

Bacopa for the Brain

A Smart Addition to Western Medicine

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Abstract

This review discusses the clinical potentials of *Bacopa monnieri* (bacopa, water hyssop, or *brahmi*). Bacopa is an herb that combines adaptogenic and nervine properties. Animal and clinical studies show it to have anxiolytic, antidepressant, cognitive-enhancing, antioxidant, cholinergic, and adaptogenic actions. These properties make it a highly useful herb to help patients cope with physical and emotional stress, and the cognitive impairment that usually accompanies aging.

Introduction

In clinical practice, many kinds of stress complicate, and may often substantially limit, ability to resolve patients' ailments and symptoms fully. Patients, in addition to their main complaints, also typically present with physical stress resulting from poor nutrition, lack of exercise, and exposure to complex environmental chemicals. Usually, an individual blend of emotional and mental stress—caused by financial worries; lack of sleep; relationship issues; and other stressors manifesting as fatigue, depression, and anxiety—is added to the physical stressors. It has been noted that as many as 75%–90% of visits to primary care physicians are related to stress.¹

The rapidly aging population has additional problems. Cognitive impairment is reported in almost half of the population over age 64.² The elderly worry greatly about the looming loss of their mental faculties, and both the actual and the feared loss of memory is a significant stressor in this group. As a result, treatments that may enhance mental function are particularly needed in the elderly, as such treatments may mitigate the social and personal losses associated with cognitive decline and thereby reduce some of the stress that accompanies aging.

We frequently urge clinicians to incorporate both adaptogenic and nervine herbs to help treat the stress that virtually all patients experience.^{3–4} Adaptogenic herbs are used to strengthen the body's immune response and increase an individual's ability to cope with physical and mental stress. These herbs are also used to increase overall vitality. Adaptogens are

generally not used to treat specific ailments but are rather used on a fairly long-term basis to help a patient achieve a more healthful state overall. Adaptogens also benefit patients who constantly develop minor ailments, such as colds.

These herbs also are a great help for patients who are struggling with chronic ailments, for example, autoimmune disease. Because adaptogens help an individual cope with physical and mental stress, these herbs are highly useful for people who feel tired, run-down, "stressed-out," "burned-out," and ill.

This replenishment is not an energy boost similar to that of caffeine or amphetamine in which the temporary boost ultimately depletes patients' strength further. Instead, these herbs assist patients to heal during convalescence, serve as prophylactics to build resistance, reduce susceptibility to illness, and promote health. Adaptogens frequently used in Western botanical medicine include *Withania somnifera* (ashwagandha), *Panax quinquefolius* (American ginseng), and *Eleutherococcus senticosus* (eleuthero).³

Nervine herbs have been widely used historically to treat mild-to-moderate cases of anxiety and depression, as well being used to promote sleep. While often lacking well-designed clinical studies to support their use, these herbs offer a safe, nonaddictive way to help people maintain emotional balance in acute care settings. Nervines frequently used in Western botanical medicine include *Avena* spp. (oat seed), *Crataegus* spp. (hawthorn), *Eschscholzia californica* (California poppy), *Lavandula* spp. (lavender), *Matricaria recutita* (chamomile), *Melissa officinalis* (lemonbalm), *Passiflora* spp. (passionflower), *Scutellaria lateriflora* (scullcap), and *Verbena* spp. (verbena, also called vervain).⁴

This article reviews an herb with both adaptogenic and nervine properties—*Bacopa monnieri* (bacopa or water hyssop).^{*} This herb has a long history of use in traditional Ayurvedic

^{*}The proper Latin binomial for bacopa is either *Bacopa monnieri* or *Herpestis monniera* (see, e.g., MgGuffin M, Kartesz JT, Leung AY, Tucker AO. *The American Herbal Products Association's Herbs of Commerce*, 2nd ed. Silver Spring, MD: American Herbal Products Association, 2000). However, research articles on bacopa very frequently instead mistakenly use a blend of these two Latin names: *Bacopa monniera*.

Forms and Dosing of Bacopa

Forms	Dosage
Daily doses in traditional practice	5–10 g of nonstandardized, powdered herb, 30 mL of syrup, or 8–16 mL of infusion
Capsules, often standardized to 20%–50% bacosides	200–400 mg/day in divided doses for adults; 100–200 mg/day in divided doses for children
Tinctures	1:2 fresh plant or 1:4 recently dried herb, 2–30 mL/day in divided doses

medicine and has properties that recommend it strongly for more-frequent use by Western practitioners.

Bacopa is also called *brahmi*, a Sanskrit name it shares with another herbal restorative, *Centella asiatica* (*gotu kola*) because both herbs are used to improve mental health, intellectual functioning, and memory as well as promoting longevity and system restoration.⁵ Because both herbs are used to improve brain health, both are called *brahmi*.⁶ In Ayurveda, bacopa has been used for almost 3000 years to treat anxiety, epilepsy, insomnia, poor memory, and asthma, as well as being applied as a cardiac energizer and diuretic.^{6,7} Given interesting clinical research that tends to support bacopa's historical uses, it would seem that this plant should be given a more prominent place in our Western apothecary of adaptogenic and nervine plants.

Constituents and Pharmacologic Properties

Bacopa contains the alkaloid brahmine and the glycoside asiaticoside, two constituents also found in *gotu kola*, an herb that has also demonstrated an anxiolytic effect.^{1,8} Bacopa belongs to the Scrophulariaceae family and contains the flavonoid wogonin—as does scullcap, a Western nervine used historically to treat anxiety and epilepsy.⁴ Animal studies strongly suggest that bacopa also may have beneficial effects in patients with epilepsy.⁵ Bacopa's anxiolytic activity, is generally attributed to this herb's saponins, particularly its steroidal saponins and bacosides.⁶ The bacosides are often used to standardize extracts of bacopa.

Attempts to explain bacopa's mechanism have not succeeded fully. Hypothesized mechanisms include cholinergic upregulation, γ -aminobutyric acid modulation, antioxidant effects, protein synthesis in the brain, 5-HT agonism, and modulation of brain stress hormones. Extracts ameliorated β -amyloid levels in the brains of transgenic mice, suggesting a potential relevance to Alzheimer's disease.⁹ The herb's cholinergic effects are multifaceted and include dose-dependent inhibition of acetylcholinesterase activity in vitro and in animals.¹⁰ The herb normalized blood levels of corticosterone and monoamine levels in brains of animals subjected to acute and chronic stress models.¹¹ Bacopa's constituents facilitated mental retention and reversed amnesic effects in various study models.

Bacopa's powers as an antioxidant are well-established, and, because its constituents are lipophilic, these constituents have the ability to cross the blood-brain barrier. Bacopa increased the activity of antioxidant enzymes in various portions of rat

brains. This herb also increased the animal's levels of serotonin, a brain chemical that promotes relaxation.⁷ There are also preliminary studies showing the plant to be effective for treating stress (e.g., by showing an adaptogenic effect).⁶

Animal studies support the use of bacopa to reduce anxiety and depression as well as to enhance learning. In an animal model of anxiety, bacopa and its saponin bacoside A had an anxiolytic effect equivalent to lorazepam.¹² While lorazepam caused amnesia, bacopa actually enhanced memory. Other studies showed antidepressant activity in various models. In one study, 20–40 mg/kg of bacopa produced an antidepressant effect equivalent to that of imipramine in rodents.¹³ In rats and dogs, an aqueous extract of bacopa had a tranquilizing effect, while an alcoholic extract improved motor learning in rats.

Bacopa had an antispasmodic effect on intestinal smooth muscle, to prevent—or enhance healing of—gastric ulcers. This effect included an antimicrobial action against *Helicobacter pylori*.⁶

Clinical Studies

There are various clinical studies on the effect of bacopa on mood and learning. Most of these studies used 300 mg of bacopa extract per day, usually for a 12-week period.

Bacopa enhanced memory in a trial of 46 healthy volunteers (ages 18–60) who took 300 mg of bacopa extract per day for

Bacopa enhanced memory in a trial of 46 healthy volunteers.

12 weeks. The positive changes in learning rate, speed of information-processing, and anxiety reduction were statistically significant at 12 weeks but not at 5 weeks.¹⁴

Ninety-eight adults (>55 years old) without signs of dementia were given 300 mg BacoMind extract (derived from 6 g of crude herb) daily for 12 weeks.¹⁵ Eighty-one individuals completed the study, which showed that bacopa improved memory acquisition and retention. However, the bacopa group in this study had significantly more side-effects (stool frequency, nausea, and abdominal cramping) than the placebo group had. The researchers theorize that these side-effects may be caused by the cholinergic effect of bacopa.¹⁵ In contrast, intestinal side-effects were much

less-frequent and much milder in a phase I trial of BacoMind in which participants took escalating amounts of BacoMind (300–450 mg daily) over a 30-day period.¹⁶ No detrimental effects were reported in another clinical study in which participants also took a daily 300 mg dose of BacoMind.¹⁷

In a randomized, placebo-controlled study, healthy volunteers took 300 mg of KeenMind (Keen Health Pty. Ltd.), a bacopa extract standardized to contain at least 55% bacosides A and B, with each capsule equivalent to 3 g of dried herb over a 12-week treatment period. Working memory performance in various computerized tasks improved in the bacopa group of this study. The bacopa group also reported a much greater incidence of increased energy, mild diarrhea (in a few cases), and a reduced number of dreams; while the placebo group had more oral problems and bruising but, overall, the differences in adverse effects were deemed to be minor and insignificant.¹⁸

In a 3-month study of 76 healthy adults (ages 40–65), bacopa (at 300 mg/day) improved retention of new information in latter recall of word pairs.^{9,19} Follow-up tests suggested that this improvement was caused by a decrease in rate of forgetting rather than by an enhancement of rate of learning—a result that has yet to be replicated in other studies.

Forty-eight healthy individuals (> 65 years old) without signs of dementia or memory issues completed a randomized, placebo-controlled, and double-blinded study on bacopa. The active group was given 300 mg of bacopa (a 50:1 extract standardized to 50% bacosides and manufactured to be the equivalent of 15 g of herb and 150 mg of bacosides A and B). In the bacopa group, positive effects were noted on various measures of cognitive performance, and reduced depression and anxiety were noted on several measures. Anxiety and depression actually increased in the placebo group. The researchers commented that bacopa's positive effect on cognition might result either from the herb's direct effects on brain chemistry and memory processes or, equally, a greater tolerance for the frustration of repeated testing or a reduction in test-taking anxiety. The researchers also suggested that the increase in anxiety and depression in the placebo group was likely the results the rigors of repeated testing.⁹

A few studies used slightly higher or lower doses of bacopa. Twenty-eight children with IQs between 70 and 90 (considered to be “slow learners”) took a 225-mg BacoMind tablet each day for 4 months. The herb improved many aspects of memory in these children, including working memory and logical memory.²⁰

Another randomized, double-blinded, placebo-controlled study investigated 65 adults (ages 50–75) who, for at least 1 year prior to the study, had complained of memory impairment but had not showed any major cognitive deficits. Participants in the active group were given a 450-mg BacoMind capsule for 12 weeks and then were studied during a 12-week withdrawal period. Bacopa improved results on tests measuring attention and verbal memory as well as improving auditory reception of information and immediate attention skills. This dose of bacopa was well-tolerated, without significant adverse effects.¹⁷

A 3-month study of adults (> 55 years old) with evidence of age-associated memory impairment, who were given 250 mg/day



Bacopa monnieri (bacopa) flower. Drawing © 2011, by Kathy Abascal, BS, JD, RH (AHG).

of bacopa, found improved logical memory and paired associate learning at 12 weeks. This improvement persisted at a follow-up 4 weeks after the study was concluded.²¹

Forty healthy males were randomized to take 500 mg of bacopa or 200 mg of caffeine daily for 16 weeks. In various cognitive tests, bacopa improved reaction times as well or better than caffeine but without the side-effects that caffeine can cause.⁷ The improvement in stimulus–response time mirrored an earlier study by Stough et al., in which the speed of visual information processing and reaction time increased.¹⁴

There are also reports of a number of clinical studies for which we were unable to obtain and review the original study data. In an uncontrolled study of 36 children with hyperactivity disorder, 100 mg/day of bacopa for 12 weeks reportedly improved scores on several cognitive assessments.²² Similar results were reportedly obtained in an uncontrolled study of a group of patients with anxiety neurosis.²³ In another study, bacopa enhanced memory, arithmetic skills, and some aspects of verbal communication in students of average intelligence.²⁴ Bacopa was said to be useful for “renovating and revitalizing intellectual behavior in children.”[†] There are also reports that bacopa, in syrup form at a dose of 350 mg 3 times/day for 3 months, improved learning, memory, perception, and reaction time in 20 schoolchildren.⁹ Bacopa reportedly was made available for clinical use by the Central Drug Research Institute in Lucknow, India, based on positive clinical study results.²⁵

[†]Barbhaiya HC, Desai RP, Saxena VS, et al. Efficacy and tolerability of BacoMind on memory improvement in elderly participants—a double blind placebo controlled study. *J Pharmacol Toxicol* 2008;3:425–434, quoting Sharma R, Chaturvedi C, Tewari PV. Efficacy of *Bacopa monnieri* in revitalizing intellectual functions in children. *J Res Educ Indian Med* 1987;6:1–10.

Positive results were obtained in an additional clinical study of BacoMind.²⁶

There are two negative studies on bacopa. In both, bacopa was administered for only a brief period of time, suggesting that the herb's effects build over time and that instant results should not be expected. One of these studies looked at the effect of a single dose, tested 2 hours after administration.²⁷ The other trial studied the effect of bacopa combined with *Ginkgo biloba* (ginkgo) after 4 weeks of treatment.²⁸

Safety and Potential Drug Interactions

Overall, bacopa appears to be both safe and well-tolerated.⁶ It has a very long history of use and its LD₅₀ in rats is very high. One study using the concentrated bacopa extract BacoMind reported a fairly significant number of adverse gastrointestinal effects.¹⁵ The researchers theorized that the side-effects may have been caused by the cholinergic effect of bacopa and urged caution when using the herb with cholinergic drugs often used

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in dementia. In contrast, intestinal side-effects were much less frequent and much milder in a phase I trial of BacoMind in which participants took an escalating amount of BacoMind (300–450 mg daily) over a 30-day period,¹⁶ and no detrimental effects were reported in another clinical study in which participants also took a daily 300 mg dose of BacoMind.¹⁷

Animal models suggest that bacopa may decrease the toxicity of the drugs morphine and phenytoin. It appears to potentiate the sedative effects of phenobarbital and chlorpromazine, suggesting that caution and forethought is warranted when combining bacopa with these types of drugs to avoid overmedication.⁶

Conclusion

Bacopa is generating a fair amount of excitement because few herbs, and yet fewer drugs, show an ability to improve cognition and memory. This herb and its constituents are being investigated as potentially helpful for addressing the dementia that occurs in Alzheimer's disease, sometimes in epilepsy, and in various other disorders.

‡Personal communication with Todd Caldecott, AHG; see also www.toddcaldecott.com/index.php/herbs/learning-herbs/384-brahmi Accessed December 8, 2010.

It is unrealistic to expect this herb to be curative for a disease such as Alzheimer's. However, bacopa has a real role to play as part of any treatment for patients in which anxiety, depression, or mental function are issues. Ayurvedic colleagues typically use bacopa as a mental/nervous restorative to calm and balance the mind. Ayurvedic clinical applications range from treating insomnia and attention-deficit hyperactivity disorder to depression and dementia. Bacopa is also used to ameliorate the mental/emotional aspects of hypothyroidism.[‡] We should use it similarly in our practices. In summary, bacopa combines attributes of an adaptogen, a multifaceted nerve, and a cognitive enhancer that is greatly needed in our botanical apothecary. ■

References

1. Head KA, Kelly GS. Nutrients and botanicals for treatment of stress: Adrenal fatigue, neurotransmitter imbalance, anxiety, and restless sleep. *Alt Med Rev* 2009;14:114–140.
2. Small GW. What we need to know about age related memory loss. *Br Med J* 2002;324:1502–1505.
3. Abascal K, Yarnell E. Increasing vitality with adaptogens: Multifaceted herbs for treating physical and mental stress. *Altern Complement Ther* 2003;9:54–60.
4. Abascal K, Yarnell E. Nervine herbs for treating anxiety. *Altern Complement Ther* 2004;10:309–315.
5. Mathew J, Paul J, Nandhu MS, Paulose CS. *Bacopa monnieri* and bacoside-A for ameliorating epilepsy associated behavioral deficits. *Fitoterapia* 2010;81:315–322.
6. Gohil KJ, Patel JA. A review on *Bacopa monniera* [sic]: Current research and future prospects. *Intern J Green Pharm* 2010;4:1–9.
7. Raina RS, Chopra VS, Sharma R, et al. The psychomotor effects of *brahmi* and caffeine on healthy male volunteers. *J Clin Diag Res* 2009;3:1827–1835.
8. Singh RH, Narsimhamurthy K, Singh G. Neuronutrient impact of Ayurvedic *rasayanatherapy* in brain aging. *Biogerontology* 2008;9:369–374.
9. Calabrese C, Gregory WL, Leo M, et al. Effects of a standardized *Bacopa monnieri* extract on cognitive performance, anxiety, and depression in the elderly: A randomized, double-blind, placebo-controlled trial. *J Altern Complement Med* 2008;14:707–713.
10. Das GS, Nath C, Pal R, et al. A comparative study in rodents of standardized extracts of *Bacopa monniera* [sic] and *Ginkgo biloba* anticholinesterase and cognitive enhancing activities. *Pharmacol Biochem Behav* 2002;73:893–900.
11. Sheik N, Ahmad A, Siripurapu KB, et al. Effect of *Bacopa monnieri* on stress induced changes to plasma corticosterone and brain monoamines in rats. *J Ethnopharmacol* 2007;111:671–676.
12. Bhattacharya SK, Ghosal S. Anxiolytic activity of a standardized extract of *Bacopa monniera* [sic] in an experimental study. *Phytomedicine* 1998;5:77–82.
13. Sairam K, Dorababu M, Goel RK, Bhattacharya SK. Antidepressant activity of standardized extract of *Bacopa monniera* [sic] in experimental models of depression in rats. *Phytomedicine* 2002;9:207–211.
14. Stough C, Lloyd J, Clarke J, et al. The chronic effects of an extract of *Bacopa monniera* [sic] (*brahmi*) on cognitive function in healthy human subjects. *Psychopharmacology* 2001;156:481–484.
15. Morgan A, Stevens J. Does *Bacopa monnieri* improve memory performance in older persons? Results of a randomized, placebo-controlled, double-blind trial. *J Altern Complement Med* 2010;16:753–759.

16. Pravina K, Ravindra KR, Goudar KS, et al. Safety evaluation of BacoMind in healthy volunteers: A phase I study [clinical report]. *Phytomedicine* 2007;14:301–309.
17. Barbhaiya HC, Desai RP, Saxena VS, et al. Efficacy and tolerability of BacoMind on memory improvement in elderly participants—a double blind placebo controlled study. *J Pharmacol Toxicol* 2008;3:425–434.
18. Stough C, Downey LA, Lloyd J, et al. Examining the nootropic effects of a special extract of *Bacopa monniera* [sic] on human cognitive functioning: 90 day double-blind placebo-controlled randomized trial. *Phytother Res* 2008;22:1629–1634.
19. Roodenrys S, Booth D, Bulzomi S, et al. Chronic effects of *brami* (*Bacopa monniera* [sic]) on human memory. *Neuropsychopharmacology* 2002;27:279–281.
20. Usha PD, Wasim P, Joshua JA, et al. BacoMind®: A cognitive enhancer in children requiring individual education programme. *J Pharmacol Toxicol* 2008;3:302–310.
21. Raghav S, Singh H, Dalal PK, et al. Randomized controlled trial of standardized *Bacopa monniera* [sic] in age-associated memory impairment. *Indian J Psychol* 2006;48:238–242.
22. Negi KS, Singh YD, Kushwaha KP, et al. clinical evaluation of memory enhancing properties of Memory Plus in children with attention deficit hyperactivity disorder. *Indian J Psych* 2000;42(suppl).
23. Singh RH, Singh L. Studies on the anti-anxiety effect of the *medyba rasayana* drug *brahmi* (*Bacopa monniera* [sic] Wettst.). *Res Ayur Siddha* 1980;1:133–148.
24. Abhang R. Study to evaluate the effect of a micro (*suksma*) medicine derived from *brahmi* (*Herpestris monierra*) on students of average intelligence. *J Res Ayur Siddha* 1993;14:10–24.
25. Bhattacharya SK, Bhattacharya A, Kumar A, Ghosal S. Antioxidant activity of *Bacopa monniera* [sic] in rat frontal cortex, striatum and hippocampus. *Phytother Res* 2000;14:174–179.
26. Kasture SB, Kasture VS, Joshua AJ, et al. Nootropic activity of BacoMind, an enriched phytochemical composition from *Bacopa monniera* [sic]. *J Nat Remedies* 2007;7:150–157.
27. Nathan PJ, Clarke J, Lloyd J, et al. The acute effects of an extract of *Bacopa monniera* [sic] (*brahmi*) on cognitive function in healthy normal subects. *Hum Psychopharmacol* 2001;16:345–351.
28. Nathan PJ, Tanner S, Lloyd J, et al. Effects of a combined extract of *Ginkgo biloba* and *Bacopa monniera* [sic] on cognitive function in healthy humans. *Hum Psychopharmacol* 2004;19:91–96.

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