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## PHYTOCHEMICAL AND PHARMACOGNOSTIC STUDY OF *BACOPA MONNIERI* L.

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### ABSTRACT

*Bacopa monnieri* L. is small green herb commonly called Brahmi. Brahmi is used to treat jaundice, skin diseases, asthma, swelling, joint pain and bronchitis. Pharmacognostical study is carried out for evaluation of drug and to detect the adulteration. It includes dermal characters like stomata, trichomes and anatomical features etc. The plant is also analyzed for its preliminary screening of phytochemicals. It is clear that the presence of bioactive constituents in plant comprising flavanoids, alkaloids, saponins and tannins. The present study is helpful for the standardization or evaluation of drugs.

**Key words:** *Bacopa monnieri* L., Pharmacognostic studies, Dermal characters, Phytochemicals.

### INTRODUCTION

In India medicinal plants are traditionally used for the treatment of many diseases. The earlier records show their use in India, Chinese, Egyptian, Greek, Roman and Syrian texts dates back to about 5000 years. The classical Indian texts include Rigveda, Atharvaveda, Charak Samhita and Sushruta Samhita. The herbal medicines have been derived from rich traditions of ancient civilizations and scientific heritage (Kumar *et.al* 2016). Plant derivatives had been employed by population to prevent different kind of diseases for centuries. The knowledge of plant properties was acquired by ancient civilization that passed from generation to generation till today (Ali Esmil Al- Snafi, 2013). In Pharmacognosy complete and systematic knowledge of crude drugs of animal and vegetable origin is studied. A complete knowledge of a drug must include knowledge of the morphological nature and the structure both macroscopic and microscopic with active constituents, their nature, quantification and their relation to the constituents of other drugs (Jyoti *et.al* 2013)

The *Bacopa monnieri* L. is small green herb belongs to family Scrophulariaceae. The plant grow in Marshes along stream and river bank. Plant is prostrate, creeping or procumbent herbs. stem is fleshy, glabrous. Leaves opposite or the upper leaves alternate, sessile, fleshy, narrowed at base. Flower with long pedicel, bracteoles liner. Calyx glabrous divided to the base, upper sepal ovate other sepals shorter, lanceolate, acute. Corolla blue or pale purple. Stamens four. Capsule ovoid, glabrous. Seeds many oblong. ( Fig 1).

*Bacopa monnieri* L. is used in folk medicine by the rustics, tribals and local people of Mahur range forest of Nanded district, Maharashtra. The plant is used in the treatment of stomach ache, Malaria, Ulcer, asthma, cough dropsy, fever, arthritis, diabetes memory enhancement, hoarseness of voice, bronchitis (Sheraz and Tanveer, 2017; Ghulam Majtaba Shah *et al.*, 2014; Thirupathy S *et al.*, 2013; Naik, 1998, Maya Verma, 2014; Pramod *et al.*, 2016; Arant Gopal *et al.* 2012). Therefore, the preliminary phytochemical investigation is necessary to prove proclaimed ethnomedicinal uses. Brahmi is largely treasured as a revitalizing herb used by Ayurvedic medical practitioners for almost 3000 year. The herbs has been mentioned in several Ayurvedic treatises (Ashalatha and Shenoy, 2015).

## MATERIAL AND METHODS

### a) Plant material:

The Plant *Bacopa monnieri* L. were collected from Mahur range forest of Nanded district, Maharashtra. The collected plant material was taxonomically identified by using renowned flora (Naik 1979, Naik *et al* 1998., Chetty *et al.* 2008 and Yadav and Sirdesai 2002). The voucher specimen of plant was preserved in Department of Botany, Nutan Mahavidyalaya Saidu Dist. Parbhani. Plants were shade dried and powdered. The powdered plants were successively extracted with different solvent. The fresh plants were used for the study of macroscopic and microscopic characters.

### b) Preliminary phytochemical Screening:

Phytochemical screening of Plant extracts of *Bacopa monnieri* L. in different solvents were undertaken by using standard methods for the analysis secondary phytoconstituents like alkaloids, glycosides, flavonoids, tannins, saponins, terpenoids and cardiac glycosides (Harborne, 1984).

### c) Preparation of extract:

Plant powder was subjected to soxhlet extraction with petroleum ether (60-80°C), Methanol (64.5-65.5°C) and water for 3-4 h in the order of increasing polarity of solvents (Daniel, 1991).

The extracted solvent is evaporated to make the final volume one fourth of its original volume. Yield of extracts are 6.3, 12.7 and 14.56 % respectively. The extracts are stored at 4<sup>o</sup>c in airtight bottles for further study.

### Pharmacognostic studies:

#### Macroscopic study:

Morphological studies were done using simple microscope. The shape, apex, base, margin, taste and odour of Plant powder were observed.

#### Microscopic studies:

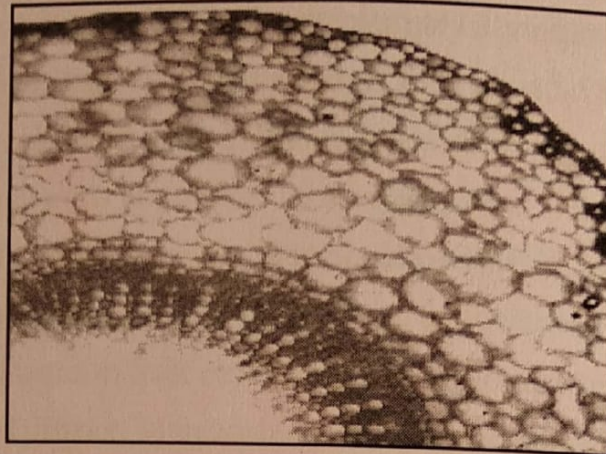
The free hand transections of leaves and stem were taken and stained by using double stained differential staining technique and mounted in DPX (Johanson, 1940). The cellular and anatomical illustration was prepared by using camera lucida and some photograph were taken with the help of digital camera.

The leaf is peeled off for the study of stomata. For vessels study the stem is macerating into Jeffery's fluid and stained with aqueous 1% saffranin and mounted in glycerine and made semipermanent by ringing with DPX mountant.

The Plant powder was treated with phloroglucinol and HCl for the detection of lignin. Glycerin and iodine solution were used to determine calcium oxalate crystal and starch grains respectively. As a part of quantitative microscopy, stomatal number, stomatal index, vein islet number and vein termination number were determined by using fresh leaves of the plant (Kokate, 1997).

### OBSERVATIONS

**T. S. of Stem :** The transverse section of the stem is wavy in out line. Epidermis is outer most single layer composed of compactly arranged barrel-shaped green cell . The outer surface of of epidermis is covered with thin cuticle. Stomata are present at intervals. Beneath the epidermis multilayered parenchymatous cortex with large intercellular spaces are present. Endodermis and pericycle is clearly visible. Inner to cortex a ring of many conjoint, collateral and open vascular bundles are present. Phloem is present towards epidermis. Xylem is endarch. Many polygonal compactly arranged cells are present at the center forming pith (Fig. 1).



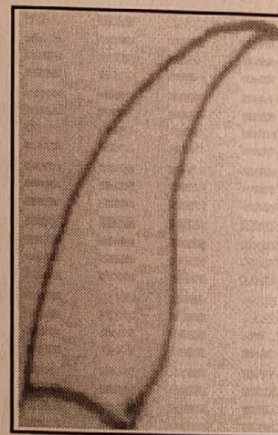
**Fig.1 :T. S. of Stem**

**Stomata:**

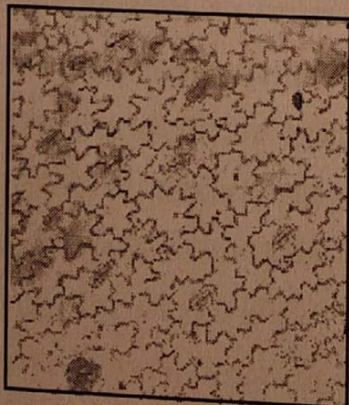
The leaf is simple smooth, leaf lamina entire uncostate reticulate pattern of venation, the leaf is amphistomatic. The stomaties of both the surfaces are anomocytic, the guard cells are surrounded by three to four subsidiaries, and subsidiaries are indistinct form epidermalf cells. Frequency of stomata more on lower epidermis than upper epidermis (Fig. 4 and Fig.5 ).



**Fig. 2 Trichomes upper epidermis**



**Fig. 3 Trichomes lower epidermis**



**Fig.4 Stomata lower epidermis**



**Fig.5 Stomata upper epidermis**

**Trichome:**

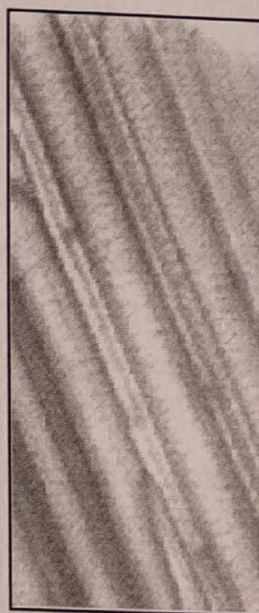
The trichomes are present on both the leaf surfaces. The trichomes of upper surface are simple unicellular with cytoplasmic content the foot is embedded into epidermal cell and tip of the trichome is slightly bent. The trichomes of lower surface are simple unicellular with cytoplasmic content, foot is embedded into the epidermal cell.( Fig. 2 and Fig.3).

**Vessels:**

The vessel elements show variation where, 50% of the vessel are with spiral. Both the end wall plate oblique and simple perforation having size 50 mμ diameter and 205 mμ length (fig. 6). In 50% vessels the lateral wall thickening is scalariform, both end wall are oblique with simple perforation plate having 310 mμ length and diameter is 80mμ ( fig. 6 A and B).



**Fig.6-A :Stem Vessels**



**Fig.6-B: Stem Vessels**

**Table 1: Preliminary phytochemical screening of Plant powder**

Sr.no	Phytochemicals	Test	Sr. no	Phytochemicals	Test
1	Alkaloid	+	6	Phlobatannins	-
2	Glycoside	-	7	Saponins	+
3	Flavonoids	+	8	Terpenoids	-
4	Tannins	+	9	Anthraquinones	-
5	Reducing sugar	-	10	Cardiacglycosides	-

**Phytochemical constituents:**

The preliminary phytochemical analysis of plant powder shows the presence of flavanoids, alkaloids, saponins and tannins. The, phlobatannins, Reducing sugar, Terpenoids, Anthraquinones and Cardiacglycosides are absent (Table. 1)

**Powder analysis:** The powder was characterized by its morphological features like green colour; presence of specific odour and bitter taste. Microscopic study of powder reveals the presence of green-pigmented endodermal layer. (Table. 2&3)

**Table 2: Preliminary test**

Sr.no	Test	Observation	Inference
1	Colour	Green	Plant of <i>Bacopa</i>
2	Odour	Specific	Aromatic crude drug
3	Taste	Bitter	Drug contain alkaloid

**Table 3: Flurosence analysis of the powdered seed of *B. monnier***

S.No.	Reagent	Observation	Characteristic
1	Powder +Phloroglucinol+ conc. HCL	Red colour	Lignified cells
2	Powder +Ruthenium red	Black	Muciligenous cells are absent in epidermis
3	Powder +Sudan red III	Red colour	Oil globules in the cell of endodermis
4	Powder +Acetic acid	Insoluble	Calcium oxalate present
5	Powder +Dil. Hydrochloric acid	Soluble	Calcium oxalate present
6	Powder +Conc.Sulphuric acid.	green colour	Stone cells are present
7	Powder +Dil. Iodine solution	blue colour	Starch is present
8	Powder +Dil. Iodine solution +Conc Sulphuric acid	Blue colour	Hemicellulose in endodermis

## DISCUSSION AND CONCLUSION

Brahmi is traditionally used in India. The plant has medicinal properties. It is abundantly found along stream and river bank and is used to treat many diseases. Thus special technique was designed for its authentication and identification on the basis of microscopy and chemical analysis. The present study reveals that the extracts of plant contain flavanoids, alkaloids, saponins and tannins. Due to the presence of these phytochemicals in this plant is used against various diseases.

The extracts indicated a relatively moderate number of phytochemicals. The pharmaceutical and antimicrobial studies could be done that will further elucidate and characterize the active components and authenticate its folkloric efficacy.

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