

Pharmacognostic and Phytochemical Study of *Boerhaavia Chinensis* (Linn.) Aschers. Roots

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Abstract

Boerhaavia chinensis (L.) Aschers. is a spreading perennial herb of Nyctaginaceae family. Plant stems are thick and branches are spread on the ground. Leaf stalks are velvety and 1-3 cm long in length. The flowers are tiny, pink, funnel-shaped, 6-8 mm. The plant is found abundantly in the Khandesh region of Maharashtra, India. The plant has great status as a folk medicine and is being used by various tribes/communities like, Pawara, Kokani, Bhils, Mavach, and Vasave etc. Tribes are using various parts of plants as an anti-inflammatory, diuretic, expectorant, anticonvulsant, antimicrobial, antidiabetic, antifibrinolytic, also in the treatment of Jaundice and as nutritional supplements. The plant has not been studied for its pharmacognostical and phytochemical evaluation. In the present study, pharmacognostical and phytochemical evaluations were carried out on roots of *Boerhaavia chinensis*. Pharmacognostical and phytochemical outcomes confirmed the presence of inorganic elements and importantly active phytochemicals beside this, other components are also present within limits. This plant can be used rationally in the treatment of jaundice and other diseases. It can also get place in modern medicine for treatment of various diseases.

Keywords: Tribes plant, chinensis roots, folk medicine, piliya plant

INTRODUCTION

Boerhaavia chinensis (L.) Aschers is spreading perennial herb of Nyctaginaceae family. The plant grows by percolating stones so being recognized by name as a Dagad-fodya by tribes of Khandesh region of Maharashtra. Plant stems are thick and branches are spreading on the ground. Leaf stalks are velvety, 1-3 cm long. The flowers are tiny, pink, funnel-shaped, 6-8 mm. In India there are six species of the *Boerhaavia* are found like *B. diffusa*, *B. chinensis*, *B. erecta*, *B. repens*, *B. rependa*, and *B. Rubicund*. These species are naturally found in the tropical region in both dry and rainy season having habitat in the India, Nigeria and many other countries and some species were studied for their prominent therapeutic effect[1-3]. In India *Boerhaavia chinensis* is found in hotter regions of the country and at the heights of 2,000 m in the Himalayan region[4,5]. The plant is found abundantly in Khandesh region of Maharashtra, India and plant has great status as a folk medicine and is being used by various tribes communities like, Pawara, Kokani, Bhils, Mavach, Vasave etc.[6-8]. Traditionally, as well as folklore remedies,

various parts of *Boerhaavia chinensis* are used by different tribes communities as an anti-inflammatory, diuretic, expectorant, antimicrobial[9], antidiabetic[10], antifibrinolytic [11], anticonvulsant [12], antioxidant, nutritional agent[13], and specially roots are used as an important drug in the treatment of jaundice[14,15]. Tribes have used entire roots as well as root powder as an important hepatoprotective agent.

METHODS AND MATERIAL

Collection and Authentication of the plant material

Roots of *Boerhaavia Chinensis* including other morphological parts were collected from Aner dam area of Maharashtra, India, with the help of tribal community people. Authentication of the specimens of morphological parts done by Dr. D. A. Patil, of Department of Botany, S.S.V.P.S's L. K. Dr. Ghogrey Science College of Dhule, Maharashtra, India.

Pharmacognostic Evaluation

Organoleptic characters

Root is woody, light brownish in color when fresh and become ash color on drying. Fresh material is having slightly aromatic, faint odor and slightly bitter in taste.

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The powder drug was pale yellow in color. The internally cut surface of roots shows bright brown circles.

Histological features of root

Histological studies the confirmed presence of periderm, cork, phellogen, phelloderm, cortex, phloem fibers, medullary rays, and lignified tissues by using different staining agents [16].

Histochemistry

Micro-chemical tests and behavior of specific reagent towards plant drug tissue, was performed as established method. Histochemical color reactions of powdered drug were carried out with Phloroglucinol + Conc.HCl, Anisaldehyde, Dragendorff's reagent Iodine solution, and FeCl₃ for the detection of Lignin, mucilage, starch, alkaloids and tannins respectively. The results of the same are reported in the Table 1.

Table 1: Histochemistry

Reagent	Test for	Inference	Histological zone
Phloroglucinol + hydrochloric acid	Lignin	+	Vascular bundles and cortex region
Aniline Sulphate + Sulphuric acid	Lignin	+	Vascular bundle and cortex region
Weak iodine solution	Starch	+	Vascular bundle
Aqs. Ferric chlorides	Tannins and phenolics	+	Cortex, Vascular bundle
Million's reagent	Proteins	+	Cortex and vascular bundle
Dragendorff's reagent	Alkaloids	+	Cortex region

(+) Indicates present of components and compounds

PHYSICOCHEMICAL EVALUATION

Ash values

Ash value like total ash, acid insoluble ash, water soluble ash and sulphated ash were determined as a part of qualitative evaluation of the plant. Total ash was determined to measure the total amount of material remaining after ignition. Acid insoluble ash was

determined to measure amount of silica in the plant. Water soluble ash was determined to measure percentage of solubility in water. Results of ash values were matched with standard data of other species of *Boerhaavia* genus. The results of the same are reported in the Table 2.

Table 2: Ash values

Parameters	Ash value (%w/w) For root powder
Total ash	11.0 % w/w
Acid insoluble ash	02 %w/w
Water soluble ash	03 % w/w
Sulphated ash	15.5 % w/w

Extractive values

This method determines the amount of active constituents extracted with solvents. The powder drug was extracted out by cold maceration method; the powder drug was kept for 24 hrs in the solvents like petroleum ether, benzene, chloroform, acetone, ethanol, methanol and with water as an aqueous extract. Percentage of dry extract was calculated in terms of air-dried flower powder. The results of the same are reported in the Table 3.

Table 3: Extractive values

Extractive value	(Extractive values) % w/w) for root
Ether- soluble extractive value	0.290
Benzene soluble extractive value	0.260
Chloroform soluble extractive value	0.040
Acetone soluble extractive value	0.340
Ethanol soluble extractive value	2.56
Methanol soluble extractive value	2.500
Water soluble extractive value	03.00

Loss on Drying

The LOD was determined according to the method reported [17]. The results of the same are reported in the Table 4.

Table 4: Loss on drying

Fresh Roots % w/w	Dried root powder % w/w
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13.33 07.33

Qualitative test for determination of inorganic elements

Total ash was prepared and was qualitatively investigated for the presence of various inorganic compounds and elements like Calcium, Potassium, Magnesium, Sodium, Iron, Phosphate etc.[18]. The results of the same are reported in the Table 5.

Table 5: Qualitative test for determination of inorganic elements

Element	Result
Calcium	-
Potassium	+
Magnesium	-
Sodium	-
Iron	+
Chlorides	+
Sulphates	+
Phosphates	-
Carbonates	-
Nitrate	-

Fluorescence analysis

Fluorescence analysis of the powder drug was carried out with different chemical reagents in the day (254 nm) and UV light (365 nm). The dry powder drug was studied on a glass slide whereas the different extracts were studied by adsorbing the extracts on Whatmann filter paper [19]. The results of the same are reported in the Table 6.

PHYTOCHEMICAL EVALUATION**Preparation of extract and phytochemical test**

The dried root powdered was extracted out by the cold maceration method, range from solvents non-polar to polar. All these extracts were concentrated in the rotary vacuum evaporator (Roteva-Equitron, Mumbai) under reduced pressure and then dried by vacuum dryer. All extracts were screened for presence of active phytochemical constituents like carbohydrate, glycoside, alkaloids, proteins, tannins, saponins, flavonoids and terpenoids [20]. The results of the same are reported in the Table 7.

RESULTS

Boerhaavia chinensis roots were studied for its pharmacognostical and phytochemical evaluation, on

the basis of morphological study, plant can be identified easily by its colour odour, taste and extra features. Histological results confirmed presence of lignified tissue, cork, cortex, medullary rays, while histochemistry shows presence of lignin, protein, tannins, starch and alkaloids.

Table 6: Observations of the fluorescence of the powdered root in day and UV light

Treatment	Colour in day light	Colour in UV (254nm)	Colour in UV (365nm)
Dry powder	Light brown	Light yellow	Brown
Powder + Alcoholic HCl	Dark brown	Light green	Black
Powder + Aq.0.1N HCl	Brown	Yellowish green	Black
Powder + Aq. NaOH	Brown	Brown	Brownish black
Powder + Alcoholic NaOH	Light brown	Brown	Blackish brown
Powder + 50%H ₂ SO ₄	Brown	White	Brown

Table 7: Preliminary chemical test results

Chemical test	Pet. Eth.	Be z.	Chl.	Ace .	Eth .	Me th.	Aqs .
Tannins	--	--	--	--	++	++	++
Steroids	++	++	++	--	--	--	--
Triterpenoids	--	--	--	++	++	++	++
Flavonoids	--	--	--	++	--	--	--
Alkaloids	++	--	++	--	++	++	++

(+) Indicates present of phytochemicals while (-) indicates absence of phytochemicals; Pet.Eth-Petroleum ether, Bez-Benzene, Chl-Chloroform, Ace-Acetone, Eth-Ethanol, Meth-Methanol, Aqs-Aqueous.

Physicochemical parameters confirmed presence of inorganic elements, ash values are found within limits, extractive values say affinity of drug towards specific solvents. Active phytochemical constituents are present in various solvents extracts, tannins, triterpenoids and flavonoid are presents in ethanolic, methanolic, and

aqueous extracts while steroids are present in petroleum-ether, benzene and chloroform extracts.

DISCUSSION

Boerhaavia chinensis has been using as a potent medicinal plant by various tribes communities in the treatment of various diseases without any rational data. However, no rational data is reported in the modern literature in concern to pharmacognostic and phytochemical study of *Boerhaavia chinensis*. The traditional claims on medicinal properties of plant encouraged to investigate its pharmacognostic and phytochemical studies.

Thus, in the present study the plant roots were studied for its quality, purity and identity. The transverse sections (T.S.) of the plant root showed the presence of important components with their specific internal location. The plant can be used as standard drug in comparative internal study for other species of *Boerhaavia*.

The plant histochemistry showed the presence of tannins, phenolic compounds, and alkaloids. The plant has great capacity to produce active secondary metabolites. The results of ash values were found within limits, it confirmed the plant is of good quality and purity. The extractive values and moisture content data also confirmed the plant is of good quality and purity.

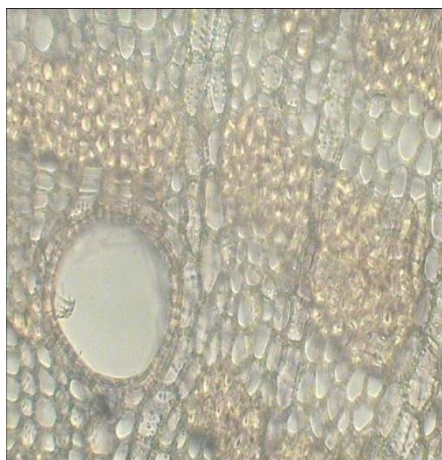


Figure 1. Vascular bundle (Transverse Section)

The fluorescent analysis data may help to identify authentic drug. The powder drug was qualitatively analyzed for presence of inorganic elements and active phytoconstituents. The results confirmed the presence of inorganic elements like potassium, iron, chloride and

sulphates. While qualitative phytochemical screening confirmed the presence active phytoconstituents like flavonoids, tannins, terpenoids, steroids and alkaloids. The plant drug can be recognized as a promising and multipurpose plant.

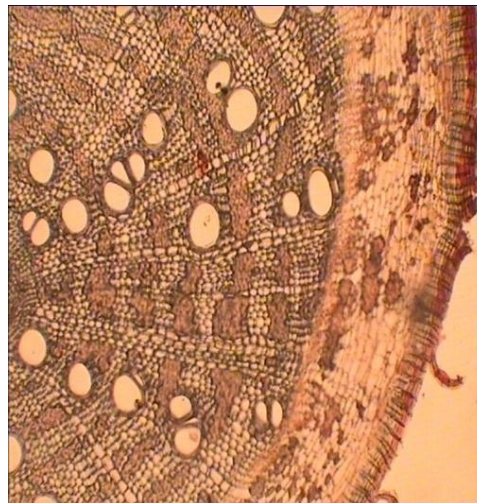


Fig 2: Lignified tissue (Transverse Section)

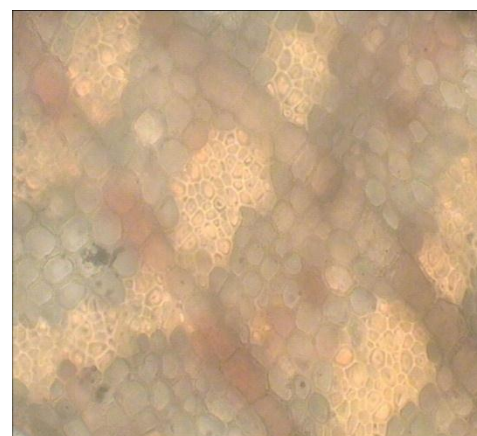


Fig 3: Medullary rays (Transverse Section)

CONCLUSION

The *Boerhaavia chinensis* is being recognized as traditional and folklore plant but pharmacognostical and phytochemical evaluations can be increased status of plant as potent medicinal plant and can get placed in modern herbal medicines.

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