

PHARMACOGNOSTICAL AND PHYTOCHEMICAL EVALUATION OF BHRUNGARAJ (*Eclipta alba* Hassk.)

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ABSTRACT

The herb *Bhrungaraj* is well familiar since *Vedic kala* to the present era. It is used in various ailments as quoted by various lexicographic texts. In spite of having a confirmed botanical identity of *Bhrungaraj*, this plant is trapped as common weed throughout India. Any plant which is used medicinally requires detail study prior to its use because the therapeutic efficacy is absolutely depends on the quality of the plant drug used. Before using a drug it is very much essential to carry out its detailed pharmacognosy study and phytochemical study, as it is helpful for correct identification and provides clue for medicinal properties. Here in this paper macroscopic & microscopic study of root, stem, leaf and phytochemical analysis of *Bhrungaraj* (*Eclipta alba* Hassk) has been studied in detail to identify the genuineness of the drug.

Keywords: *Eclipta alba* Hassk, microscopy of root, stem and leaf, phytochemical screening

INTRODUCTION

Bhrungaraj (*E. alba*) is a good remedy for blackening and strengthening of the hair.¹ It is useful in hepatosplenomegaly, skin diseases, ophthalmopathy, inflammations, hypertension, jaundice and gastropathy.² It forms a chief ingredient of several important formulations like *Bhrungaraj Taila*³, *Nilibhrungyadi Taila*⁴, *Bhrungarajasva*⁵ and *Bhrungaraj Rasayan*⁶ etc.

Bhrungaraj, *Pita Bhrungaraj* and *Nila Bhrungaraj* are three varieties mentioned in *Raj Nighanu* with different synonyms and properties⁷. *Eclipta alba* Hassk is accepted source of *Bhrungaraj*.⁸

As per WHO norms, botanical standards are proposed as a protocol for identification of the herbal drug. The phytochemical studies of drugs were done by making use of various parameters help in standardizing the

drug and authenticate it. The present study puts forth a set of anatomical parameter of root, stem, leaf which can be employed to distinguish the original drug. This study throws light on the need to properly identify the plant species with their useful parts to achieve standardization of drug and *Ayurvedic* formulations.

MATERIALS AND METHODS

Pharmacognostical Study

Fresh green full-grown and healthy *Eclipta alba* Hassk. plant was collected from its natural habitat. The plant was washed in pure water to remove all the impurities and was photographed. The leaf, root and stem are separated by cutting with a sharp blade. For stem and root cylindrical portion of almost straight

and of sufficient length to hold the sample was selected. For leaf lamina, using a sharp blade part of the leaf passing through the midrib was cut. Enough number of sections were taken. The sections were carefully transferred to a petridish containing water using a fine painting brush for selection of good sections. After staining and mounting process, the photographs of the sections were taken using digital camera.

Phytochemical analysis

Physio-chemical analysis Total ash⁹, Acid Insoluble Ash¹⁰, Water Insoluble Ash¹¹, Moisture Content¹², Volatile oil¹³, Fiber Content¹⁴ were determined by using official methods. Results are mentioned in Table No. 1

Qualitative Analysis of Crude Drug Table No. 2

Alkaloids

Dragendroff's test: To 0.5ml of alcoholic extract of *E. alba* powder taken in a test tube, 2.0 ml of hydrochloric acid solution was added to it. To this acidic medium, 1.0ml of Dragendroff's reagent was added. An orange – red precipitate produced immediately indicates the presence of alkaloid.

Meyer's test: To 10 ml of the solution of alcoholic extract of *E. alba* powder taken in a test tube, a few drops of Meyer's reagent was added. Formation of white or pale precipitate indicates the presence of alkaloid.

Flavanoids: To 0.5ml of the solution of alcoholic extract of *E. alba* powder taken in a test tube, 5-10 drops of Dilute hydrochloric acid and a small piece of magnesium were added and the solution was boiled for few minutes. Presence of reddish pink colour indicates flavanoids.

Saponins: To 5ml of the solution of aqueous extract of *E. alba* powder taken in a test tube, 1 - 3 drops of sodium bicarbonate solution was added. The mixture was shaken vigorously and kept for 3 minutes. A honey comb like froth formation in test tube indicates the presence of saponins.

Carbohydrates

Fehling's test: To 2ml of aqueous extract of *E. alba* powder taken in a test tube, a mixture of equal parts of Fehling's solution A and B were added. The test tube was then boiled for few minutes. Formation of red or

brick precipitate indicates the presence of carbohydrates.

Benedict's test: To 0.5ml of aqueous extract of *E. alba* powder taken in a test tube, 5ml of Benedict's reagent was added and boiled for 5 minutes. Formation of bluish green colour in test tube indicates the presence of carbohydrates.

Proteins

Ninhydrin test: To 1ml of the solution of aqueous extract of *E. alba* powder taken in a test tube, 5ml of ninhydrin solution was added and heated in a boiling water bath for 2-3 minutes. Formation of blue or purple colour indicates the presence of proteins.

Phenols

Ferric Chloride test: To 1.0 ml of the solution of the alcoholic extract of *E. alba* powder in a test tube, 2.0ml of distilled water was added followed by addition of a few drops of 10% aqueous ferric chloride solution. Formation of blue or green colour indicates the presence of phenols.

Lead acetate test: 1.0ml of the solution of the alcoholic extract of *E. alba* powder taken in a test tube. 5ml distilled water was added followed by few drops of 1% aqueous solution of lead acetate. The formation of yellow precipitate in test tube indicates the presence of phenols.

Steroids: To 2.0ml of the solution of chloroform extract of *E. alba* powder taken in a test tube, 1.0ml of concentrated Sulphuric acid was added carefully along the sides of the test tube. A red colour was produced in the chloroform layer indicates the presence of steroids.

Tannins

Ferric chloride test: To 1-2 ml of the solution of aqueous extract of *E. alba* powder taken in a test tube, a few drops of 5% aqueous ferric chloride solution was added. A bluish black colour formed which disappeared on addition of diluted Sulphuric acid, forming a yellow brown precipitate indicates the presence of tannins.

Lead acetate test: To 5.0ml of the solution of the aqueous extract of *E. alba* powder taken in a test tube, few drops of 1% solution of lead acetate was added.

Formation of a yellow or red precipitate indicates the presence of tannins.

OBSERVATIONS AND RESULTS

Pharmacognostical Study

Macroscopic Features¹⁵ Fig. No. 1

Root: Well developed cylindrical, greyish coloured main root with secondary branches.

Stem: Herbaceous, branched, occasionally rooting at nodes, cylindrical or flat, rough due to white hairs, node distinct, colour greenish, occasionally brownish.

Leaf: Opposite, sessile to subsessile, 2.2 - 8.5 cm long, 1.2 - 2.3 cm wide, usually oblong, lanceolate, sub-entire, sub-acute or acute, strigose with hairs on both surfaces.

Flower: Solitary or two, together on unequal axillary peduncles; involucre bracts about 8, ovate, obtuse or acute, herbaceous, strigose with hairs; ray flowers ligulate, ligule small, spreading, scarcely as long as bracts, not toothed, white; disc flowers tubular, corolla often 4 toothed; stamen 5, filaments epipetalous, free, anthers united into a tube with base obtuse; pistil bicarpellary; ovary inferior, unilocular with one basal ovule.

Fruit: Achenial cypsella, one seeded, cuneate, with a narrow wing, covered with warty excrescences, colour - brown.

Seed: Dark brown, hairy and non endospermic.

Microscopic Features

Histological Characters¹⁶

T.S. of Root: Fig No. 2

Periderm: Mature root shows poorly developed cork, consisting of 3-5 rows of thin-walled, tangentially elongated cells.

Cortex: secondary cortex consists of outer one or two rows of tangentially elongated or rounded cells with air cavities, inner secondary cortex of tangentially elongated to irregular shaped, parenchymatous cells with conspicuous air cavities; stone cells found scattered in secondary cortex and cork, in singles or in groups of various shape and size.

Stele: secondary phloem consists of sieve elements including phloem fibres traversed by multiseriate phloem rays; phloem rays broader towards periphery, consisting of rounded cells; xylem composed of ves-

sels, fibre tracheids, fibres and xylem parenchyma, traversed by xylem rays; vessels numerous, found scattered throughout wood, in macerated preparation vessels small, drum-shaped, cylindrical elongated with pitted walls and perforations, simple, rarely slightly oblique; fibre tracheids, pitted, with very pointed tips, xylem fibres long with pointed tapering ends and short lumen, a few fibres show peg-like outgrowths towards the tapering ends; xylem parenchyma sparse usually squarish to rectangular having simple pits on their walls, xylem ray distinct, run straight in tangential section, very rarely uniseriate and biseriate rays also found, ray cells pitted.

T.S of Stem: Fig No. 3

Epidermis: Mature stem shows single layered epidermis, externally covered with cuticle, a few epidermal cells elongate to form characteristic non-glandular trichomes, the cork where formed, poorly developed consisting of rectangular cells.

Endodermis: single layered consists of tangentially elongated cells; pericyclic fibres distinct, arranged in tangential strands.

Cortex: secondary cortex composed of large, rounded or irregular shaped parenchymatous cells having wide air spaces.

Vascular tissues: vascular bundles in a ring, collateral, end arch, of varying sizes traversed by medullary rays; phloem a narrow strip composed of sieve elements and phloem parenchyma; xylem consists of large number of vessels, xylem fibres and xylem parenchyma; xylem vessels appear evenly distributed throughout the xylem; in macerated preparation vessels barrel-shaped, some elongated with simple perforations, pitted with spiral thickening; xylem fibres with wide lumen, pointed tips and pitted walls, a few often bifurcate and a few other large, peg-like outgrowth; xylem parenchyma rectangular with pitted thickening; xylem rays triseriate to pentaseriate, normally biseriate and uniseriate, 8-15 cells in height and 3-5 cells in width.

Pith: centre occupied by wide pith consisting of isodiametric cells of parenchyma.

T.S of Leaf: Fig No. 4

The transverse section of leaf passing through the

midrib is broadly convex on the lower side and slightly grooved or flat on the upper side.

Midrib:

Base: cut at basal region shows both upper and lower single layered epidermis, externally covered with cuticle, a few epidermal cells elongate outwards to form uniseriate hairs; epidermis followed by cortex, consisting of 3-5 layered collenchymatous cells on both sides; **Middle:** section cut at middle region shows 3-4 layered collenchymatous cells on dorsal and 1-3 layered on ventral side; **Apex:** while the section cut at apical region, shows 2 layered collenchymatous cells on both sides, similarly transverse section cut at a basal, middle and apical regions shows 4-6 layered parenchymatous cells on dorsal side and 6-9 layered parenchyma on ventral side, in section cut at basal region 4-6 layered parenchyma on both the sides in the middle region with thin-walled cells and intercellular spaces, 2-3 layered parenchymatous cells on both

side in the apical region; in the basal region section shows vascular bundle similar to that of petiole while in the section cut at middle and apical region section shows 4 smaller bundles shifting towards lamina.

Lamina: shows a dorsiventral structure, epidermis single layered, externally covered with cuticle, followed by single layered palisade parenchyma containing chlorophyll contents; spongy parenchyma irregularly arranged with distinct intercellular spaces and filled with chlorophyll contents.

Mesophyll: traversed by number of veins; anisocytic and anomocytic stomata present on both surface, more abundant on lower surfaces; stomatal index 20.0-22.5 on upper and 23.5 -26.0 on lower surface; palisade ratio 3.8 -4.5; hairs stiff, pointed, wide at the base, about 3 celled, uniseriate, middle cells longest, uppermost generally not exceeding the basal cell in length, septa thick-walled.

Phytochemical Results

Table 1: Physico-Chemical analysis of *Bhrungaraj* (*Eclipta alba* Hassk)

Sl no	Experiments	Bhrungaraj [<i>Eclipta alba</i> Hassk.]
1	Total ash	11.45%
2	Acid Insoluble Ash	7.5%
3	Water Insoluble Ash	6.5%
4	Moisture Content	11%
5	Volatile oil	2%
6	Fibre Content	31%

Table 2: Qualitative analysis of *Bhrungaraj* (*Eclipta alba* Hassk)

Experiment	Bhrungaraj [<i>Eclipta alba</i> Hassk.]
1) Alkaloids	
a. Dragendorff's test	Present
b. Meyer's test	Present
2) Flavanoids	Present
3) Saponins	Present
4) Carbohydrates	
a. Fehling's test	Present
b. Benedict's test	Present
5) Proteins	Absent
6) Phenols	
a. Ferric chloride test	Absent
b. Lead acetate test	Absent
7) Steroids	Absent

8) Tannins	
a. Ferric chloride test	Absent
b. Lead acetate test	Absent

DISCUSSION

Bhrungaraj is one of the important drugs used in the various indigenous medicines and formulations of Ayurveda. Detailed pharmacognostical study of *Eclipta alba* Hassk was undertaken to bring out the salient diagnostic features which would help in crude drug identification as well as standardization of the quality and purity of the drug in crude form. The following anatomical features are suggested to diagnose root, stem and leaf.

Root: Cork cells are 3-5 layered, rectangular, tangentially elongated, thin walled; cortex consisting of 6-8 layers, oval to rectangular, parenchymatous cells having a single or groups of stone cells. **Stem:** Epidermis is single layered and covered by thick cuticle having non glandular trichomes; cortex is composed of 6-10 layered parenchymatous cells, Pith is wide, consisting of isodiametric parenchymatous cells. **Leaf:** Both the epidermal layers are covered with cuticle, traversed with stomata and bears simple and non glandular trichomes; in base, middle, apex both parenchymatous and collenchymatous cells are present.

While observing the physiochemical analysis, total ash represents the inorganic salts in the drug. Thus ash value is a general criterion to ascertain the purity of any drug. Here a total ash value was found as 11.45%. Acid insoluble ash gives the percentage of sand and impurities that remains insoluble in dil. HCl and it was found to be 7.5%. Lower the value higher the purity of the drug. Water insoluble ash mainly gives the percentage of organic matter present in the ash of the drug. It was found to be 6.5%. Moisture content was found to be 11% and the less amount of moisture indicates the proper drying of the materials. Volatile oil content was observed 2%. Fibre content was found to be 31%. The different extractive solution of crude drug powder of *Bhrungaraj* showed the presence of alkaloids, flavanoids, saponin, carbohydrates.

CONCLUSION

This study on macroscopic and microscopic features of *Eclipta alba* Hassk revealed set of anatomical parameters which may facilitate identification of genuine drug. Preliminary phytochemical study was also carried out and their details are mentioned along with the results, observation obtained in the experiments. These parameters help in standardizing the drug and in identification of genuine drug along with an idea of phytochemistry of plant.

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Fig. No. 1 *Eclipta alba* Hassk.

1. Leaf 2. Flower 3. Stem

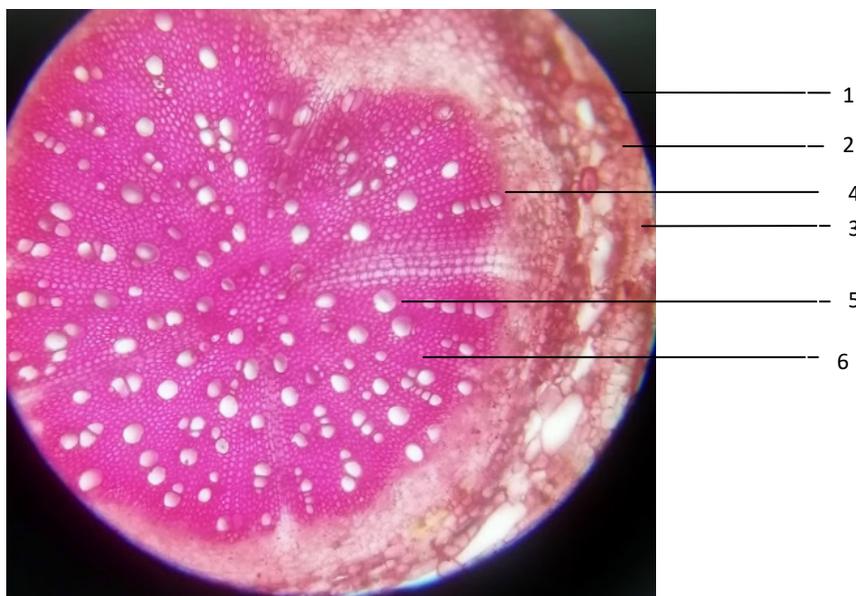


Fig. No. 2 T. S. of root of *Eclipta alba* Hassk.

1. Periderm 2. Secondary cortex 3. Stone cells 4. Phloem 5. Xylem 6. Medullary rays

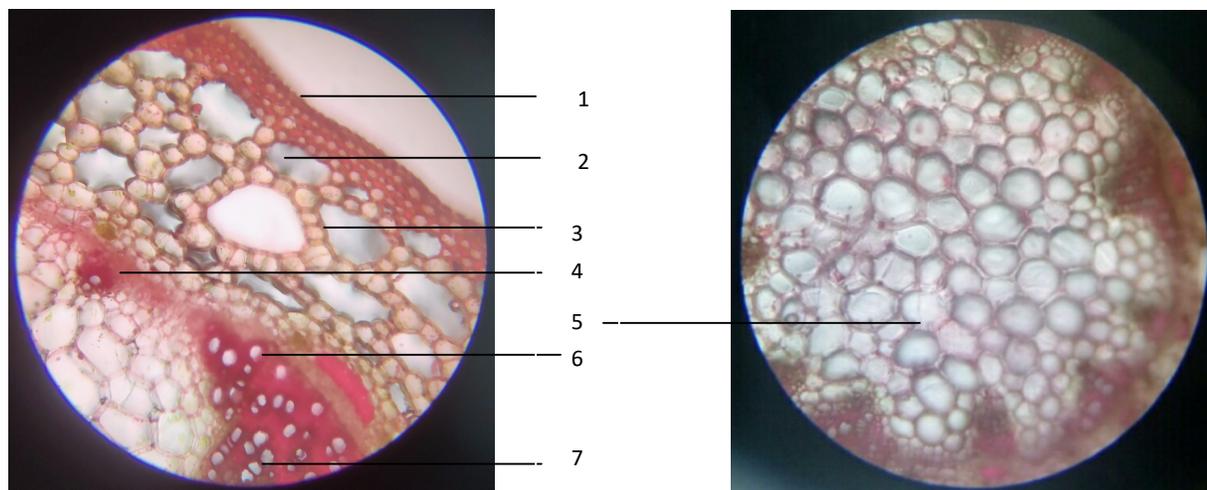


Fig. No. 3 T. S. of stem of *Eclipta alba* Hassk.

1. Epidermis
2. Secondary cortex
3. Parenchyma
4. Vascular bundle
5. Pith
6. Xylem
7. Phloem

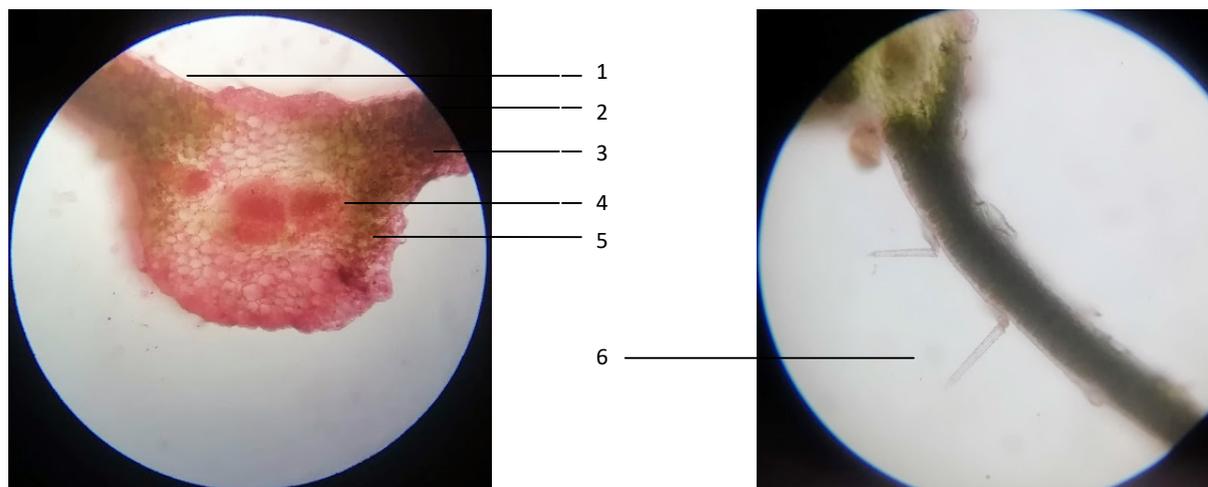


Fig. No. 4 T. S. of Leaf of *Eclipta alba* Hassk.

1. Upper epidermis
2. Palisade tissue
3. Spongy tissue
4. Vascular bundle
5. Collenchyma
6. Trichomes

Source of Support: Nil

Conflict Of Interest: None Declared

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