

Research Article

A comparative study of roots of *bacopa monnieri* (L.) Pennel and *bacopa floribunda* (R.Br.) Wettst.

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ABSTRACT

Bacopa monnieri a well known herbal drug, extensively using as memory enhancer all over the world. In Ayurveda Bhavaprakash nighantu described Brahmi (*Bacopa monnieri*) as Medhya, Ayushya, Rasayana. In Rajanighantu as Vatastra pittajit, buddhi, prajna, Medhya, Ayushyavardhini. Still utilizing from thousands of years due to lack of knowledge & availability, improper identification we are using *Bacopa floribunda* and other species in the name of *Bacopa monnieri*. Present study differentiated *Bacopa monnieri* & *Bacopa floribunda* in morphology, root TS, powder microscopy. Morphological character shows colour difference in flower, stem, root & leaf, also shows difference in microscopic study and also in powder studies.

Key words: *Bacopa monnieri*, *Bacopa floribunda*, Morphology, Pharmacognosy.

INTRODUCTION

Today urbanization & industrialization have taken the world into 21st century. National resources are being utilized at a larger extent for the development of industries. Ayurvedic medicines are completely dependent on the natural sources.¹ People are now realizing preventive, Promotive and curative effect of Ayurveda. Lack of conservation of natural habits of plants will live into shortage. Due to this people are using alternative or different species in the name of original plant. Moreover, people are supplying either the substitutes or the adulterants of the medicinal plants. *Bacopa monnieri* well accepted as Brahmi, is a promising plant to enhance the memory by activating neurons of that area. It has a wide range effect on CNS activity, but is most popularly considered a memory enhancer. Other pharmacological properties of the extracts include sedation & Cardiotonic², Vasoconstriction³, anti-inflammatory activity⁴. In Ayurveda Bhavaprakash nighantu described Brahmi (*Bacopa monnieri*) as Medhya, Ayushya, Rasayana. In Rajanighantu Brahmi is described as Vatastra pittajit, buddhi, prajna, Medhya, Ayushyavardhini.

MATERIALS AND METHODS

Collection of the drug-Whole plant of *Bacopa monnieri* was collected from Foundation for Revitalization of Local Health Traditions (FRLHT), Bangalore in the month of December and *Bacopa floribunda* was collected from Jamnagar in December. Both the plants were identified & authenticated in Pharmacognosy dept. IPGT&RA, GAU, Jamnagar.

Macroscopic evaluation/Organoleptic evaluation:

Various parameters of the plant material, such as size, shape, odour, colour, taste of root were recorded. Microscopic evaluation-Thin free hand sections of roots were made and washed with water and diagnostic characters in section and powder of both roots were studied with and without staining. The microphotographs were taken under Carlzeiss binocular microscope attached with camera^{5,6,7}.

Aims and objectives

- Macroscopic, Microscopic study root of *Bacopa monnieri* and *Bacopa floribunda* and its powder.
- Comparison between both the roots and its powder.

RESULT AND DISCUSSION

Organoleptic character: Various parameters of the plant material, such as size, shape, odour, colour, taste of root were recorded and are depicted in Table.1.

Bacopa Monnieri

Plant morphology: A creeping herb with ascending branches, rooting at nodes. Leaves sessile, upto 2.5x0.6 c.m, oblong or obovate, entire, obtuse at apex. Flowers solitary, axillary, pedicelled. Calyx c. 6mm long; upper sepal broadly ovate, lateral sepals linear lanceolate. Corolla 5-6mm long, white or pale violet-blue. Capsules ovoid, apiculate. The plant is succulent when fresh but becomes shriveled on drying; slightly bitter in taste, without any characteristic odour and composed of crumpled, matted broken pieces of roots, branching stems, leaves, flowers and few tender fruits (fig.B).

Root morphology: Fragments of dried main roots are cylindrical, about 5mm in diameter, longitudinally wrinkled and white in colour (fig. 15)

T.S of Root: Diagrammatic TS of the root is irregularly circular to angular at places in outline, shows outermost

piliferous layer, parenchymatous cortex with intervening air spaces and a centrally located solid core of xylem encircled by narrow phloem. Detailed TS shows piliferous layer occasionally at places getting replaced by formation of cork cells, cortex is wide, parenchymatous, traversed

Table.1 Organoleptic Charecters

Character	Bacopa monnieri	Bacopa floribunda
Colour	Brown	Greenish
Odour	Pungent	Odourless
Taste	Bitter-Astringent	Bitter

with simple and compound starch grains and intervened with air spaces, endodermis is distinct, a narrow band of phloem surrounding the centrally located solid core of xylem composed of radially arranged isolated vessels, fibres, parenchyma and medullary rays (fig. 11-14).



Fig.A. Bacopa floribunda



Fig.B. Bacopa monnieri

Powder microscopy: Diagnostic character of *Bacopa monnieri* shows prismatic, cluster crystals of calcium oxalate, starch grains and oil globules scattered as such throughout or embedded in the parenchymatous cells; fragments of longitudinally cut annular and pitted vessels (fig.16-21).

Bacopa Floribunda: Plant Morphology: An erect slender herb. Leaves subsessile, upto 3x0.4, linear lanceolate, acute at apex. Flowers 1-3 together in the axils; Pedicles short & slender. Sepals puberulous, upper sepal ovate, the two lateral sepals narrow. Corolla white, with purplish stripes on the upper lip. Capsules sub globose (fig. A).

Root morphology: Fragments of dried main roots are longitudinal, about 6-7 mm in diameter, wrinkled and of reddish brown in colour (fig.1).

TS of Root: Diagrammatic TS of the root is irregularly circular to angular at places in outline, shows outermost piliferous layer, parenchymatous cortex with intervening air spaces and a centrally located solid core of xylem encircled by narrow phloem.

Detailed TS shows piliferous layer occasionally at places getting replaced by formation of cork cells, cortex is wide, parenchymatous, traversed with simple and compound starch grains and intervened with air spaces, endodermis is distinct, a narrow band of phloem

surrounding the centrally located solid core of irregularly arranged collapsed xylem composed of parenchyma & fibres covering central portion of the root without any medullary rays (fig 2,3,4).

Powder microscopy: Diagnostic character of *Bacopa floribunda* shows simple & starch grains from cortical region, trichome from epidermis, tannin content from cortex, fragments of pitted, annular & spiral vessels from stealar region (fig 5-10).

The morphological study reveals that *Bacopa monnieri* showed light blue colour flowers, thick fleshy leaves, greenish coloured stem, whitish cream coloured roots. Transverse section of *Bacopa monnieri* reveals that proper epidermis, reduced cortex along with aerenchyma, parenchyma filled with large number of tannin material, prismatic crystals, oil globules, phloem & its fibres, properly arranged xylem along with parenchyma

& its fibres. In powder microscopy prismatic, cluster crystals of calcium oxalate, starch grains and oil globules scattered as such throughout or embedded in the parenchymatous cells; fragments of longitudinally cut annular and pitted vessels are seen.

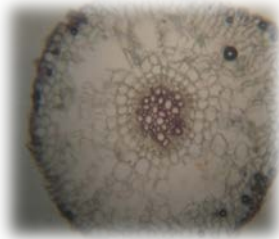
The morphological study reveals that *Bacopa floribunda* showed dark bluish flowers, flat & large leaves, greenish brown coloured stem, reddish brown coloured root. Transverse section of *Bacopa floribunda* reveals that epidermis, reduced cortex along with large aerenchymatous cells, parenchyma filled with minute quantity of tannin material, less quantity of oil globules, phloem & its fibres, improperly arranged clumped xylem along with parenchyma & its fibres. In powder microscopy starch grains and oil globules scattered as such throughout or embedded in the parenchymatous cells, tannin content material, fragments of longitudinally cut annular, pitted & spiral vessels are seen.

CONCLUSION

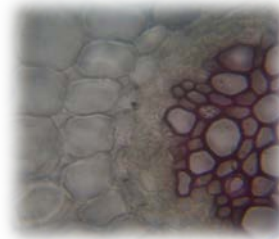
Above morphological & pharmacognostical study concludes that *Bacopa monnieri* shows much more superior characters as compare to *Bacopa floribunda*. To overcome from controversy it needs proper identification while utilizing in commercial drug preperatio



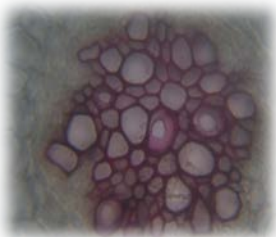
1. Fresh roots of B.F



2. Cork,Cortex,
Aerenchyma,Vascular bundle



3. Phloem,xylem fibres



4. Collapsed xylem vessels



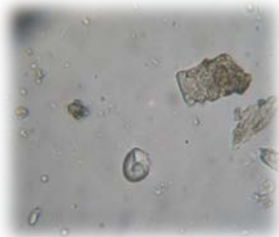
5. Simple Fibre



6. Trichome



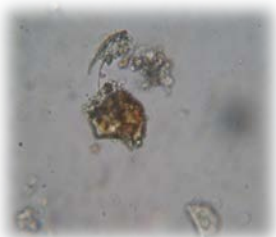
7. Spiral vessels



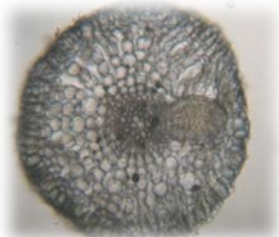
8. Starch grain with hilum



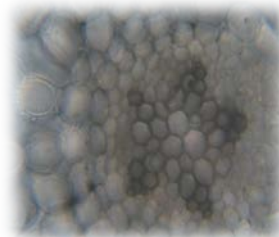
9. Pitted & Scalariform vessels



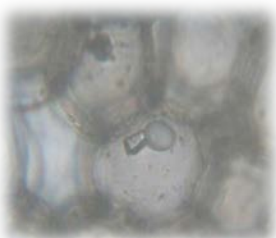
10. Tannin content material



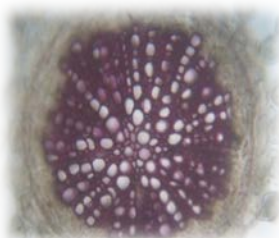
11. T S of B.M root



12. Aerenchyma with vascular bundles



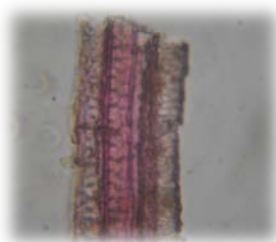
13. Prismatic crystals with oil globule



14. Endodermis,Phloem,Xylem fibres



15. Fresh roots of B.M



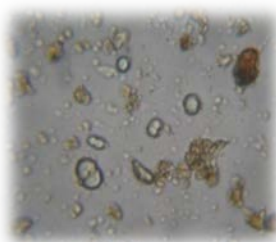
16. Pitted & scaliform vessels



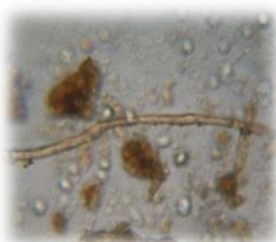
17. Scleroids



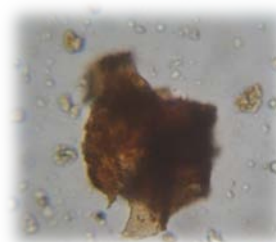
18. Compound starch grain



19. Simple starch grain



20. Simple fibre



21. Tannin content material

B.F- *Bacopa floribunda*

B.M- *Bacopa monnieri*

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