

CHAPTER 2

Unlocking the Cognitive and Medicinal Potential of Brahmi (*Bacopa monnieri*)

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Abstract: Brahmi (*Bacopa monnieri*), a herb in traditional Ayurvedic medicine, has long been valued for enhancing memory, intellect, and overall mental well-being. Recent pharmacological studies validate many of these traditional claims, highlighting its role as a potent nootropic and adaptogen. The bioactive compounds, primarily bacosides along with alkaloids, flavonoids, saponins, and sterols, exhibit neuroprotective, antioxidant, and anti-inflammatory properties that contribute to improved synaptic transmission, enhanced cognitive performance, and reduced neurodegenerative risks. Ecologically, *B. monnieri* thrives in wetlands, marshy habitats, and along riverbanks in tropical and subtropical regions, ensuring its wide availability and ethnomedicinal significance. This study documents the therapeutic uses of *B. monnieri* among selected tribal communities of Odisha and integrates traditional knowledge with contemporary findings, emphasizing its pharmacological promise. However, challenges remain in standardization, dosage optimization, and clinical validation. Future research should prioritize the development of standardized formulations, precise dosage regimens, and robust clinical trials to establish *B. monnieri* as a globally accepted, safe, and effective phytomedicine.

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INTRODUCTION

Bacopa monnieri (L.) Wettst., (Figure 1) commonly known as Brahmi, is one of the most esteemed medicinal plants in Ayurvedic medicine, classified as a potent medhya rasayana—a rejuvenator for the brain and nervous system. Traditionally, it has been valued for its ability to enhance memory, learning, intellect, and concentration, while simultaneously alleviating anxiety, stress, and epilepsy (Snafi 2013). Its use extends beyond mental health, with Brahmi being prescribed for insomnia, asthma, skin diseases, digestive ailments, and liver disorders, reflecting its broad therapeutic spectrum in ethnomedicine. Modern pharmacological research has provided scientific validation for many of these traditional claims, attributing the herb's medicinal power to its diverse phytoconstituents, especially bacosides, alkaloids, flavonoids, and saponins (Eraiah *et al.*, 2024). These compounds have demonstrated a wide range of bioactivities, including neuroprotective, antioxidant, hepatoprotective, cardioprotective, anti-inflammatory, antidiabetic, immunomodulatory, antimicrobial, and wound-healing properties (Fatima *et al.*, 2022a). Notably, *Bacopa monnieri* has attracted significant interest in the context of neurodegenerative diseases such as Alzheimer's and Parkinson's, where its potential to prevent oxidative damage, modulate neurotransmitters

and enhance synaptic plasticity offers new therapeutic avenues (Charoenphon *et al.*, 2016; Fatima *et al.*, 2022b). Modern studies confirm its neuroprotective, antioxidant, hepatoprotective, cardioprotective, antidiabetic, wound-healing, antimicrobial, and immunomodulatory effects (Gawande *et al.*, 2023). It is also explored for anticancer and antifertility potential in experimental research. Traditionally, its leaf juice, paste, powder, decoction, and medicated ghee (Brahmi ghrita) are used to treat liver disorders, hypertension, hyperglycemia, wounds, skin infections, respiratory allergies, and as a general rejuvenator for overall vitality and longevity. Although *Bacopa monnieri* is primarily valued as a medicinal herb, it also has a role as food in some traditional practices (Sudharani *et al.*, 2011). Its succulent leaves are occasionally consumed raw, cooked as a leafy vegetable, or added to soups and salads, especially in rural and tribal communities of India and Southeast Asia. The herb has a slightly bitter taste, which is associated with its health-promoting properties, including cooling, digestive, and tonic effects (Devendra *et al.*, 2018). An effort has been made to document the therapeutic uses of *B. monnieri* among selected tribal communities of Odisha and to consolidate literature on traditional knowledge and modern findings on Brahmi's therapeutic potential while

recognizing the challenges of standardization, dosage optimization, and clinical validation.

METHODOLOGY

The ethnobotanical investigation on the medicinal uses of *Bacopa monnieri* among selected tribal communities (Santhal, Ho, Bhumija and Bathudi) of Odisha was carried out through a combination of field surveys and literature-based review. The data were collected from traditional healers, elderly villagers, and knowledgeable community members using semi-structured interviews, questionnaires, and group discussions. Participant observation and guided field walks were also conducted to document the collection practices, parts used, preparation methods, and modes of administration of the plant were collected.

RESULTS

B. monnieri is widely used in traditional medicine for a range of ailments, with particular emphasis on neurological health. Crude extracts are taken to enhance memory, improve learning, control abnormal behaviour, and manage epilepsy, while preparations with honey or ghee serve as antidepressants and remedies against Alzheimer's and Parkinson's diseases (Sangale and Ritu 2025). Massaging the head with extract in hot coconut oil

helps treat insomnia and anxiety, showing its adaptogenic role. For respiratory issues such as asthma and cough, heated paste is applied as a poultice on the chest. Digestive problems are managed with decoctions for diarrhoea and inflammation, while juice with milk is taken for anticancer and antioxidant benefits. The plant also supports liver health, reduces blood sugar, and promotes wound healing and antifungal effects. In reproductive health, paste or juice is used as a contraceptive, while cardiovascular problems are treated with plant paste in ghee. Topical applications also help relieve arthritis, eczema, and skin infections. The collected information on therapeutic uses along with the literature survey are listed in Table 1.

Ancient therapeutic use of *B. monnieri* in India

Bacopa monnieri (Brahmi) holds a significant place in both Ayurveda and Unani systems of medicine, where it is primarily valued as a brain tonic and memory enhancer. In Ayurveda, it is classified as a Medhya Rasayana, a rejuvenator that nourishes the brain and nervous system, and has traditionally been prescribed to improve memory, learning, concentration, and intellect. It is also used to manage epilepsy (*Apasmara*), insanity (*Unmada*), insomnia, anxiety, and stress-related disorders, while additionally being recommended for asthma, skin



Figure 1: *B. monnieri* in natural habitat (Mahanadi River bank)

diseases, fever, digestive problems, and liver ailments (Gawande *et al.*, 2023).

Classical Ayurvedic preparations like *Brahmi Ghrita*, *Saraswatarishta*, and *Brahmi Vati* are still widely used for enhancing cognitive performance, treating speech disorders, and supporting children with learning difficulties (Kuruvalli *et al.*, 2023). In Unani medicine, *Bacopa monnieri* is known as Brahmi Booti and is similarly recognized as a potent brain tonic (*Muqawwi Dimagh*) that strengthens memory and intellect. It is prescribed for nervous exhaustion, hysteria, epilepsy, depression, melancholia, and insomnia, and is also used for chronic fevers, joint pain, skin diseases, and liver dysfunctions. Moreover, Unani physicians recommend it as a general tonic to fortify the nerves and as a supportive remedy for sexual debility (Pandey 2022). Thus, while Ayurveda highlights Brahmi as a *Rasayana* for

promoting longevity, intellect, and mental balance, the Unani tradition emphasizes its value in strengthening the nervous system, calming the mind, and supporting overall vitality (Prajapati *et al.*, 2024).

Phytochemical constituents and therapeutic properties

B. monnieri contains a wide spectrum of phytochemical constituents that directly correlate with its therapeutic activities (Figure 2). The most important bioactive compounds are bacosides (A, B, A3, bacopasaponins, bacopasides), which are triterpenoid saponins responsible for the herb's well-documented cognitive effects (Goswami *et al.*, 2011). They enhance memory and learning by improving synaptic transmission, protecting neurons from oxidative stress, and promoting synaptic plasticity, making them useful in conditions like

Alzheimer's disease, Parkinson's disease, and age-related cognitive decline (Jeyasri et al., 2020). Alongside bacosides, alkaloids such as brahmine, herpestine, and nicotine exert mild sedative and anxiolytic effects, contributing to its traditional use in anxiety, epilepsy, and insomnia (Gouthami et al., 2023). Flavonoids including luteolin, apigenin, and quercetin act as strong antioxidants and anti-inflammatory agents, protecting tissues against free radical damage, reducing inflammation, and offering potential anticancer activity through apoptosis induction and angiogenesis inhibition (Roy 2017). Similarly, phenolic compounds such as caffeic acid, chlorogenic acid, and betulinic

acid provide hepatoprotective and antidiabetic actions by enhancing insulin sensitivity, inhibiting carbohydrate-digesting enzymes, and protecting the liver from toxins. The presence of plant sterols like β -sitosterol and stigmasterol contributes to cardioprotective properties by lowering cholesterol and preventing atherosclerosis, while also showing immunomodulatory and anti-allergic effects (Khare 2004). In addition, other saponins and glycosides support adaptogenic functions, enhance stress tolerance, promote wound healing through collagen synthesis, and have shown antifertility potential in experimental studies (Pandey *et al.*, 2022).

Table 1: Therapeutic uses of *Bacopa monnieri*

Medicinal Use	Ailment(s) concerned	Source(s)
Treatment with crude extract	Enhances memory	Devendra <i>et al.</i> , (2018)
Treatment with crude extract	Enhances learning and control abnormal behaviour	Devendra <i>et al.</i> , (2018)
Treatment with crude extract	Against epilepsy	Phadke (2023)
Plant powder mixed with honey and ghee is taken	Anti-depressant	Phadke (2023); Prajapati <i>et al.</i> , (2024)
Plant extract mixed with ghee is taken	Against alzheimer	Pandey (2022); Kumar <i>et al.</i> , (2016); Gawande <i>et al.</i> , (2023)
Plant extract mixed with ghee, <i>Phyllanthus emblica</i> , <i>Terminalia chebula</i> and <i>Terminalia bellirica</i> is taken	Against Parkinson disease	Pandey (2022); Gawande <i>et al.</i> , (2023)

Massaging head with plant extract with hot coconut oil	Treat insomnia	Prajapati <i>et al.</i> , (2024); Kuruvalli <i>et al.</i> , (2023) Present study
Massaging head with plant extract with hot coconut oil	Treat anxiety	Present study
Heated plant paste is applied as poultice on the chest	Against asthma	Phadke (2023) & Present Study
Heated plant paste is applied as poultice on the chest	Against cough	Phadke (2023) & Present Study
Plant decoction is taken	Anti -diarrhoea	Pandey (2022); Rai <i>et al.</i> , (2017)
Plant decoction mixed with honey is taken	Anti-inflammation	Pandey (2022)
Plant juice mixed with milk is taken	Anticancer activity	Pandey (2022); Rai <i>et al.</i> , (2017)
Plant juice mixed with milk is taken	Antioxidant activity	Pandey (2022)
Plant paste is applied topically or wash with the plant decoction	Antifungal activity	Pandey (2022)
Plant juice mix with water is taken everyday	Hepatoprotective activity	Pandey (2022)
Leaf decoction is taken in small amount everyday	Anti-hyperglycaemic activity	Pandey (2022); Rai <i>et al.</i> , (2017)
Heated Plant paste is applied topically	Wound healing	Pandey (2022)
Leave juice mix with water is taken	Anti-allergic activity	Pandey (2022)
Plant paste or juice is taken as contraceptive	Antifertility	Pandey (2022)
Plant juice with milk is taken	Anti-ageing	Pandey (2022); Khare (2004)
Whole plant is applied as poultice	Against arthritic pain	Roy (2017)
Plant decoction is taken in small amount everyday	Antimicrobial activity	Roy (2017)
Plant paste with ghee is taken	Treat cardiovascular problems	Rai <i>et al.</i> , (2017); Prajapati <i>et al.</i> , (2024)
Plant paste is applied topically	Against eczema	Present study

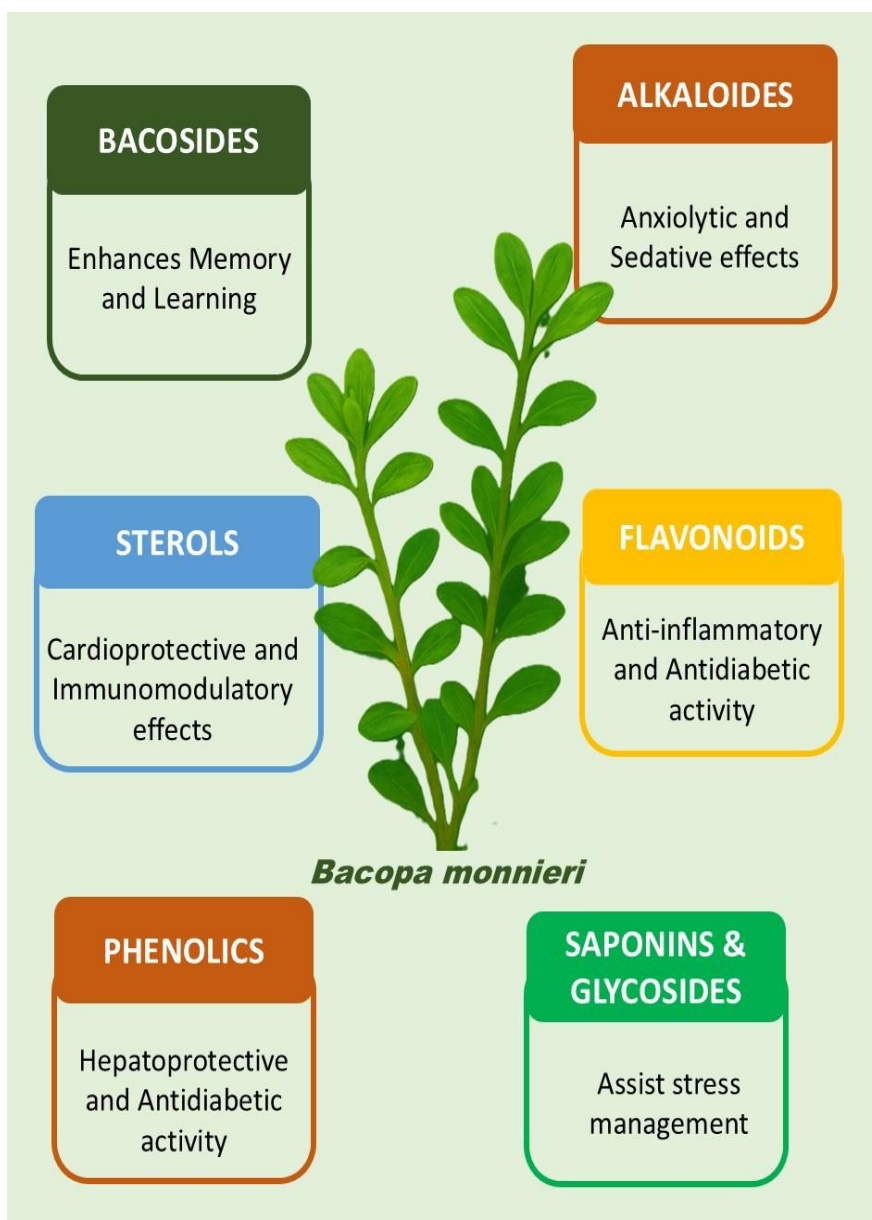


Figure 2: Phytochemical constituents with associated ailments

Habitat and Ecology

B. monnieri thrives in moist, swampy, and marshy habitats. It naturally grows along riverbanks, lakeshores, wetlands,

rice fields, and damp soil where waterlogging is common. The plant prefers tropical to subtropical climates with warm temperatures and can tolerate both freshwater and slightly

saline conditions, making it widespread in coastal and inland regions (Gouthami *et al.*, 2023). It propagates easily through stem cuttings, forming dense mats over wet ground or shallow water. In India, including Odisha, it is commonly found in lowland paddy fields, ponds, and ditches, indicating its adaptability to aquatic and semi-aquatic ecosystems. Its ability to withstand submergence and regenerate rapidly makes it an important species in wetland ecology and a readily available medicinal resource.

CONCLUSION

Bacopa monnieri (L.) Wettst., or Brahmi, emerges as a highly versatile medicinal plant with deep roots in Ayurveda, Unani, and traditional tribal healthcare practices. The present ethnobotanical investigation among the Santhal, Ho, Bhumija, and Bathudi communities of Odisha reaffirms its significance as a multipurpose remedy, particularly in enhancing memory, learning, and neurological health. The field-based findings, supported by classical texts and modern pharmacological research, highlight its applications in treating epilepsy, insomnia, asthma, digestive disorders, liver ailments, skin diseases, cardiovascular issues, and reproductive health. The dual role of *Bacopa monnieri* as both food and medicine underscores its cultural and nutritional value in rural and tribal diets, where it

is consumed as a leafy vegetable or tonic. Its adaptability to wetland habitats ensures sustainable availability.

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