



## **An Overview on BACOPA MONNIERI (BRAHMI)**

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### **ABSTRACT :**

Bacopa monnieri is a highly valued medicinal plant belonging to the Plantaginaceae family. It is known by various names, including water hyssop, Brahmi, and Indian pennywort. This herb has been utilized in Ayurvedic medicine for its therapeutic properties.

Characterized by its vibrant green leaves and delicate bluish-white flowers, Bacopa monnieri is a non-aromatic herb. Traditionally, it has been employed to address a range of health concerns, including cognitive function, mental well-being, and physical ailments.

**KEYWORDS:** Biological Source, Geographical Distribution, Cultivation and Collection, Herb, Bacopa monnieri, Brahmi, Ayurvedic, Cognitive Enhancer, Neuroprotective, Root, Stem, Leaves

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### **INTRODUCTION :**

Plants have been a vital source of drugs and have played a significant role in the global healthcare system. Herbal plants and their extracts are used in various cultures worldwide, and their repeated use demonstrates their substantial therapeutic properties.

For centuries, plants have been considered a rich source of essential and safe medicines. Herbal medicines have been the primary source of traditional medical systems globally, with around 80% of the world's population relying on them.[1]

In India, the Vedas highlight the considerable use of classical herbal drugs to treat various diseases. Interestingly, about 30% of the root part of plants is used in different practices.[2]

According to resources, approximately 80% of modern medicines are directly or indirectly prepared from plant extracts. Ayurvedic texts like Sushruta Samhita, Charak Samhita, and Atharva Veda describe plants with specific actions on the intellect and memory.

Bacopa monnieri L. Penn., also known as Brahmi or Water hyssop, is a significant therapeutic plant in the Indian Medicinal System. The name "Brahmi" is derived from "Brahma," the Hindu creator god, signifying "bringing information on the incomparable reality." [3]

Due to overexploitation, B. monnieri is considered an endangered species. It possesses various medicinal properties, including anti-inflammatory, analgesic, antipyretic, sedative, antiepileptic, and antioxidant effects.[4]

A recent report ranked B. monnieri second in Indian therapeutic plants based on medicinal significance, business value, and research and development. The National Therapeutic Plants Board Report stated that the annual market demand for Brahmi (Bacopa monnieri) was around 1,000 tons in 2000, driving its growth due to its potential uses in Ayurvedic medicines.[5]



**Figure No.1: Bacopa Monnieri**

**SYNONYMS [6]**

Bacopa monniera Hyata and mastum  
 Bramia monniera (L.) Pennell  
 Gratiola monniera L.  
 Herpestis monniera (L.) Kunth  
 Herpestisfaurei H.Lev.  
 Herpestis monniera  
 Herpestris monniera  
 Lysimachia monniera L.  
 Monniera cuneifolia Michex

**BIOLOGICAL SOURCE [7]**

The biological source of Bacopa monnieri is a fresh and dried leaves and stems of this plant and its various species.

**FAMILY**

Plantaginaceae.

**TAXONOMY [8-10]**

Taxonomical Rank	Taxon
Kingdom	Plantae
Division	Antophyta
Class	Dicotyledonae
Order	Scrophulariaceae
Family	Plantaginaceae
Genus	Bacopa
Species	Monniera
Common Name	Brahmi

**Table no.1: Taxonomy of Brahmi (Bacopa monnieri)**

**BOTANICAL DESCRIPTION :**

- **General Characteristics**
  - Perennial, non-aromatic herb
  - Smooth, crawling, and beefy with numerous branches
  - Height: 60-90cm
- **Roots**
  - Thin, wiry, and creamish-yellow
  - Expanded and small
- **Stem**
  - Delicate, green or purplish-green
  - 1mm thick with nodes and internodes
  - Slightly bitter taste
- **Leaves**
  - Bent, straightforward, inverse, and crisscross
  - Green, sessile, 8-15mm long, and 4mm wide
  - Elongated with minute specks on the lower surface
- **Flowers**
  - Small, axillary, and five-petaled
  - White, purple, pink, or pale violet in appearance
  - Pedicels: 6-30mm long with narrow bracteoles
- **Fruits**
  - Ovoid, glabrous, and sharp at the apex
  - Purple in fresh condition, up to 5mm long [11-15]

**ORGANOLEPTIC PROPERTIES :**

- **Odor:** Characteristic, slightly bitter and earthy.
- **Taste:** Bitter, slightly sweet and astringent.
- **Texture:** Soft, fragile and slightly hairy.
- **Colour:** Greenish-brown to brown.
- **Shape:** Stem is quadrangular, leaves are oval or elliptical. [16]

**MACROSCOPICAL STUDY**

- **Stem:** Slender, quadrangular, and creeping
- **Leaves:** Simple, opposite, and sessile

- **Leaf shape:** Oval or elliptical
- **Flowers:** Small, blue or purple, and arranged in axillary or terminal spikes
- **Fruits:** Small, capsule-like, and contain numerous seeds [17-18]

### MICROSCOPICAL STUDY

#### • Root

1. Single-layered epidermis
2. Cortex with large air cavities
3. Single-layered endodermis
4. Pericycle not distinct
5. Stele consists of phloem with few sieve elements and xylem with vessels having reticulate thickenings

#### • Stem

1. Single-layered epidermis
2. Wide cortex with thin-walled cells and large intercellular spaces
3. Single-layered endodermis
4. Pericycle consists of 1-2 layers
5. Vascular ring continuous with phloem and xylem
6. Small pith with distinct intercellular spaces
7. Simple, round to oval starch grains present in cortex and endodermis

#### • Leaf

1. Single-layered upper and lower epidermis with thin cuticle
2. Glandular hairs sessile with subsidiary cells
3. Prismatic crystals of calcium oxalate occasionally found in mesophyll cells
4. Mesophyll traversed by small veins surrounded by bundle sheath.
5. No distinct midrib present

#### • Powder

1. Yellowish-brown color
2. Shows xylem vessels with reticulate thickening
3. Glandular hairs present
4. Simple, round, and oval starch grains measuring 4-14  $\mu$  in diameter. [19-20]

### GEOGRAPHICAL DISTRIBUTION :

Bacopa monnieri originates from India and Southeast Asia, with a presence in Africa, Australia, and North America. It's cultivated in multiple continents and flourishes in tropical and subtropical climates. The herb is widespread globally, including the Pacific Islands and South America. Its adaptability has made it a popular crop. Bacopa monnieri grows in wet environments and is commonly found in China, Japan, and Sri Lanka. It's also cultivated in the US, particularly in Florida and Texas, and is valued for its medicinal properties. [21-24]

### PHYTOCHEMICAL CONSTITUENTS :

Bacopa monnieri contains a diverse range of bioactive compounds. These compounds contribute to its medicinal properties and therapeutic benefits. Alkaloids such as brahmine, herpestine, and nicotine is present. Glycosides like monnierasides and bacosides are also found. The herb is rich in flavonoids, including luteolin, quercetin, and apigenin. Triterpenoid saponins and phenolic acids like chlorogenic acid and ferulic acid are present. Bacopa monnieri also contains steroids such as stigmasterol and  $\beta$ -sitosterol. These bioactive compounds work together to provide various health benefits. Bacopa monnieri has been used in traditional medicine for centuries. Its phytochemical constituents make it a valuable herb for overall well-being. [25-29]

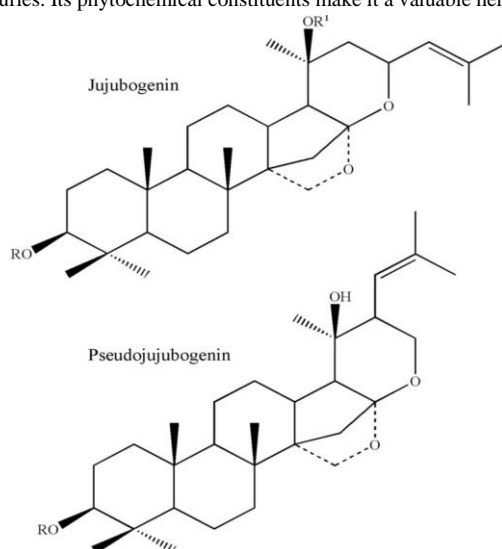


Figure no.2: Chemical Structure of Jujubogenin and Pseudojujubogenin

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## CULTIVATION AND COLLECTION :

- Bacopa monnieri is typically cultivated in tropical and subtropical regions with high humidity and warm temperatures. The ideal soil for cultivation is well-drained, fertile, and slightly acidic.
- Seeds are sown in nurseries during the spring season, and seedlings are transplanted to fields after 4-6 weeks. The crop requires regular watering, fertilization, and pruning to promote healthy growth.
- Harvesting of Bacopa monnieri usually occurs after 3-4 months of planting, when the leaves and stems are mature. The entire plant is uprooted, cleaned, and dried to preserve its medicinal properties.
- Collection of wild Bacopa monnieri is also practiced, particularly in areas where the herb grows abundantly. However, over-collection can lead to depletion of natural resources, emphasizing the importance of sustainable cultivation practices. [30-32]

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## AYURVEDIC LITERATURE ON BRAHMI :

Bacopa monnieri, or Brahmi, holds significant importance in Ayurvedic medicine. Ancient texts like Charaka Samhita and Sushruta Samhita document its therapeutic applications. In Ayurveda, Brahmi is valued for its cognitive-enhancing properties, earning it the classification "Medhya Rasayan." This herb has been employed for centuries to support mental clarity, memory, and intellectual function. Brahmi is a key component in various traditional Ayurvedic formulations, which are utilized to address seizures, cognitive decline, and other health concerns. Ayurvedic literature attributes five distinct properties (Ras Panchak) to Brahmi, contributing to its therapeutic benefits. [33-34]

### *Ayurvedic Actions of Brahmi*

1. **Vatahara:** Calms Vata, maintaining the circulatory system.
2. **Anuloma:** Redirects Vata (blood flow) downwards.
3. **Unmadahara:** Reduces mental illness.
4. **Pradnya shakti:** Increases intellectual power.
5. **Hridya:** Heart tonic.
6. **Majjadhātu Rasayana:** Rejuvenative, treating nervous system disorders.
7. **Ayushya vardhana:** Increases longevity.
8. **Balyam:** Gives strength (especially to the mind).
9. **Jeevaniya:** Promotes energy.
10. **Medhya:** Nervine.
11. **Nidrajnana:** Promotes sleep.
12. **Kushtaghna:** Alleviates skin conditions. [35-36]

## PHARMACEUTICAL USES

Bacopa monnieri is utilized in various pharmaceutical applications due to its cognitive-enhancing, neuroprotective, and adaptogenic properties. Some of its key uses include:

1. **Memory and Cognitive Enhancement:** Bacopa monnieri extracts are used to improve memory, learning, and concentration.
2. **Neuroprotection:** The herb's antioxidant and anti-inflammatory properties help protect against neurodegenerative diseases such as Alzheimer's and Parkinson's.
3. **Anxiety and Stress Relief:** Bacopa monnieri is used to alleviate anxiety, stress, and insomnia due to its anxiolytic and sedative effects.
4. **Anti-Inflammatory and Antioxidant:** The herb's anti-inflammatory and antioxidant properties make it useful in treating various inflammatory conditions.
5. **Cardiovascular Health:** Bacopa monnieri may help lower blood pressure and cholesterol levels, contributing to overall cardiovascular well-being. [37-41]

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## CONCLUSION :

This review focuses on Bacopa monnieri, a plant belonging to the Plantaginaceae family, extensively utilized in Ayurvedic medicine. Traditionally, Bacopa monnieri has been employed to prepare various ayurvedic formulations, primarily aimed at treating diverse health conditions. Additionally, Bacopa monnieri has been used to manage various health issues, including asthma, back pain, hoarseness, and mental disorders, showcasing its versatility and potential in promoting overall well-being.

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