Phyto-Pharmacological Aspects of *Bisehri Booti (Aerva Lanata)* and its Uses in Unani System of Medicine : A Review

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Abstract

This review article is an attempt to explore the origin and history of use of *Bisehri Booti (BB) (Aerva Lanata (Linn.)* in Unani system of medicine and to establish the fact that the drug is in fact a part of the rich documentation of the Unani system of medicine. It also recapitulates the action and uses of BB mentioned in Unani classical literature along with the morphology, phytochemistry and pharmacological aspects to provide a direction for further research. The review reveals that the plant, as part of folk medicine, has been used by some Unani Physicians of western Uttar Pradesh, India for cough, strangury (slow to be and painful discharge of urine), headache and Urolithiasis. Further, the authors in this article based on the review suggest that BB has many phytochemical constituents for example; alkaloids, flavanoids, tannic acid etc. in addition to activities like diuretic, anti-inflammatory, hypoglycemic, anti-diabetic, antiparasitic, antimicrobial, hepato-protective, anti-urolithiasis, anti-asthmatic, antifertility and hypolipidemic.

Keywords: *Aerva lanata Linn.* Bisehri booti, Pharmacology, Phyto-Chemistry, Unani Medicine.

Introduction

Bisehri booti (Aerva lanata (Linn.) Juss.; Family Amaranthaceae, is a common weed which grows wild everywhere in the plains of India. BB grows in Asia, Africa, Australia, Sri Lanka, South Asia, Saudi Arabia, Egypt, Java and Philippines (Lakshmi and Lethi 2014). BB is widely used by rural communities of India and Srilanka. It has been used for the treatment of Headache, Diarrhoea, Sore throat and Cough in Srilanka (Anonymous 1990, Trimen 1974). In Bihar region of India, it is used by common people for White urine, Diarrhoea and Snakebite (Jain 1976; Asolkar, et. al. 1992, Nadkarni 1976). The tribes of Rajasthan use the juice and decoction of the roots for treating liver congestion, jaundice, biliousness, dyspepsia, pneumonia, typhoid and other prolonged fevers (Singh & Pandey 1998). The drug was taken up by the traditional systems of medicine like Unani system of Medicine (USM), Ayurveda etc. The basis of such belief is the herbal origin of the USM which is not true. The USM is an exhaustively documented system with strong references of systemic pharmacology of the drugs.

The use of BB as a Diuretic and Anthelmintic agent is mentioned in the classical literature of USM. BB has been used for Haematuria, albuminuria and other nephrological disorders by some Tabeebs and the outcome was good. However, it seems to have been included later as it does not find mention in the important works on *Mufradat, Murakkabat* and *Moalajat* of USM. Although *Aerva lanata* L. is mentioned by Nadkarni (1976) and Kirtikar & Basu (1987) but they have not mentioned the term BB as one of its vernacular names. BB is derived

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from Arabic word Arwa (Collett, 1921). A renowned Unani physician of western Uttar Pradesh, Hakim Abdul Qadir (1930) had mentioned the use of BB in his book *Mujarrabat-e-Qadri* in the treatment of albuminuria, heamaturia, renal and vesicular calculi and prostatitis.

Ibn Baitar (1874) and Najmul Ghani (1921) have mentioned a drug *Aksar* which is somewhat similar in medicinal properties to *Aerva lanata*. Najmul Ghani (1921) has also mentioned that the synonym of *Aksar* is mentioned as *Arwa*. The morphological description mentioned in the books is not identical to *Aerva lanata* but the medical properties are somewhat similar to the plant. A well-known botanist of Aligarh Muslim University, Prof. S.H. Afaq (1991) was the first persi on to establish that *Bisehri booti* is *Aerva lanata* (Linn.) Juss.; Family Amaranthaceae, the other species are *A. Javanica* Burm. and *A. tomentosa* L. which are also commonly used as medicine.

Botanical Description

BB is an erect, prostrate under-shrub which grows as a common weed in the fields and wastelands in hotter plain parts of India. It is 1-4 ft. high, having tap root which is cylindrical and branches arising from the stem or root stock, straight or slightly twisted with many slender, fibrous lateral roots. Externally it is pale yellowish brown in colour and whitish internally with camphoraceous odorous (Thiselton, 1963; Trimen, 1974; Nagaratna et. al. 2014).

Taxonomy

Kingdom: Plantae (Plants)
Sub-kingdom: Tracheobionta (Vascular plants)
Division: Magnoliophyta (Angiospermes, flowering plants)
Class: Magnoliopsida (Dicotylédones)
Subclass: Caryophyllidae
Order: Caryophyllales

Family: Amaranthaceae
Genus: Aerva
Species: *Aerva lanata* (L.) A. L. Juss. ex Schultes

Common name

Ayurvedic: Paashaana bheda, Gorakshaganjaa, Aadaanpaaki, Shatkabhedi
Bengali: Chaya
Delhi: Gedue ki Chal
Hindi: Chaya, Gorkhabundi, Kapurijadi Bhui Kalan
Marathi: Kapurmadhura, Kapurimadhuri, Kapurphuti
Punjabi: Bui-kallan
Rajasthani: Bhui
Sanskrit: Astmabayda
Sindhi: Bui, Jari
Unani: Tarf- dosh,

In some areas of Madhya Pradesh, it is commonly known as Gorakha Benja and Pindikura (Bedi 1978; Dymock, et. al. 1890; Bamber 1916; Collett 1921; Patnayak 1956; Maheshwary 1963; Kirtikar & Basu 1975; Nadkarni 1976; Anonymous 1985).

Morphology

Herb, erect with a long tap-root, branches are many, pubescent or wolly-tomentose, striate generally originated from near the base. Leaves are alternate, 2-2 × 1-1.6 cm on the main stem, 6-10 x 5-6 mm on the branches, elliptic or obovate or subotbicular, obtuse or acute, entire, pubescent above, more or less white with cottony hairs beneath; petioles 3-6 mm long, often obscure (Thiselton, 1963; Trimen, 1974; Kirtikar, et. al. 1975,Nagaratna et. al. 2014).

Flowers are very small, sessile, often bisexual, dense sub-sessile axillary heads or spikes 6-13 mm long, greenish white in colour, sometime closely crowded and 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, acute; stigmas two, seed 0.85 mm in diameter, smooth and polished, black (Thiselton, 1963; Trimen, 1974; Kirtikar, et. al. 1975, Nagaratna et. al. 2014).

Part used: The whole plant, flowers, leaves, stem and roots. Both the juice of the fresh plant and extract of the dried plant are common in use (Qadri, 1930; Chunekar & Pandey 2010).

Flowering and Fruiting Season: November to January (Pandey, 2001).

Phytochemistry

BB consists of the following biological active constituents:

Alkaloids

It contains 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), 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) (Zapesochnaya, et.al. 1991a; Zapesochnaya, et.al. 1991b; Zapesochnaya, et. al. 1992).

Flavanoids

BB (*Aerva lanata* Linn.) is a rich source of flavanoids such as kaempferol, quercetin, isorhamnetin, isorhamnetin 3-O-β-[4-p-coumaroyl-α-rhamnosyl(1→6) galactoside and flavanone glucoside persinol, persinosides A & B 5, 4'-hydroxy-3, 6, 7-trimethoxyflavone, 5-hydroxy-3, 6, 7, 4-tetramethoxyflavone, 5-hydroxy 2', 3,5', 6, 7-pentamethoxyl flavone, 3,3',5,7-trihydroxy-4'-methoxyflavone, apigenin 7-O-β-D- glucoside and 7-O-β-D-glucopyranoside (Saleh, et. al. 1990; Pervykh, et. al. 1992; Ahmed, et. al. 2006).

Miscellaneous Phyto-constituents

Aerva lanata L. also contains methyl grevillate, lupeol, lupeol acetate benzoic acid, β-sitosteryl acetate and tannic acid (Omoyeni & Adeyeye, 2009).

Nutritive Content

Leaves of BB (*Aerva lanata* L.) contain carbohydrate, crude protein and ash. Some mineral composition revealed that the leaves were high in PO_4, and moderately high in other minerals such as Poatssium, Calcium, Magnesium, Zinc, Ferrous) and Manganese (Omoyeni & Adeyeye, 2009)

Pharmacological Studies

Analgesic Activity

The ethanolic extract of dried aerial part of *Aerva. Lanata* L. showed significant antinociceptive activity which may be through peripheral pain receptors and not by central opioid receptors on acetic acid-induced writhing and hot plate test in mice as compared to aspirin and morphine (Venkatesh, et al. 2009).

Anti-asthmatic Activity

The ethanolic extract of the aerial parts of *Aerva lanata* L. showed anti-asthmatic activity against clonidine -induced catalepsy and it also inhibits mast cell degranulation in mice (Kumar, et al. 2009).

Anti-Diabetic Activity

The alcoholic extract of *Aerva lanata* L. significantly reduces the increased blood sugar level in alloxan-induced diabetes in rats and mice models (Deshmukh, et. al. 2008; Vetrichelvan & Jegadeesan 2002).Single oral administration of methanolic extract of the roots significantly reduces the serum glucose level in streptozotocin-nicotinamide induced type-II NIDDM in rats (Agrawal, et. al. 2013).Methanol and aqueous extracts showed a significant anti-diabetic activity in Streptozotocin induced diabetic rat as compared to Glibeneclamide (Rajesh, et. al. 2014).Seventy percent hydro ethanolic extract significantly improved the fasting blood glucose, insulin level, HbA1c and glycogen content in the liver and muscle as compared to diabetic controls (Riya, et. al. 2014). Ethanolic, aqueous and ethyl acetate leaf extracts showed a significant anti-hyperglycemic activity in normal and streptozotocin induced diabetes in rats (Riya, et. al. 2015).

Anti-Diarrhoeal

Ethanolic and aqueous extracts of *Aerva lanata* L. and *A. javanica* L. showed a significant anti-diarrhoeal activity in charcoal meal test, reduction of the intestinal transit is suggested as mechanism of action (Joanofarc & Vamsadhara 2003). Alcoholic extract of whole plant showed anti-diarrhoeal effect in castor oil, charcoal meal test and PGE2 induced rats by reducing gastro intestinal motality and inhibiting the synthesis of prostaglandin (Sunder, et al. 2011).

Anti-Fertility Activity

The ethanolic extract of the aerial parts of *Aerva lanata* L. showed antifertility activity by anti-implantation, abortificient and decrease motility activity of rat spermatozoa in vitro models (Savadi & Alagawadi 2009).

Anti-Fungal Activity

Ethyl acetate and methanol extract showed antifungal activity against the fungi like *Aspergillus fumigatus, Aspergillus niger, Candida albicans, Hensinela californica* and *Rhizopus oligosporum* as compared to standard clotrimazole (Chowdhury, et al. 2002).

Antihelminthic Activity

Ethanolic extract of seed and leaf extracts of *Aerva lanata* L. showed antihelminthic activity against tapeworms and earthworms than the Albendazole which is used for treating parasite infections (Anantha, et. al. 2010).

Anti-HIV Activity

Hexane, chloroform, ethyl acetate, Acetone and Methanol extracts exhibited HIV-RT inhibition by using Retro sys HIV-1 RT activity against the control drug Azidothymide (Gujjeti & Mamidala 2014).

Anti-Inflammatory Activity

Benzene and alcoholic extract of *Aerva lanata* L. showed significant inhibited carrageenan-induced rat paw edema (Vetrichelvan, et. al. 2000).Plant-derived natural products such as alkaloids, flavonoids, terpenoids and polysaccharides significantly reduce the elevated levels of proinflammatory cytokines and nitric oxide production by lipopolysaccharide (LPS)-stimulated macrophages (Siveen & Kuttan 2012).

Anti-Metastatic Activity

Ethanolic extract showed a significant reduction in tumour nodule formation in B16F-10 melanoma induced lung metastasis mice in three different modalities (prophylactic, Simultaneous and developed metastatis) and also increase the survival rate of metastatic tumour bearing animals (Siveen & Kuttan 2013).

Antimicrobial Activity

Ethyl acetate and methanol extracts of whole plant showed antimicrobial activities against *Bacillus subtilis, Bacillus cereus, Staphylococcus aureus, Escherichia coli, Shigella dysenteriae, Shigella shiga, Shigella sonnei, Shigella flexneriae, Shigella boydii* and *Klebsiella*, (Chowdhury, et. al. 2002; Valsaraj, et. al. 1997; Perumal, et. al. 1999). *Aerva lanata* extracts influenced the growth of Corynebacterium xerosis 1911 (Baronets, et. al. 2001)

Anti-Neurotoxic Activity

Hydro-ethanolic extract of dried part showed dose dependent protective effect in the neurotoxicity induced by cisplatin in experimental rats (Rao, et. al. 2014).

Anti-Oxidant Activity

Aqueous, Ethanol and hydro-ethanolic extracts of whole plant showed antioxidant activity in experimental rats when compared to different standards e.g. Butylated Hydroxytoulene and Ascorbic acid (Ragavendra,et. al. 2012). The petroleum ether and methanol extracts showed significant inhibition of lipid peroxidation in CCl_4 induced toxicity in rats (Ramachandra, et. el. 2013). Aqueous extract of *Aerva lanata* L. stem exhibited high radical scavenging activity, metal chelating activity, reducing power activity and DNA damage inhibition efficiency (Kumar, et. al. 2013).

Anti-Plasmodial Activity

Ethyl acetate and methanolic extracts of whole aerial parts showed promising antiplasmodial activity against the chloroquine resistant INDO strain of P. falciparum and good selectivity indices when tested against the HeLa cell line (Kaushik, et. al. 2015)

Anti Ulcer Activity

Aqueous extract showed significant anti ulcer activity as compared to omeperazole in gastric mucosal lesions in rats caused by ethanol, pyloric ligation, indomethacin and cysteamine (Indukuri, et. al. 2013).

Anti-urolithiatic Activity

Oral administration of *A. lanata* L. and *Vediuppu Chunnam* increased the urinary excretion of calcium, oxalate, uric acid, phosphorous, protein and decreased magnesium excretion in hyperoxaluric rats (Selvam, et. al. 2001). Aqueous suspension reduced the oxalate-synthesizing enzymes and significantly showed anti-urolithiatic activity by diminishing the markers of crystal deposition in the kidney and cytoprotective mechanism (Soundararajan, et. al. 2006; Soundararajan, et. al. 2007a; Soundararajan, et. al. 2007b). Another study on aqueous extract of dried flowers showed better anti-urolithiatic activity than the cystone tablet against ethylene glucol induced renal calculi in experimental rats (Chandirika, et. al. 2013).

Cardio-Protective Activity

Extract of *Aerva lanata* L. showed cardioprotective activity against Doxorubicin induced cardiotoxicity in animal models (Abushouk, et. al. 2017)

Cytotoxic Activity

Petroleum ether, ethyl acetate, methanol extracts and partial purified fraction of petroleum ether in in-vitro and in-vivo studies showed significant cytotoxic properties in Daltons lymphoma ascites (DLA) tumor cell lines and stimulated lymphocyte proliferation (Chowdhury, et. al. 2002; Nevin & Vijayammal 2003; Nevin & Vijayammal 2005b). Ethanolic extract was found to stimulate cell-mediated immunological responses in normal and tumor-bearing BALB/c mice (Siveen & Kuttan 2011; Siveen & Kuttan 2012b). Chloroform and Ethyl Acetate Fraction of flowering aerial part showed significant inhibitory effect for leukaemia, lung, colon and cervix cancer as compared to standard drug mitomycin (Bhanot, et. al. 2013).

Diuretic Activity

The alcoholic extract of *Aerva lanata* L. showed good diuretic effect with respect to acelazolamide in animal models (Vetrichelvan, et. al. 2000). Ethanolic extract of whole plant significantly increase in urine volume, urinary sodium, potassium and chloride levels as compared to frusemide (Kumar, et. al. 2005). Fresh and dried aqueous extract have showed diuretic effect in hydrated rat assay technique (Herath, et. al. 2005). Hydro-alcoholic extract of leaf and root have

showed significant diuretic activity on albino rats as compared to control group (Majumdar, et. al. 1999).

Hepatoprotective Activity

Petroleum ether extractable fraction of the whole plant *Aerva lanata* L. showed hepatoportective activity against liver damage induced by carbon tetra chloride (CCl_4) in Sprague Dawley rats by reduceing hepatic lipid peroxidation and increased the serum total protein and albumin/globulin (A/G) ratio and also significantly reversed the histopathological changes (Nevin & Vijayammal 2005a). Hydro/alcoholic extract significantly reverse the levels of AST, ALP and bilirubin and ALT in paracetamol induced liver damage in rats (Manokaran, et. al. 2008). Hydro-alcoholic extract of leaf and root showed slight hepatoprotective activity (Majmundar, et. al. 1999)

Hypolipidemic Activity

Aqueous suspension of *Aerva lanata* L. showed hypolipidemic activity by reverting total cholesterol and triglyceride levels, phospholipids, high-density lipoproteins, low-density lipoproteins and very low-density lipoproteins levels in calcium oxalate urolithic rats (Soundararajan, et. al. 2007).

Immunomodulatory Activity

Petroleum ether extract of *Aerva lanata* L. showed immunomodulatory activity (Nevin & Vijayammal 2005b). Intraperitoneal administration in five different doses found to enhance the total WBC count, bone marrow cellularity and number of α-esterase-positive cells (Siveen & Kuttan 2011; Siveen & Kuttan 2012a). Ethanolic extract of *Aerva lanata* L. was found to stimulate cell-mediated immunological responses in normal and tumor-bearing BALB/c mice (Siveen & Kuttan 2012b).

Nephroprotective Activity

The ethanol extract of the entire plant of *Aerva lanata* L. showed nephroprotective activity by decreasing the blood urea and serum creatinine in cisplatin and gentamicin induced acute renal injury in albino rats of either sex and also normalized the histopathological changes (Shirwaikar, et. al. 2004).

Conclusion

Bisehri booti is a useful medicinal plant described by Unani physicians which is also ethnomedicinally used as a therapeutic agent for a variety of diseases in traditional systems of medicine and folklores. Numerous research works on BB have proved its uses in experimental animals. Phyto-constituents from this plant are responsible for its pharmacological activities. Therefore, cultivation,

collection and further clinico- pharmacological exploration of BB are essential. The plant possesses many phytochemical constituents for example; alkaloids, flavanoids, tannic acid etc. in addition to activities like diuretic, anti-inflammatory, hypoglycemic, anti-diabetic, antiparasitic, antimicrobial, hepato-protective, anti-urolithiasis, anti-asthmatic, antifertility and hypolipidemic.

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सारांश

यूनानी चिकित्सा पद्धति में फीटो-फार्माकोलॉजिकल पहलुओं और बिसेहरी बूटी (ऐरवा लानाटा) का उपयोग : एक समीक्षा

[1]निग़हत अंजुम, [2]नीलम कुद्दुसी और [3]मिस्बाहुद्दीन अज़हर

यह समीक्षा लेख यूनानी चिकित्सा पद्धति में बिसेहरी बूटी (बी.बी.) (ऐरवा लानाटा लिन.) के उपयोग की उत्पत्ति और इतिहास तथा इस तथ्य को स्थापित करने के लिए कि यह औषधि वास्तव में यूनानी चिकित्सा पद्धति के समृद्ध दस्तावेज का भाग है, को जानने का एक प्रयास है। यह आगे अनुसंधान के लिए एक दिशा प्रदान करने हेतु मोर्फोलॉजी, फाइटोकैमिस्ट्री और फार्माकोलॉजिकल पहलुओं के साथ यूनानी शास्त्रीय साहित्य में बिसेहरी बूटी के उपयोगों और कार्य को भी संक्षेप में दोहराता है। समीक्षा से पता चलता है कि लोक औषधि के रूप में पौधे का उपयोग भारत के पश्चिमी उत्तर प्रदेश के कुछ यूनानी चिकित्सकों द्वारा खांसी, मूत्रकृच्छ (बूंद बूंद कर कष्ट से पेशाब निकलना), सिरदर्द और यूरोलिथियासिस के लिए किया जाता है। इसके अलावा, समीक्षा के आधार पर इस लेख के लेखकों का सुझाव है कि डाइयूरेटिक, एंटी–इन्फ्लामेटरी, हाइपोग्लाइसेमिक, एंटी–डाइबेटिक, एंटीपैरासिटिक, एंटीमाइक्रोबायल, हेपाटो–प्रोटेक्टिव, एंटी–यूरोलिथियासिस, एंटी–अस्थमेटिक, एंटीफर्टिलिटी और हाइपोलिपिडेकिम जैसी गतिविधियों के अतिरिक्त बिसेहरी बूटी में कई फोटोकैमिकल घटक उदाहराणार्थ; अल्कालोइड्स, फ्लेवानोइड्स, टेनिक एसिड इत्यादि हैं।

शब्द कुंजीः ऐरवा लानाटा लिन., बिसेहरी बूटी, फाइटोकैमिस्ट्री, औषध विज्ञान, यूनानी चिकित्सा