

## Pharmacological Activity of Brahmi - A Review

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### ABSTRACT

Plants have been utilized as medicines for a huge number of years, in light of involvement and society cures and keep on illustration wide consideration for their job in the treatment of gentle and endless ailments. In these periods, concentration on plant inquire has expanded throughout the world also, a vast assemblage of proof has been collected to feature the monstrous capability of medicinal plants utilized in diverse system of medicine. In diverse of medicinal plants *Bacopa monnieri* is one of the most useful plants seen in Ayurveda medicines. *Bacopa monnieri* is a perennial, creeping herb origin to wetlands of southern and eastern India, Australia, Europe, Asia and north and South America. Brahmi has its own individual distinctive strong herbal taste and a bitter aftertaste. Due to alteration in lives and growing awareness for health there is a countless demand of food products that are healthy as well as provide some useful welfare. Its phytochemical substances are alkaloids, flavonoids, glycosides, saponins and the significant constituents such as bacosides, bacopasides and bacopasaponins, which all of these contribute to its helpful properties. It is now being widely promoted to enhance memory, learning and concentration and also to treat anxiety, depression and systemic disorders like cardiovascular, gastrointestinal, hepatic, neurological and also respiratory problems. This article mainly incorporates on the overview of *Bacopa monnieri* collection, cultivation, Ayurveda benefits.

**Keywords:** *Bacopa monnieri*, Bacoside, Brahmi, Bacopasaponin C, Anti-Parkinson

### INTRODUCTION

Brahmi is a typical herb originated all over India. It is a plant which lives more than two years (perennial) of 10 cm high. Brahmi leaves are sessile arranged in opposite direction, which is small and fleshy. The flowers are of 1-2 cm and white in color. It even grows in hot and moisture place. It is one of the medicinal plants in India [1]. The word Brahmi comes from the word 'Brahman' which means Consciousness of God. Brahmi gives a state of calmness to the body, soul and spirit. It is mainly originate from Karnataka, Kerala, Odisha, Bihar, Punjab, Haryana, Bengal, Tamil Nadu, Himachal Pradesh and Uttrakhand. In subtropical and poorly water drained areas it grows well. It grows faster at 30-40°C. Created on their role in treatment of slight and enduring health problems, plants have been used for a thousand years now. As of late, herbal plants are in attention due to their ability to show hopefully outcomes in numerous health difficulties. It even grows in swamp and marshy places of Nepal, Sri Lanka, China, Bangladesh and USA. *Bacopa monnieri* Linn. (Herpestismoniera) synonym. *Bacopa* popularly known as brahmi, Jalnim in Hindi and Nirpirami, Piramiyapundu in Tamil which belongs to the family Scrophulariaceae [2].

### Taxonomical classification

**Kingdom:** Plantae

**Division:** Angiosperms

**Class:** Eudicots

**Order:** Lamiales

**Family:** Scrophulariaceae

**Genus:** *Bacopa*

**Species:** *monnieri*

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### Plants parts used

Whole herb is used- Seeds, roots, leaves, rhizomes

### Cultivation

Temperature: 33-40°C

Rainfall: 50-100 cm

Altitude: 1300-1400 m

Harvesting temperature: 20-25°C

Sowing temperature: 25-30°C [3]

### Soil condition

It can be grown under varying soil conditions, but wet soil with poor water drainage, is found to be suitable for its growth. It can be grown in marshy areas, canals and several water bodies. It requires acidic soil for its good growth [4].

### Cultivation details

Seeds can be used, but due to excessive loss of seeds, vegetative propagation (plant cutting) is widely practiced. Transplanted during summer March-May or June-July [5].

### Land preparation

Land is ploughed twice or thrice thoroughly and made weed free. Well decomposed manures/hectare is added, again ploughed, leveled and irrigated a day before planting. Nursery bed is raised by using mixture of soil, manure and sand. It is irrigated well to keep the soil moist. Within, few months the seedling is ready for transplanting [6].

### Time of sowing

The planting should be done in the month of mid-June or early July.

### Spacing

Seedlings are transplanted at the distance of 20 × 20 cm the mother plants are cut into small pieces along with roots,

which are ideal transplanting material. It is moist loving, marshy plant, hence requires adequate irrigation. First irrigation after transplanting is essential for establishment of plants, followed by flood irrigation and no additional irrigation is required during monsoon, 7-8 irrigation is sufficient [7].

### Fertilizer

At the time of land preparation, apply organic manure such as FYM and mix well in soil. Apply inorganic fertilizer dose of Nitrogen: Phosphorus: potassium in the form of Urea. Phosphorus and potash are applied as a basal dose and Nitrogen is applied in 3 split doses. First application is done 30 days after planting then second application is done at 60-70 days and third application is applied at 90 days after planting [8].

### Weeding

During initial stages of plant growth, hand weeding is preferred at an interval of 10-15 days and proliferates with dense mass, weeding is carried out as and when required [2].

### Harvesting

Plant starts yielding by 5-6 months after transplantation. Harvesting is done in the month of October-November [9], 2008 the upper portion from the base, i.e., 4-5 cm from the base is cut for harvesting. 2-3 harvestings are done in one year. Harvested material is washed and cleaned of the external matter [10]. It is then spread in thin layer on ground under shade at room temperature. The product is tossed twice a day for uniform drying. The drying process takes about 8 to 10 days [11] then packing is done in airtight bags for long distance transportation. The total dry herb yield of plant in two harvesting seasons is approximately 100 quintal per hectare [11].

### Microscopical feature

The microscopical features are mentioned in **Table 1**.

**Table 1.** Microscopical features of *Bacopa monnieri*.

Characters	<i>Bacopa monnieri</i>
Stem	Herbaceous, branched, solid with prominent nodes and internodes, cylindrical, green in color
Root	Tap and adventitious root
Leaf	Opposite decussate, sessile, estipulate simple
Flower	Solitary, stalked, ebracteate, zygomorphic, bisexual, hypogynous
Calyx	Gamosepalous, inferior, persistent, irregular
Corolla	Gamopetalous, deciduous, inferior, irregular, color-white with tinge purple
Androecium	Stamen-4, epipetalous, antisepalous, antherbilocular, black dorsifixed
Gynoecium	Syncarpous, carpels, ovoid in shape, style-1, stigma-2
Fruit	Capsule

## MICROSCOPICAL STUDY

### Transverse section (T.S.) of root (Table 2)

**Table 2.** Microscopical study of Bacopa roots.

<b>Epidermis</b>	Single layered with wide cortical parenchymatous region
<b>Endodermis</b>	Distinct and single layered and pericycle was not differential
<b>Central region</b>	Stele consisted of 1-5 layers of peripheral phloem and centrally located xylem vessels

### Transverse section (T.S.) of stem (Table 3)

**Table 3.** Microscopical study of Bacopa stems.

<b>Epidermis</b>	<b>Single layer</b>
Cortex	Chlorenchymatous paerenchyma or air spaces, cortical cells with starch grains
Endodermis	Single layered
Pericycle	1-2 layered
Phloem	Narrow zone composed of continuous vascular ring
Xylem	Located towards centre
Parenchymatous	Centrally located, pith with simple, round to oval starch grains
Stomata	Anomocytic and diacytic
Trichomes	8 celled sessile glandular trichomes

### Transverse section (T.S.) of leaf (Table 4)

**Table 4.** Microscopical study of Bacopa leaves.

<b>Epidermal</b>	Distinct upper and lower, presence of sub epidermal foliar idioblasts
<b>Vascular bundles</b>	Collateral encircled by a parenchymatous sheath
<b>Mesophyll</b>	Few crystals of calcium oxalate were seen embedded

## POWDER CHARACTERISTICS

### Whole plant powder (Table 5)

**Table 5.** Powder characteristics of whole Bacopa plant.

<b>Starch grain</b>	Simple, round to oval shaped
<b>Stomata</b>	Anomocytic and diacytic
<b>Calcium oxalate crystal</b>	Prismatic
<b>Xylem vessel</b>	Spiral thickenings
<b>Trachids</b>	Pitted

**Root powder (Table 6)****Table 6.** Powder characteristics of Bacopa root.

<b>Color</b>	Brown
<b>Starch grain</b>	Simple
<b>Xylem vessel</b>	Spiral thickening
<b>Trachids</b>	Pitted xylem

**Stem powder (Table 7)****Table 7.** Powder characteristics of Bacopa stem.

<b>Color</b>	Light color
<b>Taste</b>	Bitter
<b>Xylem vessels</b>	Spiral thickening
<b>Trachids</b>	Pitted xylem
<b>Starch grain</b>	Simple, oval, round

**Leaf powder (Table 8)****Table 8.** Powder characteristics of Bacopa leaves.

<b>Color</b>	Green
<b>Taste</b>	Bitter
<b>Stomata</b>	Anomocytic and diacytic
<b>Mesophyll tissue</b>	Prismatic calcium oxalate crystal
<b>Starch grain</b>	Simple

**ORGANOLEPTIC CHARACTER**

Colour: Green

Taste: Bitter [12]

Size (leaves): About 2 cm [13]

**CHEMICAL CONSTITUENT**

This plant in the indigenous system of medicine, orderly chemical inspections of the plant have been carried out by numerous groups of scientists. Some of the chemical constituent that are present are alkaloids, flavonoids, glycosides, saponins and the significant constituents such as bacosides, bacopasides and bacopasaponins, which all of these contribute to its helpful properties. It also contains bacopaside X, bacopaside II, bacoside A3 and bacopasaponin C [14] (**Figure 1**).

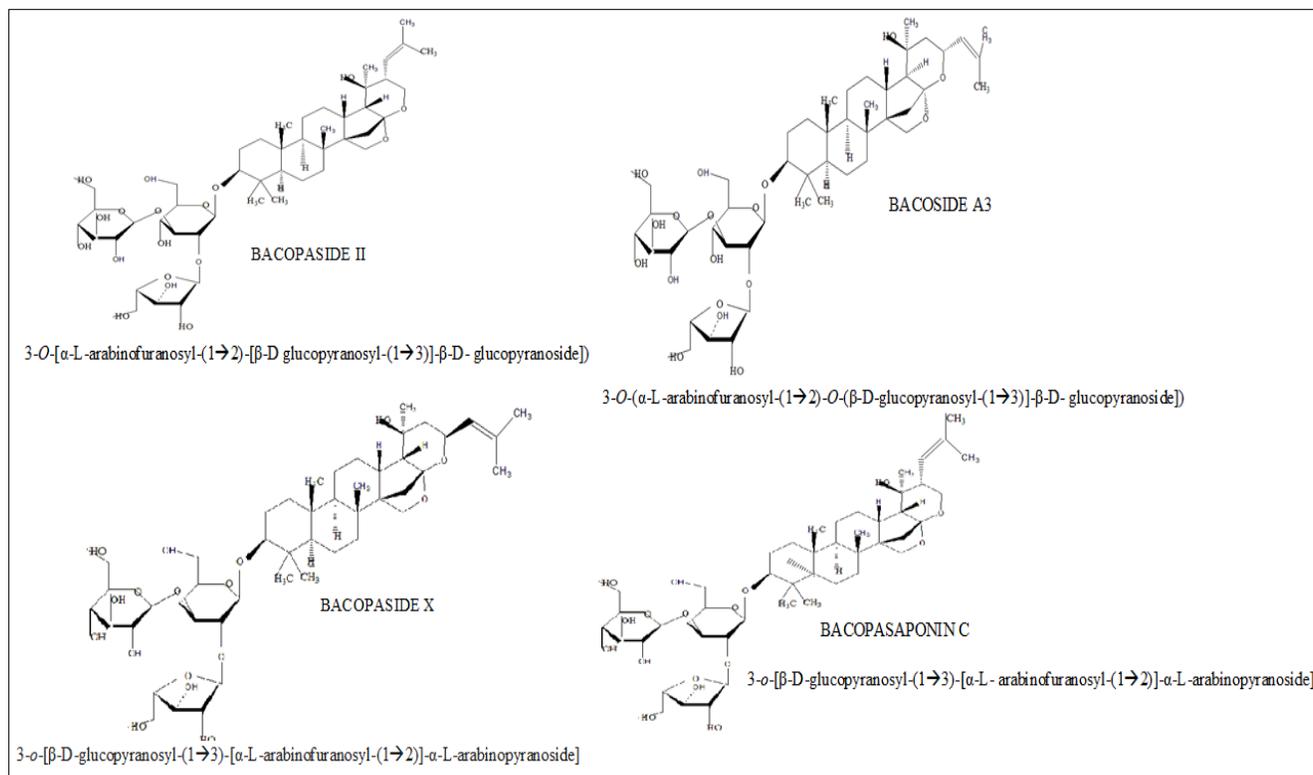


Figure 1. Significant constituents of Bacopa.

## ETHNOMEDICAL USES

- Brahmi is utilized for oxidative damage and also act as a powerful antioxidant agent.
- It relieves backache, mental illness, epilepsy, irritation in the bowel and joint pain [15].
- Elephantiasis is treated by brahmi root ointment [16].
- Gonorrhoea, the sexually transmitted diseases is treated by using powder leaf of brahmi which is mixed with milk [17].
- The leaf extract of brahmi is used to cure jaundice and fever and its other applications is neurological tonic which also acts as neuroprotective properties; even it cures asthma and bronchitis [18].
- It is also treated for dysentery in children [18].
- To increase the blood and for enhancing the nervous system, brahmi leaf juice is administered [19].
- The leaves purify the blood and used to cure mental illness, cholera, home medication for piles and amenorrhoea are also treated by using brahmi [20].
- When brahmi is mixed as a composition with tulsi, neem, amla it promotes the growth of nails, hair and skin [21].

- It provides nutrition supplement for the hair, and make it longer and thicker [22].
- It is also used as a medicament to cures ulcer, Alzheimer's disease and tumor [23].
- It is used against indigestion, leprosy and anemia and even treats spleen disorder and skin diseases [24].

## PHARMACOLOGICAL USES

### Central nervous effects

Memory enhancement: The Ayurvedic herb brahmi also called Bacopa. It helps in increasing the memory and learning skill of human and it also sharpen the brain [25,26]. It's used to treat Alzheimer's disease, anxiety, along with fighting stress and improving memory [27].

### Antioxidant

The antioxidant potential is good in brahmi which protects from oxidative destructions [28]. The cellular destruction is due to free radical and which also enhance antioxidant activity in other organs that mainly acts on brain related to the cognitive functions [29].

### Anti-depressant

The active ingredients affect the hormonal balance in the body and affect the stress hormone in our body [30]. It increases the serotonin levels in the brain, which relieves

from anxiety, nervousness and allows relaxing the mind, when brahmi leaf is administered [30].

#### Anti-Parkinson

The cluster of alpha-synuclein protein in the substantia nigra, the dopamine producing cell of the brain is reduced by brahmi [31]. It kills dopamine producing cells. Brahmi prevents the death of dopamine cells and symptoms of Parkinson's [24].

#### Anti-convulsant

It has a neural pathway and prevents the epileptic fits. Bacoside promote acetylcholine which activates GABA, it balance the chemicals within the brain that controls the

seizure activity [32]. It also enhances GABA activity and reduces the cognitive problems [33].

#### Anti-inflammatory

It is used for systemic redness in the brain and swelling in the body [36]. When brahmi leaf is applied in the affected part, it reduces swelling and decreases the irritation level inside the body. This also has important anti-inflammatory action that may well be applicable to its efficiency in the curative of numerous inflammatory situations in traditional medicine. It also knowingly inhibited 5-lipoxygenase (5-LOX), 15-LOX and cyclooxygenase-2 (COX-2) activities. This activity may be due to occurrence of the triterpenoids and bacosides in it. It can be used for people suffering from arthritis, gout and other swelling situations [33].

### VERNACULAR NAMES (TABLE 9)

**Table 9.** Names of Bacopa in different languages.

Arabic	Zarazab
Bengali	Brahmisak, Jalanimba
Bombay	Bama
Chinese	Pa-Chi-Tlien
English	Water Hyssop, Thyme leaved gratiola
Hindi	Brahmi, Jalnim, Barambhi
Kannada	Nirubrahmi, Kirubrahmi, Neeruppigida
Konkan	Brahmi
Malay	Bremi
Malayalam	Brami, Nirbrahmi
Marathi	Nirbrahmi
Persian	Jaranab
Sanskrit	Aindri, Brahmi, Gundala, Indravalli, Jalsaya
Tamil	Nirpirami, Piramiyepundu, Vivitamcampirani
Urdu	Jalanim, nirbrahmi
Telugu	Sambrani Chettu, Neeri Sambrani mokka, sambraani aaku

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