

Brahmi *Bacopa monniera*

By Caroline Robertson and Rama Prasad



Botanical name *Bacopa monniera*. **Family name** Scrophulariaceae. **English name** Thyme leaved gratiola. **Sanskrit name** Brahmi, Sarasvati. **Hindi name** Barami, Jalnim. **Parts used** Leaves, the whole plant.

Description *Bacopa* is often confused with *Centella Asiatic* as it is also called Brahmi in South India and the US but *Centella* is commonly known as Gotu Cola in English. *Bacopa* is a profusely branched, prostrate, succulent herbaceous plant with a deep green colour. It is a glabrous annual rooting at the nodes with ascending branches. The leaves are simple, decussate, opposite, ovate-oblong, sessile, penninerved, punctate with entire margins and an obtuse apex. They are about 1cm by 0.4cm in size. Its flowers are pale blue, purple or white arranged on long, slender pedicels. They are axillary, solitary, linear and with 2 bracteoles. The pedicel is approximately 0.5cm. *Bacopa*'s calyx has five unequal lobes with the outer two lobes being larger. They are ovate and measure about 7 by 3.5mm in an ovate shape. The inner two lobes are linear and the one median long lobe is oblong, imbricate, obtuse and acute.

Brahmi's corollas are white with violet and green bands. Its didynamous stamens have filament pairs 1 and oblong anthers. The fruits are ovoid, acute, 2-celled with 2-valved capsules and minute numerous seeds. It has no distinct odour but a slightly bitter taste.



Distribution

Grows throughout Asia, Australia and the United States. Most abundant in India throughout wet mountainous regions upto 1,200m elevation.

General information

Bacopa is one of Ayurveda's most investigated and documented herbs. A vast array of clinical trials and scientific studies support its efficacy as a brain and nervous system tonic. It also has the remarkable ability to enhance mental clarity while simultaneously effecting a sedating action. This gives it a reputation as the ideal herb to support study and mental performance under stressful conditions.



Constituents

Bacopa monniera contains the alkaloids brahmine, herpestatine, (C₃₄H₄₆N₂O₆, m p 116-170), and a mixture of three bases. The herb also contains saponins, monnierin (C₅₅H₈₂O₂₁ · 3H₂O, m p 630); hersaponin [m p 232-340' (decomp.)], bacoside -A [C₄₄H₆₀O₁₃ · 4H₂O, m p 2500 (decomp.)] and bacoside -B; [C₄₄H₆₈O₁₃ · 5H₂O, m p 2030. Monnierin, on hydrolysis, gave glucose,

arabinose and aglycone (C₃₀H₄₈O₄, m p 235-370) whereas, bacosides A and B gave glucose, arabinose and bacogenines A, A₂, A₃ and A₄; bacogenines A₁ and A₂ are epimers, and A₄ is an ebelin lactone.

Smith-de Mayo degradation of bacoside A gave jujubogenin and pseudojujubogenin. Other constituents present are D-mannitol, betulic acid, β-sitosterol, stigma-sterol and its esters, heptacosine, octacosane, nonacosane, triacontane, hentriacontane, dotriacontane, nicotine, 3-formyl-4-hydroxy-2H-pyran (C₆H₆O₃), luteolin and its 7-glucoside. The presence of α-alanine, aspartic acid, glutamic acid and serine is also reported. Isolation of apigenin-7-glucuronide and luteolin-7-glucuronide from leaves; a new minor saponin bacoside A₁ - isolated and characterised as 3-O-α-L-arabinofuranosyl (1-3)-α-L-arabinosyl-jujubogenin; isolation of another saponin - bacoside A₃ - and its structure elucidated as 3-O-β-D-glucosyl (1-3)-[O-(α-L-arabinofuranosyl (1-2))-O-β-D-glucosyl]-jujubogenin; revision of structure of cis-isomer of ebelin lactone, obtained during acid hydrolysis as another artifact of jujubogenin. Analysis of the leaves and stalks gave: moisture, 88.4; protein, 2.1; fat, 0.6; carbohydrates, 5.9; crude fiber, 1.05; and ash, 1.9 g / 100g. calcium, 202.0; phosphorus, 16.0; iron, 7.8; ascorbic acid, 63.0; nicotinic acid 0.3 mg / 100 g; and energy, 38 cal / 100 g. The leaves contain a sterol C₂₆H₄₆O .H₂O, m p 760). The drug is characteristically designated on the basis of its total bacosides content which are tetra cyclic triterpenoid saponins. These steroidal saponins called Bacoside A & Bacoside B are considered Bacopa's most therapeutic constituents.

Traditional uses

Though Brahmi is now promoted as the 'brain booster' of the new millennium Ayurvedic medicine has known this for millennia. It is highly valued in conditions affecting the nervous system and brain. As such it is often prescribed for epilepsy, psychiatric disorders such as a mental breakdown, dementia, alzheimers, neuralgia and poor concentration and memory. Clinical evidence supports Bacopa's antiinflammatory activity which explains its traditional useage for general inflammation and splenomegaly. Considered a bronchodilator, those suffering from asthma or bronchitis have benefited from Bacopa. Its emmenogogic action make it useful in amenorrhagia and dysmenorrhoea. Other miscellaneous historical uses include for biliousness, boils, diabetes, tumours, ulcers, dyspepsia, skin diseases such as leprosy and leucoderma, syphilis and elephantiasis.

It is often mixed as a hair oil to restore and preserve the memory and taken internally with ghee to aid its assimilation across the blood/brain barrier.

Actions and pharmacodynamics

The body of scientific evidence explaining Bacopa's therapeutic actions help herbalists to use it with confidence and precision. At the forefront of its effect is

Bacopa's brain tonic properties. These are mostly attributed to the Bacosides A and B effect which support the transmission of nerve impulses, thereby maintaining memory and cognition.(Singh 1997). Bacopa is said to effect the the GABA-ergic system which involves the nerves and synapses of the central nervous system where memory originates and is stored.(Shukia 1987). The saponin hersaponin is reported to possess cardiogenic, sedative and spasmodic properties. A comparative study of hersaponin and pentobarbitone indicates that hersaponin has a superior sedative effect:

1. Vasoconstrictor (1)
2. Sedative (1)
3. Cardiogenic this effect was demonstrated during a preclinical trial on frogs using the whole plant. (1)
4. Improved motor efficiency in learning(2). This is hypothetically due to the bacosides.
5. Faster comprehension and improved memory retention(3) Also due to Bacosides A and B.
6. Analgesic (4) This effect was shown in studies with mice and rats administered Bacopa in a traditional formula called Brahmi Rasayana which also contains cloves, cardamom and long pepper.
7. Anticonvulsant (4), (5) , protects mental function in those with epilepsy who take the drug phenytoin. (Moharana, D.; Moharana, S. Department of Physiology, SCB Medical College, Cuttack, Orissa.) A clinical trial of Bacopa in patients with various types of epilepsy.. Thirty one adult epileptic patients aged between 23-42 years were treated with Bacopa and other herbs in a formula called Mentat along with the other antiepileptic drugs for a period of six weeks. Bacopa brought about significant reduction in seizure frequency and served as a valuable adjuvant to commonly used antiepileptic drugs. No side effects were observed.
8. Antiinflammatory (6) The mechanism of the antiinflammatory action is said to be similar to NSAIDs such as aspirin which are mediated through prostaglandin synthesis and stabilisation of lysosomal membranes. In induced inflammation it was shown to be as effective as the antiinflammatory indomethacin without the side effects of gastric irritation.
9. Improved cognitive function(7)including improved speed of visual information, processing information and memory consolidation.
10. Antioxidant (8) Preclinical research suggests that Brahmi particularly has an antioxidant action on the brain's frontal cortex, striatum and hippocampus which are all associated with cognitive functions such as memory.
11. Anticancer(10) An ethanolic extract (50%) of the plant exhibited anticancer activity against the Walker carcinosarcoma 256 in rats.
12. Antistress(11) Clinical studies performed in India confirm that the bacosides can revitalize intellectual functions in children and reduce anxiety in stressed individuals thereby contributing to improved brain functions.

Studies have suggested that Bacopa prepares the brain to respond to stress in the most efficient way.

13. Thyroid stimulating(12) When given to male mice Bacopa was shown to increase T4 concentrations suggesting a thyroid stimulating role. Mast cell stabiliser (13) A methanolic fraction of Bacopa was shown to have mast cell stabilising effects comparable to disodium cromoglycate, a known mast cell stabiliser.
14. Therapeutic indications Bacopa monniera is the remedy of choice for nervous system and mental debility. Conditions where it has proven effective include-

- Memory loss
- Poor concentration
- Alzheimers disease
- Attention Deficit Disorder
- Brain fag
- Insanity
- Nervous deficit due to an injury, stroke or transcient ischemic attack
- Nervous breakdown or exhaustion
- Epilepsy
- Carcino sarcoma
- Hypothyroidism
- Stress
- Insomnia

Traditional uses include for neuralgia, inflammation, tumours, ulcers, constipation, asthma, bronchitis, skin diseases, syphilis, fever and dysmenorrhoea.

Contraindications and cautions

Brahmi possess no known side effects or toxicity at normal doses. In experimental studies, the saponinrich highly potent extract of Brahmi did not show any endocrine, metabolic, gastrointestinal, anabolic or behavioural side effect. No lethality was observed on the oral administration up to 2150 mg/kg body weight in rats and mice. Clinical Studies in school children for over three years have not shown any adverse side effects. In healthy human volunteers multiple doses of bacosides (the active ingredient in Brahmi) have been well tolerated and are devoid of any untoward reactions or side effects. The isolated extract of brahmine from Bacopa was shown to be highly toxic when administered at a dose of 0.5 mg/kg body weight of cats as it produced a fall in blood pressure. In therapeutic doses it is said to resemble strychnine.

Dosage

Dried herb: 2-6gm/day

Powdered herb as infusion: 1-3gms tds

1:2 fluid extract: 4-12ml/day

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