*ejpmr, 2022, 9(9), 440-447*

**SJIF Impact Factor 6.222**

**EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH**

www.ejpmr.com

**Review Article**

**ISSN 2394-3211**

**EJPMR**

# BISHARI BOOTI (*AERVA LANATA* (L.) JUSS. EX SCHULT): ETHANOMEDICINAL IMPORTANCE OF A VALUABLE PLANT FROM MOTHER NATURE

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**Article Received on 21/07/2022** **Article Revised on 11/08/2022** **Article Accepted on 01/09/2022**

## ABSTRACT

Bishari Booti (*Aerva lanata* (L.) Juss. Ex Schult is a prostrate herb belongs to the family Amaranthaceae. It also known by the name of *Gorakshaganja*. It is considered one among the few plants listed as *Pashanbheda*. It is a traditional plant in India used for the treatment of several medical conditions like dysmenorrhea, urolithiasis, cough, intoxications, skin infections etc. On the basis of bioactive compounds like alkaloids, flavonoids, phenol, tannin, proteins, amino acids and carbohydrates, various pharmacological studies like anti-hyperglycaemic, lithotriptic, anthelmintic, anti-hyperlipidaemia, hepatoprotective, anti-oxidant and anti-microbial activities etc. have been done. This review encompasses the morphology, chemical constituents, and pharmacological activities of *Aerva lanata* and available literature on the plant, which might be supportive to discover new chemical entities responsible for its claimed traditional uses.

**KEYWORDS:** *Bishari Booti*; *Gorakshaganja*; Unani Medicine; *Aerva lanata*; Lithotriptic; Diuretic.

## INTRODUCTION

In present days, scientific studies on pharmacological activities of various medicinal plants are being done throughout the world. It is reported by the World Health Organization (WHO) that 80% population from developing countries depends upon the traditional medicines for primary health care, mainly plant origin drugs. Medicinal plants exhibit lower side effects compare to synthetic drugs because of this reason use of medicinal plant is growing worldwide.[1]

*Aerva lanata* (L.) Juss Ex. Schult of Amaranthaceae, is a perennial branching shrub, commonly found in different waste parts of India. It is also known as *Gorakhganja*. They are found in India, Africa and Australia. It is also known as "knot grass". The plant has different name in different language like *Astmabayda* in Sanskrit, *Gorakh Booti* in Hindi. It is one of the important plants grow in the warmer parts of India ascending to 1,000 m. It is one of the plants included in *Dasapushpam* (ten sacred flowers) of Kerala. This is one of the most important drugs of urinary system which is used for diuretic and lithotriptic properties in Ayurveda. In addition to kidney diseases, it also reported for various pharmacological properties to cure ailments like leucorrhoea, spermatorrhoea, dysentery, intestinal worms, headache, liver diseases, uterine diseases, venomous bites, etc. This herb is added in Unani System of Medicine in India seeing its beneficial Ethanomedicinal uses. The plant has an extensive range of traditional and folklore uses in different geographical locations.

Various research works have been done on the plant. Leaf extract of *A. lanata* is very effective in curing the urinary risk factors associated with calcium oxalate urolithiasis.[2]


**Fig. *Aerva lanata a.* illustration *b.* Fresh plant with leaves and flowers *c.* root**

***Mutaradifat* (vernacular names)**

Bengali: Coffee, Chaya[3]
English: Mountain knot grass[4]
Gujrati: Bur, Kapurimadhuri[5]
Hindi: Gorakhabooti, Kapurijadi, Chaya, Khali and Khari[1,4]
Kannad: Bilesuli, Bilihindosoppu[6] Vibhoothikasa, Pashanabhed[4]
Malayalam: Cherula
Marathi: Kapuri-madhura, Kaapurmadhuri[5]
Oriya: Paunsia
Panjabi: Bui-Kaltan, Buikallan (flowers as sold in bazaars)[3]
Rajasthani: Bhui[3]
Sindhi: Bhui, Jari[8]
Siddha: Sirupeelai[8]
Sanskrit: Gorakshaganja, Paashaanabheda, Satkabhedi, Aadaanpaak, Astmabayda[5,8]
Sinhalese: Polpala[9]
Tamil: Sirrupulayvayr, Sirupeelar[8]
Telugu: Pindi-Kura,[4] Pindi-chettu
Urdu: Gorakhganja[4]

***Taxonomical classification***

*Kingdom:* *Plantae*
Subkingdom: Viridaeplantae
Infra kingdom: Streptophyta
Phylum: Mangoliophyta
*Class:* *Mangoliopsida*
Subclass: Caryophyllidae
Super order: Caryophyllanae
*Order:* *Caryophyllales*
*Family:* *Amaranthaceae*
Division: Tracheophyta
Subdivision: Spermatophytina
Infra division: Angiospermae
*Genus:* *Aerva*
*Species:* *A. lanata*[3]

**Cultivation and collection**

*Aerva lanata* is cultivated by seed propagation. Each plant is planted with the space of 30 cm in a row. Sun light is needed for the growth of the plant. These plants are cultivated during the month of September. Flowering appears in the first year of cultivation. To prevent attack

of foreign substances like microorganism, weed, insect etc., inorganic, organic and synthetic fertilizers are used. Animal waste, plant waste (organic fertilizers), cow dung are also can be used.[10]

**Botanical Description**

It is an erect or prostrate dioecious herb which grows up to 80 cm height. Root- cylindrical and branched, tap root with a length of 7-2 cm and thickness 2-8 mm with numerous fibrous lateral roots possessing a camphoraceous odour. The colour of root is yellowish brown from outer side and whitish from inner side.[4] Shoots covered with smooth hairs.[11] Leaves stalk less, simple and alternate with lamina being elliptic or obovate or sub orbicular, along with obtuse or acute apex and tapering base and have white cottony hairs underneath.[4] The inflorescence consists of axillary heads or spikes.[12] Flowers are bisexual, small, sessile, and greenish in small dense crowded and forming globose cluster; bracteoles 1.25 mm. long, often closely membranous, broadly ovate, concave apiculate. Perianth is 1.5-1.25 mm long; sepals oblong, obtuse, sometimes apiculate, silky-hairy on the back[5] and stamen 5, filaments connate at base with alternating linear staminodes, anther 2- celled; ovary ovoid or sub globose unilocular with one ovule;[13] fruit is greenish, compressed, ovoid in shape with shining black and kidney bean like seed. Flowering time is from November to February.[14]

***Ja-e-Waqu'*** **(distribution):** It is grown 30-80 cm in height and is indigenous to tropical India, Tropical Africa, Saudi Arabia, Sri Lanka, Philippines, Java.[15] It is found frequently in shady places as a prostrate herb. Species is commonly found in gardens as a field weed in this area of Mawana Meerut District, Aligarh Uttar Pradesh. The plant is abundant on the plains in the warmer parts of India and is native in tropical Africa through Arabia and to the Philippines up to an altitude of 3000 meter.[16,17]

***Ajza-i-Musta'mla*** **(parts used):** Whole plant, flowers, leaves, stem, seed and roots in the form of decoction, soup, juice of fresh plant are used as medicine.[8,6]

***Mizaj*** **(temperament):** Hot and dry in 2nd degree.

**Ethnopharmacology**

The plant is used as anti-asthmatic[18] antidiuretic[19,20] nephroprotective[21] antidiabetic[22,23], Antihyperglycemic[24], antimicrobial[25], cytotoxic[26,27], anti-HIV[28], immunomodulatory[29], anti-inflammatory[30], analgesic[31], antiulcer[32] antioxidant[33], abortifacient[3], astringent[34], demulcent, diuretic[35], emollient[34], haemostatic[13], hepatoprotective[33,36,37], hypolipidemic[39], vermifuge[38] activities. In various localities and tribal areas, the plant is used for the treatment of several diseases as follows:

**Headache**

- In Gujarat (Hills of Kutch district) the root extract is used in headache.[40]
- A small piece of fresh root is crushed with a little amount of water and are mixed together to make a fresh root paste.
- This paste is rubbed on forehead for 3-4 times a day to relief headache.[41]

**Pyorrhea**

- The fruit powder is used to treat pyorrhea in Rayalaseema region of Andhra Pradesh.[42]

**Dysentery**

- The fruits are used to treat dysentery in the state of Rajasthan.[43]

**Lung diseases**

- The whole plant is used in asthma, and chest pain by the Kanitribals in Tirunelveli hills of Western Ghats and for pneumonia, in Eastern parts of Rajasthan and in cough by the villagers of Dindigul district, Tamil Nadu.[44,45,46]

**Heart tonic**

- The fruits are used as heart tonic in the state of Rajasthan.[43]

**Appetizer**

- The fruits are used as appetizer, in dysentery and heart tonic and the roots are used as demulcent and diuretic in the state of Rajasthan.[43]

**Intestinal worms**

- In a village called Nakulnar near Dantewara of Bastar district (Madhya Pradesh), people use the stem pieces of this plant to tie around the neck of the cattle's get rid of worms in the wounds.[47]

**Cholera**

- The whole plant and roots are used by tribal community of Odisha in the treatment of cholera.[48]

**Liver diseases**

- The extract prepared from the roots is given in the cure of jaundice in sub-Himalayan regions of Uttarakhand.[49]
- The roots are given in liver congestion, jaundice, biliousness, dyspepsia and the whole plant is used to treat pneumonia, typhoid and prolonged fevers in Eastern parts of Rajasthan.[45]

**Kidney Diseases**

- Afaq *et al* (1991) has mentioned it very effective for kidney disorders specially for controlling diabetes and lithiasis.[50]

**Antidiabetic**

- As antidiabetic the decoction of leaves is used by the Nadars of Atoor village of Kanyakumari district.[51]
- The plant is also used to cure diabetes in the Vattamalai hills of Namakkal district of Tamil Nadu.[52]

**Nephritis**

- The people in tribal villages of Theni district in Tamil Nadu uses the decoction of its fresh leaves per orally in case of inflammation due to kidney stones.[53]

**Kidney stone**

- It is used in the treatment of kidney stones in the Aravalli regions of Rajasthan.[54]
- The people in Chittoor district of Andhra Pradesh use the whole plant of *Aerva lanata* in the treatment of nephrocalcinosis and ureteral stones.[55]

**Retention of urine**

- The villagers in Udhampur district of Jammu and Kashmir use the decoction prepared from the whole plant as a diuretic.

**Spermatorrhoea**

- In Odisha the paste prepared from the whole plant is being used for spermatorrhoea.[56]

**Hydrocele**

- The root bark is given orally in the treatment of hydrocele in Odisha.[57]

**Albuminuria**

- In east and west Godavari of Andhra Pradesh the root decoction is used for albuminuria which occurs in children.[58]

**Skin ailments**

- The whole plant is used in the treatment of skin ailments by the various tribal of Rajasthan.[59]

**For wound Healing**

- The leaf paste is used for healing of wounds by the tribal of Niyamgiri Hill area of Kalahandi district. In Odisha the paste prepared from the whole plant is being used for spermatorrhoea.[56]

**Osteoporosis**

- The formulation of *Aerva lanata* combined with other herbs is used in the treatment of osteoporosis by the *Sardar* traditional medicinal practitioners of Bangladesh.[60]

**Leucorrhoea**

- The Rai tribal practitioners of Rajshahi district of Bangladesh use the crushed roots of the plant with a little salt to treat leucorrhoea.[61]
- The people in Chittoor district of Andhra Pradesh use the whole plant of *Aerva lanata* in the treatment of leucorrhoea.[55]

**Uterine tonic**

- Local people of Trivandrum (Kerala) identify this plant as "*Baliopov*", the whole plant is used as Uterine tonic and administered from 6$^{th}$ day of delivery for three days in the form of *Halwa* (sweet dish) with rice & jaggery.

**Antifertility**

- The aerial part of the *Aerva lanata* ethanolic extract which shows antifertility activity and anti-implantation. The dose ranges from 200-400 mg/kg.[62]

**Fever**

- It is used to cure malarial fever, by Nadars and Kanis of Kanyakumari district, Tamil Nadu.[63]
- The roots are given to treat typhoid and prolonged fevers in Eastern parts of Rajasthan.[45]
- In Kolkata (West Bengal) the juice of whole plant is given internally in Measles. In Madhya Pradesh the root of this plant is roasted and mixed with mustard oil and applied externally over the affected area in skin diseases.[64]

**Haemorrhoids**

- It is used to cure piles, by Nadars and Kanis of Kanyakumari district, Tamil Nadu.[63]

**Haemorrhage**

- It is used to cure haemorrhage by Nadars and Kanis of Kanyakumari district, Tamil Nadu.[63]

**Snake bite**

- It is used as an antidote for snake poison by Nadars and Kanis of Kanyakumari district, Tamil Nadu.[63]

**Herpes zoster**

- The whole plant is used in the cases of Herpes in Orrisa.[40]

***Kimiyawi Ajza* (chemical constituents)**

Phytochemical screening showed the presence of numerous classes of phytochemicals such as alkaloids, steroids, flavonoids, tannins, amino acids and proteins, carbohydrates, cardiac glycosides, saponins and terpenoids.[65] The four different flavanols identified were quercetin, Kaempferol, 4- methoxy kaempferol and 4, 7- dimethoxy kaempferol. It comprises of an extensive range of phytochemicals such as canthin-6-one and β-carboline alkaloids, flavonoids, phenolic acids, steroids, terpenoids and numerous other classes of phytoconstituents that contribute to its wide coverage of pharmacological activities. Plant contains biological active canthin-6-one alkaloids such as 10-methoxy-canthin-6-one, 10-hydroxy-canthin-6-one, 10-O-β-D-glucopyranosyloxy-canthin-6-one, 10-hydroxycanthin6-

one (ervine), 10-methoxycanthine-6-one (methylervine), 10-β-D-glucopyranosyloxycanthin6-one (ervoside), aervine (10-hydroxycanthin-6-one), methylaervine (10-methoxycanthin-6one) and aervoside (10-β-D-glucopyranosyloxycanthin-6-one).[41]

The *A. lanata* also comprises steroidal glycol-alkaloid solanin and chaconine.[66] The four new alkaloids were reported includes aervine, methyl aervine, aervoside, aervolanine.[19]

The leaves are a reservoir of minerals such as K, Na, Ca, Mg, Zn, Fe, Mn.[67]

**Element Analysis of *Aerva lanata***

| Macro elements | Ultra-trace elements | Micro elements |
|---|---|---|
| Ca, phosphorus, sodium, chloride[8] | Iron, fluoride, copper, cobalt, potassium, magnesium, chromium, iodine, sulphur, zinc, manganese, selenium, molybdenum.[8] | Boron, silicon, arsenic, nickel.[8] |

**Pharmacological studies**

Various pharmacological studies related to kidney diseases like antiurolithiatic, antidiabetic,[22,23], nephroprotective[21], diuretic[35], antimicrobial[25], activities, beside these other pharmacological studies like, antioxidant[33], anticancer, antitumor[3], hepatoprotective,[33,36,37] Immunomodulatory[29], antidiarrheal[3], anti-inflammatory[30], analgesic[31], antinociceptive, anthelmintic[38], antifertility[3], antiasthmatic[18], anti-HIV[28], antiparasitic[3], antineurotoxicity, anti-metastatic activity[10] are scientifically evaluated. Some of them mentioned as follows:

**Acute renal failure**

The ethanolic extract of *Aerva lanata* which used for kidney failure.[65]

**Nephroprotective activity**

The ethanolic extract showed nephroprotective activity against mercuric chloride induced nephrotoxicity in male albino rats. The serum levels of urea, uric acid, creatinine, SGPT, SGOT, alkaline phosphatase and cholesterol levels in a dose of 200 mg/kg and 400 mg/kg were found decreased, whereas the protein levels increased. There was also an increase in the vitamin C, glutathione content and antioxidant enzymes such as glutathione peroxidase, superoxide dismutase, catalase, glutathione S-transferase in the kidneys and livers of extract treated groups. This was further confirmed by histopathology of the liver and kidneys showing the absence of fatty infiltration, fatty degeneration and necrosis.[20] The ethanolic extract at a dose of 75, 150 and 300 mg/kg decreased the elevated levels of blood urea and serum creatinine in cisplatin and gentamicin induced renal toxicity in male albino rats in a dose-dependent manner. Histopathological characteristics in the kidneys of intoxicated animals like glomerular congestion, tubular casts, epithelial desquamation, interstitial oedema and inflammatory cells were normalized to a considerable extent in animals treated with various doses of extract.[21]

**Diuretic activity**

The hydro alcoholic extract of the *Aerva lanata* flowers (200 mg/kg, 400 mg/kg, 800 mg/kg and 1600 mg/kg) was screened for its diuretic activity for which Lipschitz test was followed. There was increase in urine volume and $Na^+$ $K^+$ and $Cl^-$ ions in treated group as compared to the vehicle treated group was noted.[68] Alcoholic extract of the powdered shoots showed a diuretic effect in a dose dependent form and also exhibited aquaretic, kaliuretic and chloruretic activities (400 and 800 mg/kg). The sodium and potassium ratio were reduced as half fold.[22] The methanolic extract of the roots (200 mg/kg) was evaluated for its diuretic activity in male Wistar strain albino rats by Lipschitz method where there was an increase in urine output compared to the control group. However, the sodium, potassium and chloride ion excretion were not significantly affected.[35] The ethanolic extract of the mature plants were compared for its diuretic activity (200 and 300 mg/kg) with *Aerva tomentosa* in healthy albino rats by the Lipschitz method. There was an increase in urine output, sodium, potassium and chloride levels in urine with *Aerva lanata*. The alcoholic extract of *Aerva lanata* only gave diuretic activity which was not in *Aerva tomentosa* as compared to standard diuretic drug furosemide.[69]

**Lithotriptic activity**

A polyherbal formulation of *Aerva lanata* with other herbs at a dose of 100 and 200 mg/kg decreased the levels of calcium and phosphate in the urine, serum uric acid, creatinine, urea and BUN in ethylene glycol (0.75%) induced urolithic rats. It also enhanced the urine pH, volume and magnesium content. The anti-urolithic activity was further evidenced by a decrease in the deposition of crystals in the kidney sections, tubular dilatation and necrosis.[70]

**Hepatoprotective**

The hydro alcoholic extract of *Aerva lanata* (600mg/kg) was administered orally to the animals with hepatotoxicity induced by paracetamol (3gm/kg). Silymarin (25mg/kg) was given as reference 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 was evident from significant reduction in serum enzymes alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP) and bilirubin.[71]

## CONCLUSION

*Aerva lanata* has been Ethno -medicinally used as therapeutic agent for the treatment of a variety of disease. Moreover, numerous research works have proven its uses beyond the Ethno medicinal ones in experimental animals. Alkaloids and flavonoids which were isolated from this plant may be responsible for its pharmacological activities. The road ahead is to established specific bioactive molecules, which might be responsible for these actions. Therefore, the cultivation, collection and further pharmacological exploration of *Aerva lanata* are essential.

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