

## Research Article

# A Quality Assessment of *Boerhaavia diffusa* Linn. Commonly Known as 'Punarnava' Plant

AK Meena<sup>\*1</sup>, Uttam S Niranjana<sup>2</sup>, AK Yadav<sup>2</sup>, Ajit K<sup>1</sup>, Brijendra Singh<sup>2</sup>, Kiran<sup>2</sup>, M M Rao<sup>1</sup>.

<sup>1</sup>National Institute of Ayurvedic Pharmaceutical Research, Patiala – 147001 (Punjab)

<sup>2</sup>School of Pharmaceutical Sciences, Shobhit University, Meerut, UP, (India)

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### ABSTRACT

The present study deals with the investigation of standardized and phytochemically evaluated aqueous and hydroalcoholic extracts of the plant *Boerhaavia diffusa* Linn. The whole plants of *Boerhaavia diffusa* L. (Nyctaginaceae) are reported to have good medicinal values in traditional system of medicines. The present study deals with pharmacognostical examination of morphological and microscopical characters and phytochemical investigations of *Boerhaavia diffusa* plants including determination of loss on drying, ash values, TLC and extractive values. The preliminary phytochemical screening of powdered drug was also carried out. The qualitative chemical examinations revealed the presence of various phytoconstituents like carbohydrates, saponins, phenolic compounds and mucilages in the extracts.

**KEYWORDS:** *Boerhaavia diffusa* L., Physicochemical, Phytochemical, Microscopy, TLC

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### INTRODUCTION

*Boerhaavia diffusa* Linn. commonly known as 'Punarnava' is an abundant creeping weed found all over India<sup>1</sup>. The plant has drawn lot of attention due to its uses in Indian Traditional Medicine. The various parts of the plant are used in the treatment of cancer, jaundice, dyspepsia, inflammation, enlargement of spleen, abdominal pain and as an anti-stress agent<sup>2,3</sup>.

*Boerhaavia diffusa* L. (Nyctaginaceae) is a perennial herbaceous plant growing in tropical regions such as the Antilles, South America, India and Africa. In the Asian medicine practiced in Britain the roots are used as diuretic, laxative, and stomachic preparations and the leaves are used as an appetizer and alexiteric preparation. The seeds are used as tonic and carminative preparations<sup>4</sup>. Some pharmacological actions have been demonstrated for this plant, including a hepatoprotective activity in CCl<sub>4</sub>-induced hepatotoxicity in rats<sup>5</sup>. The root extract of *Boerhaavia diffusa* appears to be a potent antifibrinolytic and anti-inflammatory agent in monkeys<sup>6</sup>. The other pharmacological activities of this plant include kidney regeneration and nutrition<sup>7</sup>. An experimental evaluation of the possible teratogenic potential of *Boerhaavia diffusa* for rats showed no teratogenic effect<sup>8</sup>.

Phytochemical research has demonstrated the presence of alkaloids and amino acids in *B. diffusa*<sup>9</sup>. Two known lignans, liriiodendrin and syringaresinol mono-β-D-glucoside, have been isolated from a methanol extract the roots of *Boerhaavia diffusa* and the former compound was found to exhibit a significant calcium

channel antagonistic effect<sup>10</sup>. The seeds of this plant contain fatty acids and allantoin and the roots contain alkaloids. The green stalk of the plant has also been reported to contain boerhavin and boerhavic acid<sup>11</sup>.

TLC and HPTLC are methods commonly applied for the identification, the assay and the testing for purity, stability, dissolution or content uniformity of raw materials (herbal and animal

extracts, fermentation mixtures, drugs and excipients) and formulated products (pharmaceuticals, cosmetics, nutriment)<sup>12</sup>. These flexible and cost-effective techniques present the advantage of the simultaneous processing of standards and samples with versatile detection possibilities, including a great variety of post-chromatographic derivatization reagents. The validation of analytical methods is largely recognized as the best safeguard against the generation of unreliable data and is becoming an absolute requirement in many fields. Validation is the process by which it is established, by laboratory studies, that the performance characteristics of an analytical method meet the requirements for the intended applications<sup>13</sup>. Depending on the objective of the analytical procedure, the typical validation characteristics which can be considered through a statistical approach are accuracy, precision, specificity or selectivity, detection limit, quantification limit, linearity and ruggedness<sup>14</sup>.

### MATERIALS AND METHODS

#### Plant material

The whole plants of *Boerhaavia diffusa* Linn. Were collected in Sep. 2009 from Patiala (Punjab) specimen was identified and authenticated at the National Institute of Ayurvedic Pharmaceutical Research (NIAPR), Patiala (Punjab).

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\* Corresponding author.

E-mail address: [uttamiftm@gmail.com](mailto:uttamiftm@gmail.com);

[ajaysheera@gmail.com](mailto:ajaysheera@gmail.com)

Tel: +919023468472, +919451340239

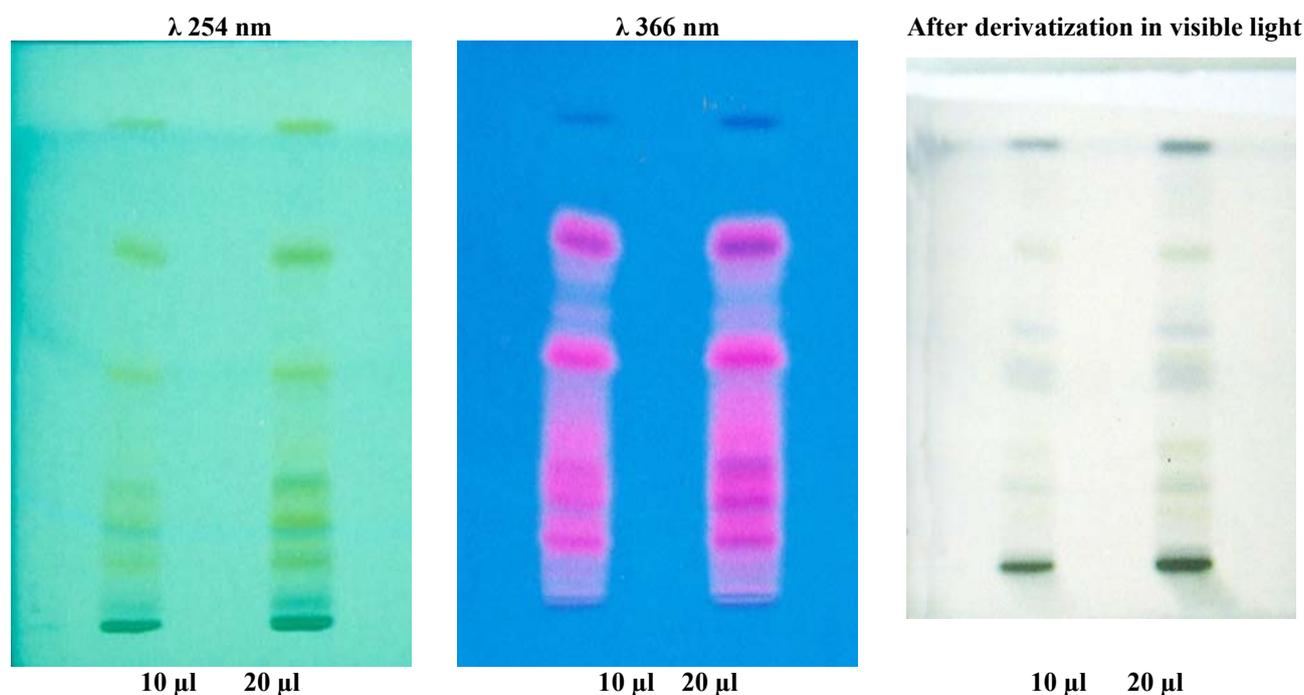


Fig 1. TLC of punarnava (*Boerhaavia diffusa* Linn.)

## RESULT AND DISCUSSIONS

The whole plants of *Boerhaavia diffusa* Linn was collected and analyzed the various standardization parameters. Preliminary phytochemical results showed the presence or absence of certain phytochemicals in the drug. The tests performed using n-Hexane, Chloroform, Ethyl acetate, alcoholic and water extracts. Phytochemical test revealed the presence or absence of Alkaloid, glycoside, saponins, flavonoids, polysaccharides, Steroid, Tannin and results are given in Table1.

**Table1. Preliminary phytochemical tests for different solvent extract whole plants of *Boerhaavia diffusa* Linn**

S. No.	Natural products	Test performed	Result
1	Alkaloid	Dragendorff's test	+ ve
2	Coumarin	Alkaline test	-ve
3	Flavone	Shinoda test	+ve
4	Steroid	Liebermann-Burchard reagent	+ve
5	Tannin	Neutral FeCl <sub>3</sub>	-ve
6	Sugar	Molisch's test	-ve
7	Terpenoid	Noller's test	+ve
8	Saponin	NaOH solution	+ve
10	Glycoside	Brontragar,s	+ve

Physico-chemical parameters of the *Boerhaavia diffusa* Linn. are tabulated in Table 2. The pH value of 10% w/v aqueous solution is acidic (5.81). Deterioration time of the plant material depends upon the amount of water present in plant material. If the water content is high, the plant can be easily deteriorated due to fungus. The loss on drying at 105°C was found to be 3.05 %. Total ash value of plant material indicated the amount of minerals and earthy materials attached to the plant material. Analytical results showed total ash value content was 8.54 %. The negligible amount of acid-insoluble siliceous matter present in the plant was 1.25%. The water-soluble extractive value was indicating the

presence of sugar, acids and inorganic compounds (15.15 %). The alcohol soluble extractive values indicated the presence of polar constituents like phenols, alkaloids, steroids, glycosides, flavonoids the results given in Table 2.

**Punarnava - Root *Boerhaavia diffusa* Linn.**

**Table 2. Physico-chemical parameters of whole plants of *Boerhaavia diffusa* Linn**

S.No.	Parameters	Results
1	Description	Brownish
2	Foreign matter	< 1.0 %
3	pH (10 % w/v aqueous solution)	5.81
4	Loss on drying at 105 °C	3.05 % w/w
5	Total ash	8.54 % w/w
6	Acid-insoluble ash	1.25 % w/w
7	Water-soluble extractive	15.15 % w/w
8	Alcohol-soluble extractive	12.38 % w/w

**Macroscopic:** White bitter tasting powder with a characteristic odour.

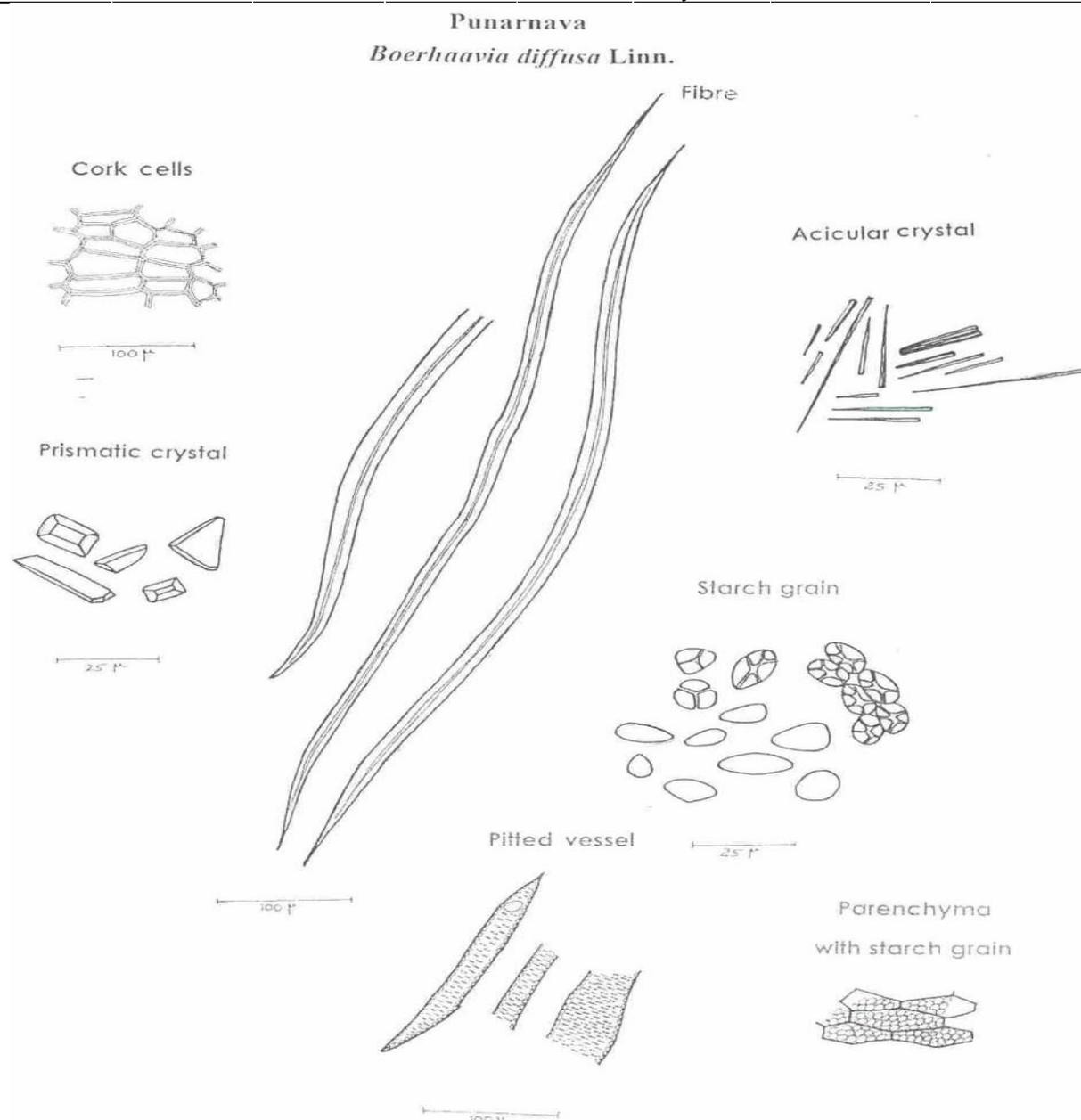
**Microscopic:** The powder shows characters like cork cells in surface view, acicular crystals of calcium oxalate up to 50µ in length, prismatic crystals of calcium oxalate about 25µ in length, thin long narrow fibers with sharp pointed ends and narrow lumen measuring up to 800µ in length, simple to 5-compound oval to rounded starch grains measuring up to 15µ in length, simple pitted vessels up to 200µ in length and few parenchyma with starch grains. Fig 2. The leaf of plants upper and lower epidermis show the presence of numerous multicellular glandular hairs and anomocytic stomata. Palisade is one layered, spongy parenchyma 2-4 layered, cells polyhedral or isodiametric in shape with distinct intercellular spaces.

### TLC Methodology

4g of the sample was soaked in 40 ml of rectified spirit (90%) with occasional shaking for 18 hrs, boiled for 10

**Table 3. TLC Profile of punarnava (*Boerhaavia diffusa* Linn.)**

S.No	254 nm		366 nm		After derivatization in visible light		Remarks
	Colour	R <sub>f</sub>	Colour	R <sub>f</sub>	Colour	R <sub>f</sub>	
1	Green	0.12	Pink	0.12	Grey	0.12	TLC profile is good in all the three detecting systems
2	Green	0.21	Pink	0.21	Grey	0.21	
3	Green	0.30	Pink	0.30	Grey	0.30	
4	Green	0.53	Pink	0.53	Grey	0.53	
5	-	-	-	-	Grey	0.58	
6	Green	0.79	Pink	0.79	Grey	0.79	

**Fig 2. Microscopic: characters of powder *Boerhaavia diffusa* Linn.**

minutes and filtered. The filtrate was concentrated and made up to 10 ml in a standard flask. 10 μl and 20 μl of the solution was applied on (E.Merck) Aluminium plate pre-coated with Silica gel 60 F<sub>254</sub> of 0.2 mm thickness using Linomat IV applicator. The plate was developed in Toluene: Ethyl acetate (5:1.5v/v). After air drying the plate was visualized in UV 254 and 366 nm. The plate was then dipped in Vanillin -Sulphuric acid and heated in air oven at 105°C till the spots appeared. The result of TLC Profile (R<sub>f</sub>) of punarnava (*Boerhaavia diffusa*

Linn.) given in the Table 3. And TLC of punarnava (*Boerhaavia diffusa* Linn.) has given in Fig 1.

#### CONCLUSION

Preliminary phyto-chemical as well as various aspects of the sample were studied and described along with physico-chemical, microscopic and TLC studies in authentication, adulteration for quality control of raw drugs. The plant of *Boerhaavia diffusa* Linn. exhibit a

set of diagnostic characters, which will help to identify the drug in dried condition.

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