

A Review on Brahmi (Bacopa Monnieri)

Aashish S Phadke

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Abstract

Brahmi is known to be for its Medhya Rasayana properties. One may also note various other properties than Medhya Rasayana while referring Brahmi in the classical Ayurvedic texts ranging from Samhitas to Nighantus. Surprisingly, when we refer modern pharmacological & Phytochemical studies of Brahmi (Bacopamonnieri), one may co-relate these activities. This paper is taking account of the various paryaya (synonyms), etymological derivations of some of them, regarding its Rasapanchaka (Ayurvedic Pharmacological aspects), its Dhoshaghnatva & Rogaghnatva. Paper will briefly discuss about its chemical constituents & pharmacological studies undertaken on plant.

Keywords: Brahmi; Bacopa Monnieri; Medhya Rasayana; Dravyaguna; Pharmacology; Phytochemistry; Review.

INTRODUCTION

In Ayurvedic literature, while discussing Medhya Rasayana (Nervine tonic) drugs, one remember Brahmi as one of the most important herbal drug apart from others in the list such as Mandukaparni, Shankhapushpi, Jyotishmati etc.^{1,2} While confirming the botanical identity, we should

accept that Neerabrahmi or Brahmi is nothing but Bacopa monnieri and not to be mistaken as Centell Aasiatica which is nothing but Mandukaparni.³ In certain areas like Maharashtra, Gujarath, Brahmi is considered to be Centel laasiatica, which is infact termed as Mandukaparni. It has got a very specific umbrella shaped leaves & it prostrates on ground from one point to other like frog (Manduka). In south, Neerabrahmi is identified as Bacopamonnieri.⁴

Author Affiliation: Deputy Director, Division of Endocrine & Metabolic Disorders - Lifestyle Modifications & Yoga Modules, Kasturba Health Society, Medical Research Centre, Mumbai 400057, Maharashtra, India.

Corresponding Author: Aashish S Phadke, Deputy Director, Division of Endocrine & Metabolic Disorders - Lifestyle Modifications & Yoga Modules, Kasturba Health Society, Medical Research Centre, Mumbai 400057, Maharashtra, India.

E-mail: ayurinstitute@yahoo.com

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Etymology of the term Brahmi:

Brahmi

A Sanskrit word derived from "Brahman". Brahman is the divinity responsible for all of the creative forces in the world Brahman is the Hindu/Vedic name given to the Universal Consciousness. Here Brahman should not be mistaken from the mythological deity Lord Brahma. This concept of Brahman is more specifically emphasized in *Advait* Vedanta school of philosophy by *Adi Shankaracharya*.

Brahmi literally means the energy (Shakti) of Brahma. One may understand it as a property of creation of the world.

When we speak about Shakti, we remember *Shakta Sampradaya*. We remember *Bhagavati*. We remember goddess *Durga*. In *Durga Saptashati*, it is described as one of the name of *Godess Durga Brahmi*. There is a description about *Brahmi* in the *Durga Saptashati*, that "*Brahmi Hamsasamarudha*." (*Brahmi*, goddess is one, who is situated on swan).

Historical Review of Brahmi⁵

- One may see references of Brahmi in different period. One may trace references of Brahmi in Vedic period as well. In Yajurveda, Brahmi is described as Santanotpadaka (helps in getting progeny). In Atharvaveda parishista and other texts quote Brahmi as Medhya (A.P. 1/44/10). It is also mentioned in Kaushika Sutra (82.26).
- In Samhita period, one may see the references of Brahmi in different Samhitas like Bruhatrayi. In Charaka Samhita, Brahmi is found in Prajastha panamah akashaya, Garbhastha panadravya (A decoction of combination of herbs used for stabilizing the conception or preventing missed abortion), Aindriya Rasayana, Apasmara Chikitsa (In the management of epilepsy), Kushtha Chikitsa (In the management of skin disorders). Sushruta Samhita mentioned preparations of Brahmi ghrita and Brahmi rasayana. Ashtanga Sangraha Uttarasthana refers Brahmi as one of the best remedy for Apasmara (Epilepsy).
- In Nighantu (Ayurvedic Herbal Pharmacopoeias of those eras) especially in Bhavaprakash Nighantu⁸, Madanapal Nighantu⁹, Kaiyadev Nighantu¹⁰, Sodhal Nighantu¹¹, Raj Nighantu¹², Dhanwantari Nighantu¹³ and in certain contemporary Nighantus like Priyanwat Nighantu¹⁴ & Nighantu Adarsha.^{15,16} According to Shodhala Nighantu Brahmi is superior to Mandukaparni. According to Bhavaprakasha Nighantu Brahmi and Mandukaparni have same properties. Acharya Priyanwat Sharma in his Priya Nighantu mentions Brahmi in Shatapusphadivarga. Vd. Bapalal Vaidya in his Nighantu Adarsha mentions Brahmi in Tiktonik avarga.

Synonyms

Paryaya of Brahmi: We can understand about various aspect of the drug from its various synonyms (Paryayanama). When we see different Paryayanama of Brahmi in different texts, we get different aspects about its nature, properties (Guna)

& activities (Karma). To get more insight about it, let us see few paryayas of Brahmi.

- *Brahmi*: Medhyajanakat wath Brahmihita.

The one which is intellect promoting is called as Brahmi.

- *Jalashaya*: Available in water sources.
- *Toyavalli*: Grows abundantly in an around water.
- *Tiktalonika*: It is bitter type of Lonika.
- *Vayastha*: Rejuvenates individual or acts as an anti-ageing.
- *Somavalli*: A creeper prefers marshy areas for its growth.

If we see different paryayas of Brahmi from all these Nighantus as discussed earlier, we can count 36 synonyms. They are as follows:

Brahmi, Brahmacharini, Brahmasuvarchala, Brahmani, Munibhi (As explained in the etymology).

Saraswati, Satyavati, Satyavha (pertaining to truthfulness/ Godess of Intellect – Ma Saraswati).

Soma, Somavalli, Somavallari, Toyavalli, Indravalli, Sustara (Regarding the nature of the plant).

Jalashaya, Ambunimba, Kupodaka (describing the habitat of the plant).

Tiktalonika, Lonidala (Couldn't be identified the meaning of Lonika).

Medhya, Smarani, Vami, Vayastha, Suswara, Divyateja, Mahaushadhi (Describing the various properties or activities of the plant. Medhya as Nervine tonic, Smarani also refers to memorizing capability of the plant, Vami refers to helpful in inducing vomiting due to its bitter taste (Tikta Rasa), Vayastha refers to stabilizing property of age, Suswara meaning which improves quality of swara (voice), Divyateja refers to having great potency, Mahaushadhi meaning being one of the greatest amongst other medicines. Here interestingly one can see two synonyms Vayastha & Mahashadhi, which are synonyms of other important Ayurvedic medicinal plants. Vayastha is also a synonym of Amalki & Haritaki, whereas Mahaushadhi is a synonym of Shunthi (Dried powder of ginger (Ardraka)). There are few synonyms which do not lead to any concrete explanation regarding any aspect of this drug. These synonyms are Kapotavanka, Twastra, Matsyakshi, Vinirdishta, Lavani, Bharati, Sharadhi, Aindri, Kathitendrapatni, Chandranishaka.

Brahmi in different Gana & Varga

Description of Brahmi in different Gana or Varga

as mentioned in Samhitas & Nighantus. Charaka Samhita⁶ mentions about it in Prajasthapangana where as Sushrut Samhita⁷ place it in Veeratarvadi Gana.

Bhavaprakash Nighantu⁸ & Shaligram Nighantu⁹ place it in the Guduchyadi Varga. Dhanwantari Nighantu¹⁰ & Shodhal Nighantu¹¹ place it in Karaveeradi Varga. Kaiyadev Nighantu¹² classify it in Oshadhi Varga whereas Raja Nighantu¹³ place it in Parapatadi Varga. Madanapal Nighantu¹⁴ classify it in Abhayadi Varga. Priya Nighantu¹⁵ describe it in a Shatapushpadi Varga whereas Nighantu Adarsh¹⁶ place it in a Tiktalonika Varga.

Rasapanchaka of Brahmi

As per different opinions, from different Nighantus, Rasa, Veerya, Vipaka, Guna, Karma of Brahmi can be explained as follows:

Rasa: As per Bhavaprakash Nighantu, Dhanwantari Nighantu, Raja Nighantu & Sodhal Nighantu it is Tikta Rasatmaka. (Bitter in taste). Priya Nighantu & Nighantu Adarsh also endorse this fact. Along with Tikta rasa, there is presence of Kashaya Rasa (Astringent taste) as well, as per Bhavaprakash Nighantu, Raj Nighantu & Nighantu Adarsh. Where as there is also mention of Madhara Rasa (Sweet taste) by Bhavaprakash Nighantu & Madanapal Nighantu.

Rasa – Tikta, Kashaya, Madhura.

Veerya: Only Priya Nighantu mentions Brahmi to have a Sheeta Veerya.

Vipaka: Bhavaprakash Nighantu, Kaiyadeva Nighantu, Dhanwantari Nighantu, Madanapal Nighantu & Sodhal Nighantu unani mously mentions that Brahmi has Madhura Vipaka. Contemporary Nighantus like Priya Nighantu & Nighantu Adarsh endorse this.

Guna: Brahmi possesses properties such as Laghu, Sara, Hima by Bhavaprakash Nighantu, Madanapal Nighantu & Kaiyadev Nighantu. Whereas Pittchil has been described by Sodhal Nighantu & Soumya by Dhanwantari Nighantu.

Karma: While discussing Karma of Brahmi, one needs to take account as per its Doshaghatva (ie how this drug acts on the different doshas, whether it increases specific doshas or passifies particular dosha) & Rogaghatva (meaning the relation of this drug with specific reference to its disease activity).

Doshaghatva: As per most of these ancient Nighantus such as Bhavaprakash Nighantu, Kaiyadev Nighantu Raj Nighantu, Sodhal

Nighantu & Madanapal Nighantu, it is considered to be Pittahara (ie passifying increased vitiated Pitta levels). Whereas as per Bhavaprakash Nighantu, Kaiyadev Nighantu, Madanapal Nighantu & Sodhal Nighantu, it is additionally described to be Kaphahara. (ie passifying increased vitiated Kapha levels).

Karma of Brahmi is said to be Medhya (Intellect enhancer), Shothaghna (Anti inflammatory), Vishaghna (Anti Toxins), Balya (strength promoter), Hridya (Cardiac tonic), Kusthaghna (useful in treating Skin diseases), Kandughna (Anti pruritic) (Anti histaminic), Swarya (improving vocal quality), Mehaghna (helps treating Prameha) (Anti diabetic), Smrutiprada (enhancing memory), Jwaraghna (Anti pyretic), Ayushyavardhaka (enhance longevity), Vayasthapana (preventing aging process), Deepan (increasing digestive/metabolic capacity), Pandughna (Anti anaemic), Pleehaghna (Helps in Spleenomegaly).

Rogaghatva of Brahmi is described as follows:

Sushrutacharya describes Brahmi to be useful in Kushtha, Jwara, Aruchi, Shwasa, Kasa, Meha & Raktapitta. Whereas use of Brahmi is discussed in Kushta, Jwara, Shopha, Kasa, Pandu, Meha, Visha by Bhavaprakash Nighantu. Similar description gives Madanapal Nighantu whereas all indications except Visha has been given by Dhanwantari Nighantu. Unmad (Psychiatric illness) & Shwasa (Bronchial Asthma) and Shleshma vikara ghna (useful in Kapha Disorders) as explained by Sodhal Nighantu. (SN) Chakradatta describes it in the chapters of Jwarachikitsa & Unmada Chikitsa. Bhaishajya Ratnavali also mentions formulations of Brahmi in the chapters of Jwara Chikitsa, Unmada Chikitsa, Apasmar Chikitsa & Rasayana Chikitsa.

Synonyms & Etymology of *Bacopa monnieri* Linn.

Bacopa monnieri Wettst., *Bacopa monnieri* (L.) Pennell. Yes, *Lysimachia monnieri* L. Cent., *Gratiola monnieri* (L.) L., *Monnieracuneifolia* Michaux, *Herpestis monnieri* (L.) Kunth.

Herpestis meaning creeping, *monnieri* meaning necklace. This reminds Sanskrit synonyms like Somavallari, Somavalli.

Chemical Constituents of Brahmi¹⁷⁻²²

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. The herb contains the alkaloids brahmine, herpestine. (C34H46N2O6) and a mixture

of three bases. The herb also contains the saponins, monnierin (C₅₁H₈₂O₂₁.3H₂O); hersaponin. And bacoside A (C₄₁H₆₈ O 13.4 H₂O) and baco-side B (C₄₁H₆₈ O 13.5 H₂O) other constituents present in the plant are Dmannitol, betulic acid, β – sitosterol, stigmasterol and it'sesters, heptacosane, 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. The leaves contain sterol (C₂₆H₄₆O.H₂O).

Pharmacological studies on Brahmi (*Bacopa monnieri*)(BM).

Learning and memory

Administration of BM for two weeks, reversed the depletion of acetylcholine, the reduction in acetyl cholinesterase activity and the decrease in muscarinic cholinergic receptor binding in the frontal cortex and hippocampus, induced by neurotoxin, colchicines.²³ It has been suggested that the behavioural effects of cholinergic degeneration can be alleviated by a reduction in noradrenergic function.²⁴ BM is known to lower nor epinephrine and increase 5-hydroxytryptamine levels in the hippocampus, hypothalamus and cerebral cortex, thus BM indirectly, modify Ach concentrations.²⁵

Anti-inflammatory

Bacopa monnieri has the ability to inhibit inflammation through modulation of pro-inflammatory mediator release.²⁶ It possesses significant anti-inflammatory activity that may well be relevant to its effectiveness in the healing of various inflammatory conditions in traditional medicine.²⁷ It also significantly inhibited 5-lipoxygenase (5-LOX), 15-LOX and cyclooxygenase-2 (COX-2) activities. This activity may be due to presence of the triterpenoids and bacosides in it.²⁸

Anti-epileptic/Anti convulsive Activity (Apasmarghna)

Bacopa has been indicated as a remedy for epilepsy in Ayurvedic medicine and animal research showed anticonvulsant activity present in it, only at high doses over extended periods of time. It have been also reported that crude water extract of BM controls epilepsy in experimental animals.²⁹ The naturally it exhibited sedative effect and significantly prolonged hypnotic action of phenobarbitone. Those substances which stimulate GABA are known to possess anticonvulsant, pain relieving and sedative effects. It suggests the involvement of GABA-ergic system in mediation

of central nervous system.^{30,31} BM was evaluated alone and in combination with phenytoin (PHT) for its effect on PA task, maximal electroshock seizures and locomotors activity in mice. Both acquisition and retention of memory showed improvement without affecting PHT anti convulsive activity. Further investigations using BM alone or in combination with other antiepileptic drugs are warranted to explore the full potential of BM in epilepsy.³²

Anti-oxidant

Alcoholic and hexane extract of BM have antioxidant properties by inhibiting lipid peroxidation.³³ A more recent study explored antioxidant effect of BM by other mechanism like inhibition of superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPX) activities.³⁴ It was also observed that the hydro alcoholic extract of the whole BM plant exhibited an inhibitory effect on superoxide released from polymorphonuclear cells in nitro blue assay.³⁵ Methanolic extract BM is able to directly inhibit the superoxide anion formation in a dose dependent manner due to this it reduces concentrations of nitric oxide (NO), generated (enzymatic and non-enzymatic) by activated astrocytes, might be involved in a variety of neuro degenerative diseases, such as AD, ischemia and epilepsy.^{36,37}

• Anti Stress - Anxiolytic Activity (Medhya)

Standardized extract of BM possesses an adaptogenic activity. Pre treatment with low dose of BM extract significantly reversed changes in ulcer index and plasma AST only, whereas the pre treatment with higher dose significantly reversed changes in ulcer index, adrenal gland weight, CK, and AST.³⁸ The higher doses of BM extract produced significantly greater anxiolytic effects compared to LZIP.³⁹ However, BM has a distinct advantage over lorazepam (LZIP) since it does not induce amnesia and has a memory promoting action in animals and man.^{40,41} These results was also observed by Shanker and Singh and reported that BM extract possessed an anxiolytic effect.⁴²

Anti depressant Activity

Methanolic extract of BM possess potential antidepressant activity in rodent. When given in the dose of 20 and 40 mg/kg, orally for 5 days, the extract was found to have significant anti depressant activity in forced swim and learned helplessness models of depression and was comparable to that of imipramine.⁴³

Anti-Asthmatic Activity (Kasahara - Shwasahara)

BM extract possessed relaxant properties in tracheal muscle of rabbit and guinea pigs with a

partial contribution by (beta)-adrenoreceptor and prostaglandins.⁴⁴ It also produced broncho dilation in anaesthetized rats supported the traditional use of this plant in for various respiratory ailments.^{45,46} Bronchodilator property of extract may be reflected by antagonism of carbachol induced effects on inspiratory and expiratory pressures. Extract exhibited a dual action on bronchoconstriction induced by carbachol. At low doses (25 and 37 mg/kg), predominantly inhibited inspiratory pressure, but at a high dose (50 mg/kg) inhibited only expiratory pressure. This property of the plant extract implies that more than one mechanism of action may be responsible for broncodilation. Some of the possible mechanisms include (beta)-adrenoreceptor activation, muscarinic receptor antagonism, prostaglandin release or interference with calcium mobilization. A more recent study by the same authors demonstrates the calcium antagonistic activity is present in ethanol extract of BM.⁴⁷ In addition, it has been reported that BM methanolic extract exhibited a potent mast cell stabilizer, indicating the potential usefulness of BM leaves in allergic conditions.⁴⁸

Anti-Cancer Activity (Ayushya/ Vayastha)

Pre treatment with BM significantly reduced the acute stress (AS) induced increase in the ulcer index, adrenal gland weight, plasma glucose, aspartate aminotransferase (AST), and creatine kinase (CK) in cancerous patients.⁴⁹ This was due to presence of Bacosides present in BM, which have anticancer activity. Methanolic extract exhibited potent mast cell stabilizer activity.⁵⁰ Bacopamonneri is a known hyper accumulator of cadmium, chromium, lead & mercury and used for phytoremediation.⁵¹

There are studies pertaining to Cardiovascular activity, Hepato-protective activity, Anti spasmodic activity, Anti nociceptive activity, apart from above stated activities of BM.

DISCUSSION

Thus Brahmi (is one of the most important herbal drug in Ayurveda. One should undertake more studies on it. Usually it is used as Medhyadrag, but one may also use it in different indications as well as mentioned in both literature from Ayurveda & modern pharmacology & Phytochemistry.

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