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A REVIEW ON AERVA LANATA: AVENUE OF MEDICINAL PROPERTIES

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Abstract
A perennial undershrub with a prostrate or succulent growth habit, *Aerva lanata* (Linn.) Juss. ex Schult. is a member of the Amaranthaceae family and can be found growing 900 meters above sea level on mountain slopes. It is commonly known as Mountain knotgrass or Gorakhabooti in Hindi and is a gift from nature because of all of its healing properties. It is a member of the Pashanbheda family of plants that are used to treat kidney stones. It has a wide range of therapeutic uses in conventional and folk medicine across numerous geographical contexts. It contains a wide variety of phytochemicals, including flavonoids, phenolic acids, steroids, terpenoids, canthin-6-one and Î2-carboline alkaloids, which contribute to its broad spectrum of pharmacological actions. It is a treasure of nature due to its antiurolithiatic, diuretic, hepatoprotective, anticancer, immunomodulatory, antioxidant, antibacterial, and countless other pharmacological properties. The goal of the current review is to give readers a thorough understanding of the description, ethnomedical applications, pharmacognostic characteristics, phytoconstituents, pharmacological, and tissue culture investigations that have been investigated to date.

Keywords: Medicinal plants, *Aerva lanata*, Phytochemicals, Pharmacology,

Introduction
The huge supply of medicinal herbs utilized in both ancient and modern times to cure a wide range of illnesses is known as biodiversity. These potentially medicinal plants include a wide range of phytochemicals and secondary metabolites that may have therapeutic potential for treating a wide range of illnesses. Since very early times, herbal treatments have been used to treat many infections. Both in the past and the present, plants have been used to make medicines. Pharmacological studies on plants have grown recently since they have fewer side effects than manufactured medications. Plants become more well-liked due to their efficiency, affordability, and accessibility. High levels of stress and a change in lifestyle are the causes of many health problems nowadays. A highly frequent cause of death is an infectious disease. Bacteria are becoming more resistant to frequently used antibiotics, and there are an increasing number of novel illnesses. The nation's crude cancer rate has also gone up. Researchers should concentrate on using traditional drugs to create a new treatment for it (Mohammed, 2019; Srivastava, 2018; Sofowora *et al*., 2013)
The Amaranthaceae family includes *Aerva lanata*, often known as Gorakha Ganga, which belongs to the genus Aerva and species lanata. India, Africa, and Australia are where it first originated. The traditional medical system has been using this herb for generations. Its pharmacological characteristics have attracted a lot of attention lately. Ayurveda, Siddha, and Unani treatments in

India use many plant species to cure a variety of illnesses with no or no adverse effects (Adepu *et al*., 2013)

Morphology

Aerva lanata is a prostrate dioecious herb with a tap root that is cylindrical, branched, 7-12 cm long, 2-8 mm thick, straight or slightly twisted with many slender, fibrous lateral roots, pale yellowish brown on the outside and whitish on the inside, camphoraceous smelling, and it has many branches that branch from the root base and are pubescent/woolly-tomentose and striate. Short petiole, exstipulate, elliptic, obovate, or suborbicular lamina, obtuse or acute apex, tapering base, hairy above and more or less white cottony beneath. Simple, alternate leaves with an entire edge. A spikatate inflorescence produces subglobose clusters of flowers. Very small, sessile, typically bisexual, and greenish or hoary white, flowers. An ovary with five lobed stamens and a subglobose or oval perianth. Fruits are circular, compressed membrane utricle capsules that are greenish in color and have a coriaceous upper section or lid that contains a single seed. Reniform, shiny black coriaceous testa comprise the seed (Athira and Nair, 2017; Ragavendran, 2011).

Distribution

The plant grows as a common weed in fields, wastelands, and hills up to 3000 feet above sea level throughout India's plains. Additionally, it can be found in the Phillipines, Java, Sri Lanka, Egypt, Tropical Africa, and Arabia. Particularly in Tamil Nadu, Andhra Pradesh, and Karnataka states in India (Kirtikar and Basu, 1999).

Taxonomical classification

Subkingdom: Viridaeplantae
Infra kingdom: Streptophyta
Phylum: Mangoliophyta
Class: Magnoliopsida
Subclass: Caryophyllidae
Super order: Caryophyllanae
Order: Caryophyllales
Family: Amaranthaceae
Division: Tracheophyta
Subdivision: Spermatophytina
Infra division: Angiospermae
Genes: Aerva
Species: Lanata (Goyal *et al*., 2011).

Figure: *Aerva lanata*

Phytochemistry

Alkaloids:

Plant contains biological active canthin-6-one alkaloids such as 10-methoxy-canthin-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-D-glucopyranosyloxycanthin-6-one (ervoside), aervine (10-hydroxycanthin-6-one), methylaervine (10-methoxycanthin-6-one) and aervoside (10-β-D-glucopyranosyloxycanthin-6-one). Plant also contains alkaloids like β-carboline-1 -propionic acid, 6-methoxy-β-carboline-1-propionic acid, 6-methoxy-β-carbolin-l-ylpropionic acid (ervolanine), and aervolanine (3-(6-methyoxy-β-carbolin-1-yl) propionic acid) (Yamunadevi *et al*., 2011; Zapesochnaya *et al*., 1991).

Flavanoids

The fl avanoids kaempferol, quercetin, isorhamnetin, isorhamnetin 3-O-[4-p-coumaroyl--rhamnosyl(1-6) galactoside, and fl avanone glucoside are abundant in the plant species *Aerva lanata*. the persinosides A and B, the 3, 6, and 7-trimethoxy-5, 4'-hydroxyflavone Apigenin 7-O-D-glucoside, 7-O-D-glucopyranoside, 5-hydroxy-3, 6, 7, 4-tetramethoxyflavone, 3-, 5-, 6-, 7-trihydroxy-4'-methoxyflavone, 5-hydroxy-2, 3,5, 6, 7, pentamethoxy flavone, (Pervykh *et al*., 1992).

Miscellaneous phytoconstituents

Methyl grevillate, lupeol, lupeol acetate, benzoic acid, -sitosteryl acetate, and tannic acid are also present in *Aerva lanata*.

Nutritive content

Aerva lanata leaves were found to have significant levels of ash (31.2 g/100g), crude protein (22.6 g/100g), and carbohydrates (26.6 g/100g). The leaves had a high concentration of PO4 (187), a moderate concentration of other minerals including K (47.9), K (Potassium) (39.4), Ca (Calcium) (51.7), Mg (Magnesium) (41.5), Zn (Zinc) (44.7), and Fe (Ferrous) (11.0), and a low concentration of Mn (Manganese) (1.04). (Omoyeni *et al*., 2009).

Ayurvedic properties

Kashaya (astringent), Tikta (bitter), Rasa (taste), Laghu (light), Tikshna (sharpness), Guna (property), Usna (hot), Virya (potency), Katu (pungent), and Vipaka (taste at the end of digestion) are stated to be the qualities of the plant. Mootrala (diuretic), Vedanahara (analgesic), Ashmarighna (lithotriptic), Krimighna (anthelmintic), Kasahara, and Mehahara (diabetes) are the karma (Actions) that the plant is ascribed for. Because of its Prabhava (Special action), it has Ashmaribhedana (urolithic property). In Tamakashwasa (Asthama), the leaves and the flowers are employed in the form of Dhumapana (fumigation), the Kwatha (decoction) of its root is utilized in the condition of mootrakrichra (Dysuria), and the Phanta (hot infusion) of flowers is useful in Ashmari (Renal stones) (Levekar *et al*., 2007; Sharma and Nighantu, 1983).

Vernacular names of *Aerva lanata*

Sanskrit: Shwethashelaa, Astmabayda, Bhadra
Hindi: Gorakhaganja, Gorakhabooti, Kapurijadi
English: Mountain knot grass
Kannada: Bilihindee soppu, Vibhoothikasa, Pashanabhedi
Marathi: Karur-madhurain
Punjabi: Buikallan
Tamil: Chirupoolaiin
Telgu: Pindikoora/ Kondapindi
Odiya: Paunsia (Pandey *et al*., 2009; Gurudeva, 2001).

Ethno medicinal importance

For cases of herpes in Orrisa, the entire plant is used. The root extract is used in Gujarat (Hills of Kutch district) to treat headaches. This plant is known as "Baliopov" by the locals of Trivandrum (Kerala). The whole plant is used as a garbhashayabalya (Uterine tonic) and given starting on the sixth day after delivery for three days in the form of Halwa (sweet dish) with rice and jaggery. The

juice of the whole plant is used internally to treat measles in Kolkata (West Bengal). When treating skin conditions, the root of this plant is placed externally over the affected area in Madhya Pradesh after being roasted, combined with mustard oil. The root decoction is utilized in Andhra Pradesh's east and west Godavari for ailments like albuminuria in children. People in the Madhya Pradesh hamlet of Nakulnar use the stem parts of this plant to tie around the necks of the livestock to get rid of worms in wounds (Nagaratna *et al*., 2014; Gogte, 2000).

Pharmacological activity

Antidiuretic Activity

The use of antibiotics to treat diuresis frequently results in a drop of blood sugar levels, cardiac conditions, hypertension, etc. The flow of urine and the amounts of salt, potassium, and chloride in the urine significantly increased when an alcohol extract of *Aerva lanata* was used. On healthy albino rats, a different study compared the diuretic efficacy of concentrated ethanolic extracts of *Aerva lanata* and *Aerva tomentosa* and found that *Aerva lanata* alone increased urine production. Here, frusemide was the control medication, although its diuretic activity was only marginally different from that of frusemide (Kumar *et al*., 2005; Sundar *et al*., 2022).

Antimicrobial:

Gram-positive (Bacillus, Staphylococcus) and Gram-negative (*E. coli*, Shigella, Klebsiella, Candida species) bacteria are the most likely to cause microbial infections, and pet ether, ethyl acetate, and carbinol extracts on the entire plant of Aerva lanata neutralize their effects. When combined with chloroform, the Aerva lanata extract was found to be highly effective against microorganisms, significantly inhibiting both gram-negative and gram-positive organisms (Chowdhury *et al*., 2002; Murugan *et al*., 2014).

Antidiabetic Activity

Many people are affected by the metabolic condition known as diabetes mellitus (DM). The mainstays of DM treatment are oral glycaemic medications and insulin. Aerva lanata roots' PPABTF (Partially Purified Alkaloid Basified Toluene Fraction) shown antihyperglycemic efficacy against type 2 diabetes brought on by streptozotocin nicotinamide in rats. In dose-dependent oral administration of an ethanolic extract of Aerva lanata for four weeks, diabetic rats treated with alloxan had blood glucose levels comparable to those of standard medication metformin (Agrawal *et al*., 2013; Vetrichelvan and Jegadeesan, 2002).

Analgesic activity

On the hot plate test and acetic acid-induced writhing in mice, the ethanolic extract of the dried aerial portion of A. lanata (50 and 100 mg/kg) demonstrated substantial antinociceptive action. When compared to aspirin and morphine, the study found considerable dose-dependent analgesic effect in both test animals. Peripheral pain receptors, rather than central opioid receptors, may be involved in this function (Venkatesh *et al*., 2009; Sharma *et al*., 2011).

Anti-oxidant activity

In experimental rats with hepatotoxicity (treated with CCl4), the petroleum ether and methanol extracts of two separate doses of the whole plant of *A. lanata* (100 and 200 mg/kg) demonstrated a significant dose-dependent reduction of lipid peroxidation. The whole plant extracts of A. lanata in water, ethanol, and aqueous ethanol demonstrated concentration-dependent antioxidant activity in experimental rats when compared to several standards, including butylated hydroxytoluene and ascorbic acid (Ramachandra *et al*., 2013 Paramasivam *et al*., 2012).

Anti-diarrheal

Aerva lanata and A. javanica ethanolic and aqueous extracts were tested for anti-diarrheal properties. In the charcoal meal test, every extract significantly reduced the incidence of diarrhea. It

is proposed that the mechanism of action is to decrease intestinal transit (Joanofarc J, Vamsadhara *et al*., 2003).

Antifertility activity

Rat spermatozoa were used as in vitro models to test the anti-implantation, abortion-inducing, and motility effects of an ethanolic extract of the aerial portions of Aerva lanata. Both the dosage and the start of treatment on particular days of pregnancy appear to affect the anti-implantation impact. At doses of 200 and 400 mg/kg b/w, respectively, Aerva lanata demonstrated pre-implantation loss of 20% and 30% compared to control. At doses of 200 and 400 mg/kg b/w, respectively, the treated groups experienced a percentage of pregnancy failure of 30% and 40%. Rat spermatozoa showed no motility when Aerva lanata was used at a 10% concentration for 60 seconds (Savadi and Alagawadi, 2009).

Anti-HIV

Activity Using the Retro Sys HIV-1 RT activity kit (Innovagen, Sweden), anti-HIV activity of *A. lanata* root extracts (hexane, chloroform, ethyl acetate, acetone, and methanol) demonstrated HIV-RT inhibition. Of all the extracts, chloroform extract showed the highest HIV-RT inhibition at 2 mg/ml against the control drug azidothymidin (Gujjeti *et al*., 2014).

Anti-helmintic activity

The aqueous and alcoholic extract of A. lanata's leaf and stem showed good anti-helmintic activity against both tapeworms (Taenia solium) and earthworms (*Pheretima posthuma*) in four different doses (2.5, 5, 10, and 20 mg/ml), but the alcoholic extract was more potent when compared to the standard drug albendazole (Anantha *et al*., 2010).

Immunomodulatory and antitumor

Aerva lanata's petroleum ether extract significantly reduced the viability of Daltons lymphoma ascites (DLA) tumor cell lines in vitro and promoted lymphocyte proliferation both there and in living organisms. When given A. lanata treatment, DLA-bearing animals lived longer than control animals. The normal levels of liver marker enzymes compared to the increased levels of these enzymes in DLA alone infected mice showed that the partially purified fraction was also hepatoprotective.

In vitro tests on DLA, Ehrlich ascites (EA), and B16F10 cell lines revealed that the petroleum ether extract of Aerva lanata's partly thin layer chromatography-purified fraction was cytotoxic. It was employed to explore the pharmacological effect and its ability to lessen the solid tumors caused by DLA cell lines in mice because partially TLC-purified fraction was discovered to be more cytotoxic to DLA cell lines (Nevin and Vijayammal, 2005; Nevin and Vijayammal, 2003).

Hypolipidemic

Rats with calcium oxalate uroliths caused by ethylene glycol were used to test Aerva lanata's hypolipidemic activity. Rats with calcium oxalate uroliths had considerably higher amounts of triglycerides, total lipids, and total cholesterol in their serum. In addition, calcium oxalate urolithic rats had changed amounts of phospholipids (PL), high-density lipoproteins (HDL), low-density lipoproteins (LDL), and very low-density lipoproteins (VLDL). When Aerva lanata aqueous suspension was added, the aforementioned modifications returned to almost normal. These findings suggest that in calcium oxalate urolithiasis, the aqueous suspension of Aerva lanata functions as a hypolipidemic agent (Soundararajan *et al*., 2007).

Conclusion

Herb *Aerva lanata* is frequently used. The therapeutic value of the plant in treating a variety of ailments, particularly diseases of the urinary system, is consistent with and supported by the pharmacological research. The research have thus far been conducted in vitro and in vivo. However,

more analysis of these findings is necessary to determine their isolated mechanisms and guiding principles. Additionally, there is a need for human trials to confirm the results of research gleaned from various animal models.

References

1. Mohammed AH. Importance of medicinal plants. Research in Pharmacy and Health Sciences. 2019;5(2):124-5.
2. Srivastava AK. Significance of medicinal plants in human life. InSynthesis of Medicinal Agents from Plants 2018 Jan 1 (pp. 1-24). Elsevier.
3. Sofowora A, Ogunbodede E, Onayade A. The role and place of medicinal plants in the strategies for disease prevention. African journal of traditional, complementary and alternative medicines. 2013 Aug 14;10(5):210-29.
4. Adepu A., Narala S., Ganji A. and Chilvalvar S. (2013). A Review on natural plant: Aerva lanata. Int J Pharma Sci.,3: 398-402.
5. Athira P, Nair SN. Pharmacognostic review of medicinal plant Aerva lanata. J Pharm Sci Res. 2017;9(9):1420.
6. Ragavendran P, Sophia D, Arul Raj C, Gopalakrishnan VK. Functional group analysis of various extracts of Aerva lanata (L.,) by FTIR spectrum. Pharmacologyonline. 2011;1:358-64.
7. Kirtikar KR, Basu BD. Indian Medicinal plants. Edn 2, Vol 3, International book distributors, Dehradun, 2065.
8. Goyal M, Pareek A, Nagori BP, Sasmal D. Aerva lanata: A review on phytochemistry and pharmacological aspects. Pharmacognosy reviews. 2011 Jul;5(10):195.
9. Yamunadevi M, Wesely EG, Johnson M. Chromatographic finger print analysis of steroids in Aerva lanata L by HPTLC technique. Asian Pacific Journal of Tropical Biomedicine 2011; 1(6):428-433.
10. Zapesochnaya GG, Kurkin VA, Okhanov VV, Perzykh LN, Miroshnilov AI. Structure of the alkaloids of Aerva lanata. Chem Nat Compd 1991;27:725-8
11. Pervykh LN, Karasartov BS, Zapesochnaya GG. A study of the herb Aerva lanata IV. Flavonoid glycosides. Chem Nat Compd 1992;28:509-10.
12. Omoyeni OA, Adeyeye EI. Chemical composition, calcium, zinc and phytate interrelationships in Aerva lanata (Linn) Juss. ex schult leaves. Orient J Chem 2009;25:485-8
13. Levekar GS. Database on Medicinal plants used in Ayurveda & Sidda. Vol 8, CCRAS, New Delhi, 2007, 85- 90.
14. Sharma PV, Nighantu P. Edn 1, Chaukhambha Surabharati Prakashan, Varanasi, 1983, 91.
15. Pandey G, Dwivedi RR, Baghel MS. Sodala Nighantu of Sodala. Edn 1, Chaukhambha Krishnadas Academy, Varanasi, 2009, 132
16. Gurudeva MR. Botanical and vernacular names of south Indian plants. Divyachandra Prakashana; 2001.
17. Nagaratna A, Prakash LH, Harini A. A pharmacological review on gorakha ganja (Aerva lanata (Linn) Juss. ex. Schult). J Pharmacogn Phytochem. 2014;3:253-7.
18. Gogte VVM. Ayurvedic pharmacology & therapeutic uses of Medicinal plants. Edn 1, Bharatiya vidyabhavan, Mumbai, 2000, 294.
19. Kumar D, Prasad DN, Bhatnagar SP. Comparision of diuretic activity of ethanolic extract of Aerva lanata (linn.) juss. ex. Schult & Aerva tomentosa forsk. Family: Amaranthaceae. Anc Sci Life. 2005;25(2):66
20. Sundar NS, Dhasarathan P, Narayanan KR, Thenmozhi M. Screening of Anti Diuretic Activity Aerva Lanata Extracts against Furosemide Exposed Rodent Models. New Visions in Biological Science Vol. 8. 2022 Jan 15:160-4.
21. Chowdhury D, Sayeed A, Islam A, Shah Alam Bhuiyan M, Astaq Mohal Khan GR. Antimicrobial activity and cytotoxicity of *Aerva lanata*. Fitoterapia. 2002; 73(1): 92-94
22. Murugan M, Mohan VR. Phytochemical, FT-IR and antibacterial activity of whole plant extract of Aerva lanata (L.) Juss. Ex. Schult. Journal of Medicinal Plants Studies. 2014;4(3):51-7.

23. Agrawal R, Sethiya NK, Mishra SH. Antidiabetic activity of alkaloids of Aerva lanata roots on streptozotocin-nicotinamide induced type-II diabetes in rats. Pharm Biol. 2013;51(5):635-42
24. Vetrichelvan T, Jegadeesan M. Anti-diabetic activity of alcoholic extract of Aerva lanata (L.) Juss. ex Schultes in rats. Journal of ethnopharmacology. 2002 May 1;80(2-3):103-7.
25. Venkatesh S, Yanadaiah JP, Zareen N, Reddy BM, Ramesh M. Antinociceptive effect of Aerva lanata ethanolic extract in mice: A possible mechanism. Asian Journal of Pharmacodynamics and Pharmacokinetics 2009; 9(1):58-62.
26. Sharma A, Tanwar M, Nagar N, Sharma AK. Analgesic and anti-inflammatory activity of flowers extract of Aerva lanata. Advances in Pharmacology and Toxicology. 2011 Dec 1;12(3):13.
27. Ramachandra YI, Raja HJS, Gurumurthy H, Ashajyothi C, Rai PS. Evaluation of antioxidant activity of Aerva lanata and Boerhavia diffusa plant extracts in ccl4 toxicated rat. International Journal of Drug formulation and Research 2013; 4(1):1-8.
28. Paramasivam Ragavendran DS, RAJ CA, Starlin T, gopalakrishnan vk. Phytochemical screening, antioxidant activity of Aerva lanata (L)–AN Invitro STUDY. Asian Journal of Pharmaceutical and Clinical Research. 2012;5(2):77-81.
29. Joanofarc J, Vamsadhara C. Evaluation of antidiarrhoeal activity of Aerva species. *Nat Prod Sci.* 2003;9:177–9.
30. Savadi R, Alagawadi K. Antifertility activity of ethanolic extracts of plumbago indica and Aerva lanata on albino rats. Int J Green Pharm 2009;3:230-3
31. Gujjeti RP, Mamidala E. Anti-HIV Activity and Cytotoxic Effects of Aerva lanata Root Extracts. American Journal of Phyto medicine and Clinical Therapeutics 2014; 2(7):894-900
32. Anantha D, Kumar TI, Kumar MS, Reddy AM, Mukharjee NSV, Rao AL. In-vitro Anti-helmentic Activity of aqueous and alcoholic extracts of Aerva lanata Stems and leaves. Journal of Pharmaceutical Science & Research 2010; 2(5):317-321.
33. Nevin KG, Vijayammal PL. Pharmacological and immunomodulatory effects of Aerva lanata in daltons lymphoma ascites-bearing mice. Pharm Biol. 2005;43:640–6. [Google Scholar]
34. Nevin KG, Vijayammal PL. Effect of Aerva lanata on solid tumor induced by DLA cells in mice. Fitoterapia. 2003;74:578–82.
35. Soundararajan P, Mahesh R, Ramesh T, Begum VH. Hypolipidemic activity of Aerva lanata on ethylene glycol induced calcium oxalate urolithiasis in rats. Pharmacologyonline 2007;1:557-63