

Efficacy of *Bacopa monnieri* in the stimulation of dendrite branching and its relation to memory enhancement

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Abstract

Bacopa monnieri is widely used in natural nootropic supplements. It is variously described as a memory enhancer, a guard against cognitive decline, and a natural palliative for age-related cognitive impairment. Clinical trials have shown that *Bacopa monnieri* consumption does indeed improve memory function, particularly in older people and those with mild cognitive impairment. Those same studies implicate that specific compounds in *Bacopa monnieri* called bacosides are responsible for the observed improvements in cognitive function. We posit that those bacosides work primarily by stimulating dendrite branching. We assert that the benefits of *Bacopa monnieri* supplementation can thus be attributed to this dendritic branching effect.

Keywords: *Bacopa monnieri*, dendrite, neuron, nootropic, cognition

1. About *Bacopa monnieri*

Bacopa monnieri is among the most widely-used nootropic substances in the world. It is a common ingredient in many popular, pre-made nootropic stacks sold globally, such as Mind Lab Pro and Qualia Mind. Supplement manufacturers claim that *Bacopa monnieri* is an exceptionally potent nootropic. They variously attribute it with memory-enhancing, focus-promoting, and brain health protecting properties. While there is some skepticism about the veracity of these claims - and specifically the extent to which they are true - there is a great deal of evidence supporting the claim that *Bacopa monnieri* enhances cognitive function in several different ways.

Interestingly, most of the studies carried out on *Bacopa monnieri* to date have focused on measuring the effects of *Bacopa* supplementation on cognitive function. Little has been done to establish *Bacopa*'s exact mechanism of action.

In the following sections, we examine some of the clinical trials conducted on *Bacopa* to establish how effective it is for

enhancing memory function. We then turn to the available evidence on how *Bacopa monnieri* works.

1.1 How effective is *Bacopa monnieri*?

Bacopa monnieri's effectiveness has typically been measured in terms of how it affects memory function. This is, after all, the traditional use for *Bacopa*, so it makes sense to measure its efficacy by measuring how well it improves memory.

Several robust clinical trials have been carried out on *Bacopa monnieri* to establish its efficacy as a memory enhancer. These trials have uniformly found *Bacopa monnieri* supplementation to have a significant positive effect on memory.

In one 2010 study[1], researchers gave 103 volunteers either a standardized *Bacopa monnieri* extract (*BacopaMind*) at 300mg/day or placebo for 12 weeks. The participants given 300mg of *Bacopa monnieri* per day showed marked improvements in verbal learning, memory acquisition, and delayed memory recall than the control group.

An earlier 2002 study found that consumption of a high-Bacoside Bacopa monnieri extract (50% bacosides by weight) drastically attenuated the rate of forgetting (although it did not meaningfully improve learning)[2].

As so many studies attest to Bacopa's efficacy as a memory-enhancer, we'll move on to other claimed benefits of this nootropic.

A study carried out in 2013 found that Bacopa monnieri extract (55% bacosides) consumption not only improved learning and memory retention, but also protected against brain ageing in rats[3]. This seems to confirm the claim that Bacopa monnieri supplementation helps protect the brain from degradation and age-related cognitive decline.

But this begs an important question; how? How does Bacopa monnieri protect against cognitive decline and actively improve memory function in otherwise healthy adults? Why are the effects of Bacopa monnieri so pronounced in older people?

1.2 How Bacopa monnieri works

Several putative mechanisms of action for Bacopa monnieri have been put to the test. Somewhat surprisingly, there seems to be solid evidence supporting almost all of the theorized mechanisms of action.

For example, some nootropics researchers have suggested that Bacopa monnieri works by protecting the brain from oxidative stress. A study published in *Life Sciences* in 2006 would seem to support this claim [4]. In that trial, researchers exposed rats to cigarette smoke. A subset of the rats were given Bacopa monnieri extract. The researchers found that the rats given Bacopa monnieri extract had dramatically higher levels of Vitamin E, Vitamin C, Vitamin A, superoxide dismutase, catalase, glutathione peroxidase and glutathione reductase (antioxidants). The rats given Bacopa monnieri also had higher levels of key trace elements such as copper and selenium than the rats given nothing. This seems to indicate that bacopa monnieri improves antioxidant status in the brain in response to oxidative stress.

However, this would not explain Bacopa's efficacy as a cognitive enhancer in younger people, or how it seems to improve memory function above baseline.

A much more likely explanation as to how Bacopa monnieri exerts these benefits is that it stimulates dendritic branching. Several studies have shown that the administration of Bacopa monnieri results in significant growth and proliferation of dendrite branches [5]. Bacopa monnieri consumption results in longer dendrites and more dendrite branching points in the basolateral amygdala, an area of the brain heavily implicated in memory function.

Despite offering such an elegant and sufficient explanation for the exact mechanisms of action of Bacopa monnieri, no further research has been done to test how much of Bacopa monnieri's benefits are the result of dendrite growth and increased dendrite branching. This work should

be done as a matter of urgency given the potential that Bacopa monnieri has for improving cognitive function and protecting against cognitive decline associated with degradation at the neuronal level[6]. We suggest that the kind of benefits enjoyed by people using Bacopa-rich nootropic supplements could well be expanded to the wider population, resulting in far greater levels of productivity, learning, and quality of life.

Acknowledgements

None of the work presented here would exist without the tireless work of the nootropics community. Together, biohackers are paving the way toward better cognitive function. It is through their research and their experimentation that we yield improvements in focus, memory, and productivity.

References

- [1] 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(7):753-759. doi:10.1089/acm.2009.0342.
- [2] Roodenrys S, Booth D, Bulzomi S, Phipps A, Micallef C, Smoker J. Chronic effects of Brahmi (Bacopa monnieri) on human memory. *Neuropsychopharmacology.* 2002;27(2):279-281. doi:10.1016/S0893-133X(01)00419-5
- [3] Aguiar S, Borowski T. Neuropharmacological review of the nootropic herb Bacopa monnieri. *Rejuvenation Res.* 2013;16(4):313-326. doi:10.1089/rej.2013.1431.
- [4] Anbarasi K, Vani G, Balakrishna K, Devi CS. Effect of bacoside A on brain antioxidant status in cigarette smoke exposed rats. *Life Sci.* 2006;78(12):1378-1384. doi:10.1016/j.lfs.2005.07.030.
- [5] Vollala VR, Upadhyaya S, Nayak S. Enhancement of basolateral amygdaloid neuronal dendritic arborization following Bacopa monnieri extract treatment in adult rats. *Clinics (Sao Paulo).* 2011;66(4):663-671. doi:10.1590/s1807-59322011000400023.
- [6] Majid Abbas. Mind Lab Pro: 100% Brain Optimization? You Bet. *Ijest.org.* 2020. [Full review.](#)