaceae. Different species are: persica, lanata, artemisioides, coriacea, humbertii, javanica, madagassica, microphylla, transvaalensis, revolute, sanguinolenta. It contains alkaloid, flavonoids, phenol, tannin, proteins, amino acids, steroids, saponins and carbohydrates. It have anthelmintic, demulcent, anti-inflammatory, diuretic, hepatoprotective, hypoglycemic, anti-diabetic, anti-parasitic, anti-microbial, anti-asthmatic, anti-fertility, hypolipidemic and nephroprotective property. The herb is cultivated throughout India, Ceylon, Arabia, Tropical Africa, Java, Philippines.

**Keywords:** *Aerva lanata*; Persica; Javanica; Alkaloid; Flavonoid

### Introduction

*Aerva lanata* L. (Amaranthaceae) is a woody, prostrate or succulent, perennial herb or under shrub. It is traditionally known as, Pashana beda. Leaves are woolly, tomentose throughout, and smaller in flowering branches. Flowers are very small, sessile, bisexual, greenish or dull white, often clustered with spikes. Seeds are kidney-shaped and shining black in color. The root has camphor like aroma and medicinally important [1]. The extract of *A. lanata* is endowed with flavonoids, alkaloids, triterpenes, steroids, polysaccharides, tannins and saponins. *A. lanata* is used as an important medicinal plant for illness. It is also called in English as a stone breaking plant. *A. lanata* comprises medicinal and pharmaceutical importance [2]. It is used by ayurvedic practitioners for many pathological conditions. A variety of pharmacological activities of the *Aerva* plant such as anthelmintic, demulcent, anti-inflammatory, diuretic, expectorant, hepato-protective and nephron- protective [3].

### Phytochemistry of *Aerva*

#### Scientific classification

Kingdom: Plantae

Order: Caryophyllus

Family: Amaranthaceae

Subfamily: Amaranthoideae

Genus: *Aerva*

Species: persica, lanata, artemisioides, coriacea, humbertii, javanica, madagassica, microphylla, transvaalensis, revolute, sanguinolenta.

#### Common name

Tamil: Sirupulai, Cerupulai

Sanskrit: Bhadra

Hindi: Aa, Gorakhganja

Kannada: Bilihindisoppu

Telugu: Pindiconda, Pindicettu

Malayalam: Cherula, Cheruvula, Cerupula

Bengali: Chaya

Marathi: Kapur-madura



Figure 1: *Aerva* plant.

Gujarati: Gorakhganjo

Punjabi: Buikallan

Oriya: Paunsia (Figure 1)

#### Traditional uses

The plant is used for arresting hemorrhage during pregnancy burn healing, as an anti-inflammatory, headache, skin disease, to dissolve kidney, and gall bladder stones, for uterus clearance after delivery and

\*Corresponding author: Payal C, Asst. professor, Khalsa College of Pharmacy, Amritsar, India, Tel: 9592021088; E-mail: [amitchawla84@gmail.com](mailto:amitchawla84@gmail.com)

Received February 10, 2015; Accepted April 01, 2015; Published April 06, 2015

Citation: Payal C, Gurlaganjeet K, Davinder K, Gagan S, Amit C, et al. (2015) A Review on Phytochemistry and Biological Activities of *Aerva*. Med Aromat Plants 4: 187. doi:10.4172/2167-0412.1000187

Copyright: © 2015 Payal C, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

to prevent lactation. The plant extract is used to treat, nasal bleeding, cough, scorpion sting, fractures and spermatorrhoea. *Aerva lanata* serves as a purpose of anthelmintic and medication that soothes inflamed and injured skin. The people of bihar use the plant as a treatment of diarrhea, cholera and dysentery. The roots also used for diuretic and demulcent, and are credit with tonic properties [4].

### Macroscopy

This plant is commonly known as polpala, of *Amaranthaceae* family an important gregarious shrub growing throughout Bangladesh, particularly along waste places in India. It is a branched plant which has white to pale pink spikes of clusters of flowers 1 to 1.5 inches long. The herb is cultivated throughout India, Ceylon, Arabia, Tropical Africa, Java, Philippines [5]. *Aerva lanata* Linn. is a ramous many branched hardy erect prostrate woody herb from 30 to 80 cm height, the main stem short but stout and woody at base from which arise 4 to 10 or more elongate hairy branches. The branches bears short petioles nearly orbicular leaves 8 to 20 mm long, numerous minute hairy white flowers [6].

### Microscopic properties

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

- a) Fibers: lignified and non-lignified, long, slender and cylindrical shaped (Figure 2.1).
- b) Xylem vessels: it is lignified with bordered pits (Figure 2.2).
- c) Calcium oxalate crystals: present in parenchymatous cells and scattered. The druses are 40  $\mu\text{m}$  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 scleride are present [7].

**Powder Microscopy of flowers:** The powder microscopy of flower shows trichomes, pollen grains, starch grains, calcium oxalate crystals epidermal cells and stomata. Trichomes are multicellular, uniseriate with spinulated surface, tapered at the end and multiarticulate. Pollen grains are spherical in shape and are about 17-20  $\mu\text{m}$  in diameter. Starch grains are oval to ellipsoidal, mostly simple, without any striations (Figures 2 and 3) [8].

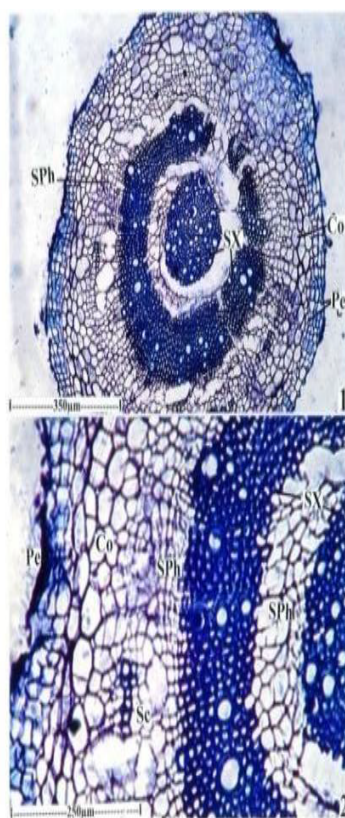


Figure 2.1: Fibers



Figure 2.2: Fibers



Figure 2.3: Calcium oxalate crystals



Figure 2.4: Starch grains



Figure 2.5: parenchyma



Figure 2.6: phloem fiber

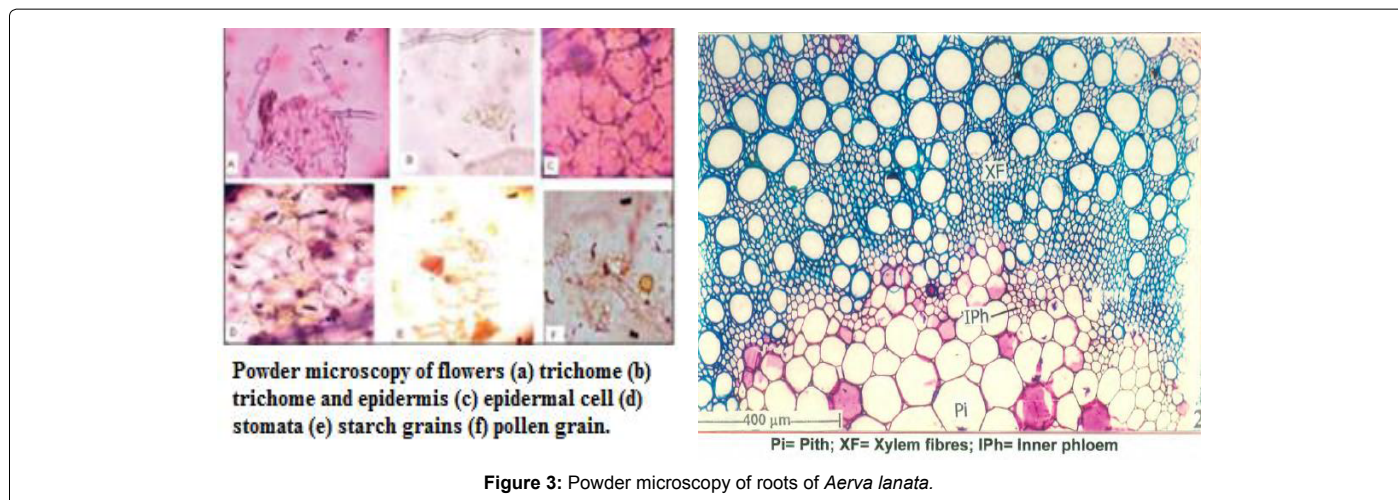


Figure 2.7: Cork cells



Figure 2.8: Tricho scleride

Figure 2: Microscopy of *Aerva lanata* roots.



### Chemical constituents

*Aerva lanata* leaves contained low levels of anti-nutrients, such as tannic acid (0.35%), saponin (7.67%) flavonoids (3.75%), oxalate (3.69%) and phytin-phosphorus (6.50%) but a little bit high in alkaloids (11.4%) and phytic acid (23.1%). The aerial parts of *A. lanata* have been reported to contain Oacylglycosides, narcissin (isorhamnetin-7-O-rutinoside), feruloyltyramine, aervitrine, syringic acid, vanillic acid, ferulic acid (Chawla et al.). The whole plant of *A. lanata* contains  $\beta$ -Sitosterol,  $\alpha$ -amyrin, betulin, hentriacontane, sitosterol palmitate, D-glucoside, glycosides, Kaempferol-3-galactoside and Kaempferol-3-rhamnolactoside, starch, free sugars (fructose, galactose, rhamnose and sucrose). Alkaloids, phenolic compounds, phytosterols, carbohydrates, proteins, amino acids, flavonoids and quinones were identified in different solvent extracts (Figure 4) [9].

### Biological activities

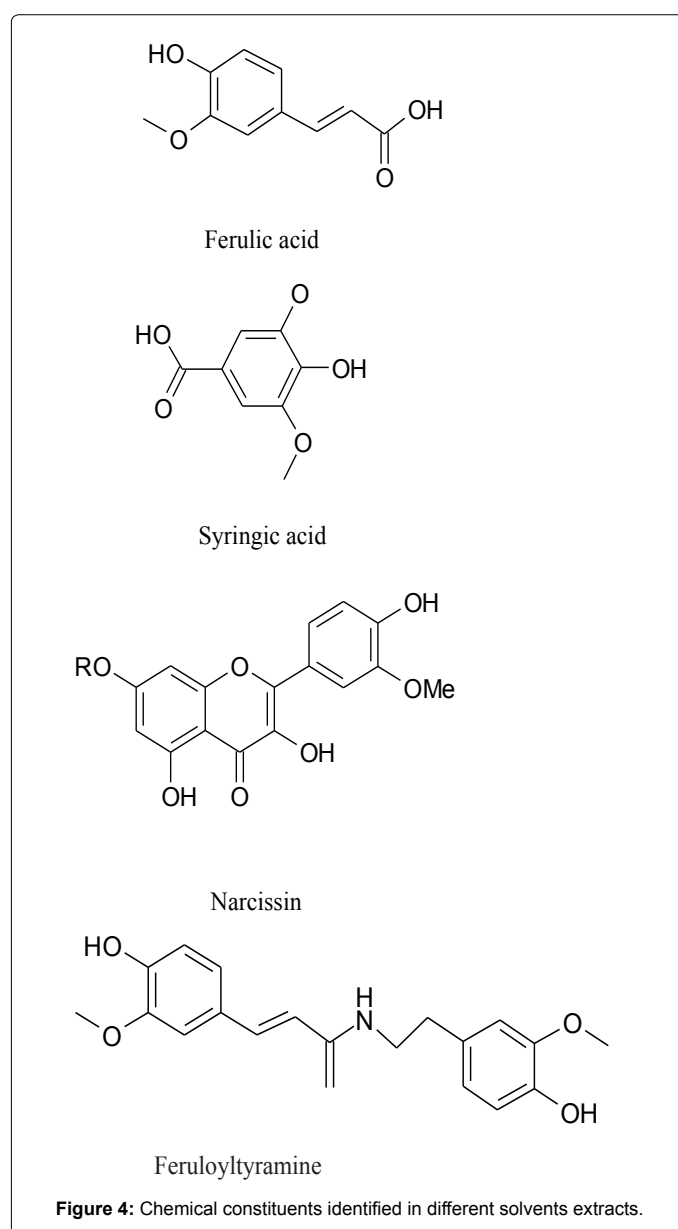
**Diuretic activity of *Aerva lanata* flowers:** The hydro-alcoholic extract of flowers of *Aerva lanata* was screened for its diuretic activity in rats. The diuretic activity studied in 5 and 24 hours and the extract showed increase of urine volume,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Cl}^-$  ions as compared to normal saline. The hydro-alcoholic extract of flowers of *Aerva lanata* upon phytochemical investigation revealed the presence of flavonoids, glycosides, carbohydrates, alkaloids and phytosterols [10].

**Anthelmintic activity:** The phytoconstituents may be responsible to show a potent anthelmintic activity. Methanolic extract of aerial parts of *Aerva lanata* at concentration of 100 mg/ml caused paralysis in 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* [4].

**Antibacterial activity:** Ethyl extract of *A. lanata* shows antibacterial activity against *Bacillus cereus*, *Staphylococcus aureus*, *Shigella flexneri*, *Klebsiella sp.* and antifungal activities against *Aspergillus niger*, *Candida albicans*. The ethyl acetate extract shows more interesting antibacterial and antifungal properties than petroleum ether and methanolic extract [11].

**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 concentration. At the concentration of 0.5 mg/ml to 2 mg/ml all extractions of *Aerva lanata* shows significant inhibition of recombinant HIV-RT [12].

**Antioxidant activity:** *B. diffusa* and *A. lanata* extracts, in the dose



of 100 mg/kg, improved the SOD, Catalase, and Peroxidase levels significantly, which were comparable with Silymarin. Methanolic 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. Both the extracts were found to inhibit lipid peroxidation [13].

**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<sup>-1</sup> and the activity is comparable 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<sup>-1</sup>) and acetyl salicylic acid induced analgesic activity [14].

**Hepatoprotective activity:** Hydroalcoholic extract of *Aerva lanata* is used against paracetamol induced liver damage in rats. The hydroalcoholic extract of *Aerva lanata* (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 [15].

**Antifertility activity:** Due the presence of  $\alpha$ -amyrin in *A. lanata*, it is used as antifertility 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%, respectively 400 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%.

#### Acknowledgements

Authors are thankful to President and Hon. Secretary of Khalsa College Charitable Society, Amritsar and Director-Principal, Khalsa college of Pharmacy, Amritsar for their inspiration, encouragement and support.

#### References

1. Deepa T, Vijayalakshmi R (2012) Studies on phytochemical constituents and hairy root induction from the leaf segments of *Aerva lanata* through *Agrobacterium rhizogenes*. *Int J C Surr Sci* 11-13.
2. Adepu A, Narala S, Ganji A, Chilvalvar S (2013) A review on natural Plant: *A.lanata*. *International Journal of Pharma Sciences* 3: 398-402.
3. Yamunadevi M, Wesely EG, Johnson M (2010) Phytochemical studies on the terpenoids of medicinally important plant: *Aerva lanata* L. using HPTLC. *Asian Pacific Journal of Tropical Biomedicine* 220-225.
4. Rajesh R, Chitra K, Parakh PM (2011) *Aerva lanata* (Linn) Juss. Ex schult-An overview, *Indian journal of natural products and resources* 2: 5-9.
5. Varghese KJ, Anila J, Nagalekshmi R, Resiya S, Sonu J (2010) Dasapushpam the traditional uses and the therapeutic potential of ten sacred plant of Kerala state in india. *IJPSR*.
6. Appia KG, Ravi VK, Nandy BC, Meen KC, Dey S, et al. (2009) Hypoglycemic and Antihyper lipidaemic Effect of Ethanolic Extract of Aerial Parts of *Aerva lanata* Linn. In Normal and Alloxan induced Diabetic Rats. *International Journal of Pharmaceutical Sciences and Drug Research*. 1: 191-194.
7. Vijayalakshmi R, Ravindhran R (2013) Pharmacognostic studies on roots of *Diospyrus ferreae* (willd) bakh and *Aerva lanata* Linn. A potent indian medicinal plants 6.
8. Silivia N, Rajeshwari CH, Mounica D, Manasa R, Prasanth DSNK (2014) Pharmacognostic and Phytochemical Studies on Flowers of *Aerva lanata*. *Juss. ex. Schultphocog* 5.
9. Nagaratna A, Prakash LH, Harini A (2014) Pharmacological review on gokhraj ganja. *Journal of pharmacognosy and phytochemistry* 2.
10. Anita A, Retna AM (2013) Review on the medicinal plant-*Aerva Lanata*. *Asians journal of biochemical and pharmaceutical research* 3.
11. Gajalakshmi S, Vijayalakshmi S, Rajeshwari DV (2013) Pharmacological activities of *A. lanata*: a perspective review, *International Research journal of pharmacy* 3.
12. Gujeeti RP, Mamidala E (2014) Anti-HIV activity and cytotoxic effect of *A. lanata* root extract. *AJPCT* 2: 894-900.
13. Ramachandra YL, Raja HJS, Gurumurthy H, Ashajyothi C, Rai PS (2013) Evaluations of antioxidant activity of *Aerva lanata* and *boerhiviadiffusa* plant extracts in CCL<sub>4</sub> toxicated rats, *International journal of drug formulation and research* 4: 1-8.
14. Venkatesh S, Yanadaiah JP, Zareen M, Madhava RB, Ramesh M (2009). Antinociceptive effect of *Aerva lanata* ethanolic extract in mice: A possible mechanism *Asian Pharmacodynamics and Journal of Pharmacokinetics* 9: 58-62.
15. Manokaran S, Jaswanth A, Sengottuvel S, Nandhakumar J, Duraisany R, Karthikeya D, Mallegaswari R (2008) Hepatoprotective activity of *Aerva lanata* Linn. against paracetamol induced hepatotoxicity in rats. *Research J. Pharm and tech*.