

Herbal nootropic agents

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ABSTRACT

Nootropics herb constitutes of compounds that enhance cognitive performance by increasing mental functions memory, creativity, motivation, and attention eventually causing individuals to be much alert and focused. These nootropic herbs tend to affect the brain performances through several mechanisms and pathways such as dopaminergic pathway and several studies reported have proven to have influence in brain activities such as on treating memory disorders such as Alzheimer's disease, Parkinson's disease, Huntington's diseases, and other mental-related disorders which are believed to impair the pathways and mechanisms as mentioned above. However, nowadays, with the present ever-evolving technology, modern science has been associating and incorporating some cognitive benefits in addition to ever safer, purer, and much effective modern manufacturing techniques fully utilizing these nootropic herbs.

KEY WORDS: Disease, Herbs, Memory, Nootropics

INTRODUCTION

Nootropic herb is also commonly known as smart drug, brain booster, or memory-enhancing drug in other words responsible to improve the brain activities, cognitive performance which leads to well-maintained mental performance eventually by enhancing in several aspects such as memory, motivation, concentration, and attention. At present, the exploration of medicinal plants globally for improving cognitive function (nootropic herbs) is on the rise due to their less adverse effects compared to common drugs. Ayurveda provides a list of herbs known for its nootropic activity as well as their multipurpose utility in many conditions.^[1] This article is a review on pharmacological properties, traditional uses, medicinal uses, and memory-enhancing function of the selected nootropic herbs from ayurvedic pharmacopoeia. Nootropics, also known as smart drugs comes from the Greek words "noos" (mind) and "tropos" (growing), are supplements that enhance the many functions (cognition, intelligence, memory, attention, concentration, and motivation) of the human brain.^[2] They are known to alter the neurochemicals (enzymes, neurotransmitters, and hormones) inside

the brains; nootropic herbs are group of medicinal plants described in Ayurveda with much benefits, specifically to improve memory and intellect. In this article, nootropic herbs we discuss about are *Bacopa monnieri*, *Ginkgo biloba*, *Acorus calamus* Linn., *Rhodiola rosea*, and *Celastrus paniculatus* which act as vasodilator against the small arteries and veins in the brain besides increasing the blood circulation to the brain besides supplementing the brain with important nutrients, energy providing extra oxygen supply to the brain.^[3] The brain, on the other hand, will be able to generate energy from the glucose burned which is crucial for the repair of cells, maintenance, electrical, and neurotransmitter functional purposes besides being able to soothe the inflammation in the brain, act as a shield and protection of brain from toxin infections, and minimizing brain aging. As a result, the brain activities and performance will be stimulated, improving cognitive skills such as thinking and memory abilities.

Herbal extracts are considered safer compared to the modern drugs with less fewer side effects, whereby according to the ancient Ayurvedic documentations, *B. monnieri* are highly recommended to treat cognitive issues such as insufficient focus and concentration, anxiety, and poor motor skills. However, due to the good safety profiles, *B. monnieri* are suggested to be integrated into the modern drugs and medicinal

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system, especially in the treatment of Alzheimer's and dementia, supported by researches and *in vivo* studies through the mechanism of the reduction of beta-amyloid deposits in animal models which proves its novelties to be worthy researched on human clinical studies. *G. biloba*, on the other hand, was used in ancient days as a treatment for senility in aging which has additional benefit which is to increase the life span of the user besides treating cognitive disorders which was presumed through the interference with mitochondria dysregulation which can also be the reasoning used to treat Alzheimer's disease. *A. calamus* plant derived from the family of Araceae is generally practiced in Ayurveda, Siddha, and Homeopathy and was traditionally used to treat various human mental ailments such as epilepsy, schizophrenia, and memory disorders. *Rhodiola* species is a hardy perennial used traditionally by the Viking those days for strengthen body and immune system to support the long hours of labor work and heavy work. Moreover, *Rhodiola* also reduces the free radicals and drugs induced cognitive damage and neuronal injuries affecting the brain performance, leading to the mental disorders eventually. There is evidence of studies that *Rhodiola* species improves the mental work capacity as well as commonly used to control depression. *C. paniculatus* is used traditionally for intellect stimulation and also to sharpen the memory by the extraction of seeds and oil where numerous alkaloids such as celastriene and paniculatin are found while the seeds are richly composed with fatty acids. Nowadays, the raw material is often included in the marketed tonic products for brain as it exhibits an effective therapeutic effect on the central nervous system improving the mental state, learning, and memory process in mentally retarded children used to treat attention-deficit disorders (Attention deficit hyperactivity [ADHD]) and anxiety, especially among children.

B. MONNIERI

Description

B. monnieri also generally known as *Herpestis monnieri* in Latin and locally known as water hyssop, and Brahmi, which has been used in the Ayurvedic system of medicine for hundreds of years for the treatment of mental state of an individual. *B. monnieri* is of the Scrophulariaceae family. In India and the tropics, it grows naturally in wet soil, shallow water, and marshes. This herb can be locally found at the elevated level from sea approximately at the altitudes of 4000–5000 feet and can be easily cultivated when there is sufficient water supply available and the genus *Bacopa* includes over 100 species of aquatic herbs. These herbs are distributed throughout the warmer regions of the world, apart from India, Nepal, Sri Lanka, China, Taiwan, and Vietnam and are also found in Florida and other southern states of the

USA. Every part of the plant is used for medicinal purposes.^[4]

Chemical Composition

Brahmi is known to contain steroidal saponin bacoside A and steroidal saponin bacoside B. Some other constituents present Brahmi are alkaloids brahmine, herpestine, etc.^[5]

Traditional and Medicinal Uses

B. monnieri was used conventionally as a brain tonic to enhance cognitive performance, memory development, learning, focus and concentration, and relieve patients with anxiety or epileptic disorders as it exhibits active compound exhibiting therapeutic activities such as antispasmodic activity, anticholinesterase activity, plays a role in neuroprotectivity, antioxidant activity, antidepressant properties, antiulcerogenic activity, broncho-vasodilatory activity, anti-inflammatory activity, antibacterial activity, and anticancer activity.^[6]

Memory Enhancing

Researchers from Australia conducted a double-blind, placebo-controlled, 12-week trial preclinical studies by administering patients with dose of Bacopa extract equivalent to 300 mg daily containing 55% combined bacosides and around 46 volunteers ranging between the age of 18 and 60 were randomly selected from a target population and evenly divided into treatment and placebo groups. The Bacopa extract was administered to the randomly selected patients with the acute dosage trial at the baseline, five, and 12 weeks after treatment began and at the end of the 12 weeks of study and analysis, results interpreted indicate improvement in cognitive performance from several aspects such as verbal learning, memory consolidation, and speed of early information processing in the treatment group compared to placebo which are mainly attributed to Bacopa antioxidant properties along with its effect on the cholinergic system.^[7] Treatment of Alzheimer's disease was studied regarding amyloid plaque pathology in the brain of PSAPP transgenic mice. Short- and long-term treatment with *B. monnieri* extract reduced brain A β (amyloid beta) 1–40 and 1–42 levels in the cortex and reversed the behavioral deficits in PSAPP mice; the study indicates the potential of *B. monnieri* as a therapeutic agent for: Standardized extract of *B. monnieri* (containing 55–60% bacosides) was shown to have adaptogenic activity.^[8]

G. BILOBA

Description

G. biloba, with other common names such as Ginkgo, Kew tree, Ginkyo, Yinhsing, Fossil Tree, Ginkgo Folium, Salisburia Adiantifolia and Maidenhair tree. It is from the botanical family of Ginkgoaceae. This tree is the only existing species of its genus. Some living

specimens of this plant may be as much as 3000 years old. The Ginkgo tree does not reproduce until it is about 20 years old and continues to do so after it has reached 1000 years of age.^[9] Ginkgo has been a part of traditional Chinese and Japanese medicine for many centuries. The Ginkgo tree has also proven to be very resistant to environmental pollution and some pathogens. The medicinal use of the leaves is of relatively recent origin and more common in western phytotherapy, in comparison to the culinary and two medicinal use of the seed (ovule), by the Oriental herbal tradition, which presumably dates back to the year 2800 BC.^[10]

Chemical Composition

Three cinnamyl alcohol-vicianosides such as rosavin, rosin, and rosarin were found and the active compounds with therapeutic effect are majorly composed with phenylethanol derivatives salidroside (rhodiolide) and tyrosol which are found in the underground part of the plants. There is also a positive presence of flavonoids in *R. rosea* which includes rodiolin, rodionin, rodiosin, acetylrodalgin, and tricin, as well as other catechins and proanthocyanidins. Monoterpenes, on the other hand, include rosiridol and rosaridin while triterpenes include daucosterol and beta-sitosterol. Phenolic acids such chlorogenic, hydroxycinnamic, and gallic acids are also present which proves the antimicrobial and anti-inflammatory effect of the herbal extract.^[11]

Traditional and Medicinal Uses

Ginkgo has been a part of traditional Chinese and Japanese medicine for many centuries. The Ginkgo tree has also proven to be very resistant to environmental pollution and some pathogens. The leaves are used medicinally in western phytotherapy, but the “seed” or ovule is used both for cooking and medicine in many countries of the Orient.^[12] Medically, it is used for the treatment of bronchial asthma, cerebral insufficiency, cognitive performance and memory loss, Alzheimer’s disease or senile dementia, anxiety and depression, ADHD disorder, against diabetes and related circulatory disorders glaucoma and macular degeneration against Raynaud’s syndrome for the treatment of depression.^[13]

Memory Enhancement

Ginkgo is commonly known as a brain herb or supplement nutrient for brain as it helps to improve as well enhance the brain performance where studies have shown that it does help to improve memory in people with dementia. Studies have proven that ginkgo helps to improve memory and thinking in healthy, young, and middle-aged people besides enhancing the concentration and focus and thinking skills of every consuming individual. The dose that works best seems to be 240 mg/day. These days, Ginkgo extract is often added as one of many ingredients in nutrition bars, soft drinks, and fruit smoothies to boost memory

and enhance mental performance besides keeping the consumers brain state active and mentally alert.^[14]

A. CALAMUS LINN.

Description

Latin name of *A. calamus* Linn. is commonly called as “Sweet flag” originates from the family of Araceae which is a semi-aquatic, perennial, aromatic herb with creeping rhizomes, sword-shaped leaves, and spadix inflorescence. This species grows either as wild or cultivated crop throughout India in elevated levels of approximately 1800 m, especially in the Himalayas mountain. However, these days, *A. calamus* is also found across Europe, in Southern Russia, Southern Siberia, China, Indonesia, Burma, Sri Lanka, Australia, as well as Southern Canada and the Northern United States, whereby its medicinal uses are widely known worldwide.^[15]

Chemistry

The chemical constituents of *A. calamus* Linn. are phenylpropanoids, sesquiterpenes, monoterpenes, xanthone glycoside, flavones, lignans, steroids, inorganic constituents, and triterpenoid saponins which are majorly responsible for all the therapeutic activities.^[16]

Traditional Uses

In Asia, *A. calamus* Linn. has been used for at least the past 2000 years. The ancient peoples of China used it to lessen swelling and for constipation. The parts used are leaves, root (rhizome), and stem. In India, Ayurvedic medicinal practice has used the rhizomes to cure several diseases such as fever, asthma and bronchitis, and as a sedative. The Sioux used the whole plant, making aromatic garlands from the leaves and using the root as a tea for bowel pains, or rubbed the chewed root on the skin for a general illness cure.^[17]

Memory Enhancement

The rhizomes of *A. calamus* are used in loss of memory given in combination with other drugs such as *Centella asiatica*, *B. monnieri*, and *Rauvolfia serpentina* as a memory booster. *A. calamus* well known for its memory-enhancing activity enhanced learning performance, of the descendants of drug-administered animals and the animals themselves. Acorus, when mixed with food and given to albino rats, showed excellent learning performance, enhancing activity proving its popular memory boosting activity.^[18,19]

R. ROSEA

Description

R. rosea (also known as golden root and Arctic root) has been categorized as an adaptogen by Russian researchers due to its observed ability to increase resistance to a variety of chemical, biological, and

physical stressors. It is a popular plant in traditional medical systems in Eastern Europe and Asia, with a reputation for stimulating the nervous system, improving depression, enhancing work performance improving sleep, eliminating fatigue, and preventing high-altitude sickness.^[20]

Chemistry

R. rosea is essentially composed of rosavin, salidroside, flavonoids, 12 amino acids, 20 minerals, multivitamins, and tannins. The antioxidant properties of *Rhodiola* are especially powerful for combating aging.^[21]

Traditional Uses

Traditional folk medicine used *R. rosea* to increase physical endurance, work productivity, longevity, resistance to high-altitude sickness, and to treat fatigue, depression, anemia, impotence, gastrointestinal ailments, infections, and nervous system disorders. In Middle Asia, *R. rosea* tea was the most effective treatment for cold and flu during severe Asian winters. Mongolian doctors prescribed it for tuberculosis and cancer.^[22] Linnaeus wrote of *R. rosea* as an astringent and for the treatment of hernia, leukorrhea (vaginal discharge), hysteria, and headache. In 1755, *R. rosea* was included in the first Swedish Pharmacopoeia. Vikings used the herb to enhance their physical strength and endurance. Extracts of *R. rosea* root were found to contain powerful adaptogens. Research revealed that it protected animals and humans from mental and physical stress, toxins, and cold.^[23]

Memory Enhancement

Studies using proofreading tests have demonstrated that *R. rosea* enhances memorization and concentration ability over prolonged periods. It increases the bioelectrical activity of the brain which improves memory and brain energy. In one study, 40 students were randomized to receive either 50 mg standardized *Rhodiola* extract or placebo twice daily for a period of 20 days.^[24] The students receiving the standardized extract demonstrated significant improvements in physical fitness, psychomotor function, mental performance, and general well-being. Subjects receiving *R. rosea* extract also reported statistically significant reductions in mental fatigue, improved sleep patterns, a reduced need for sleep, greater mood stability, and a greater motivation to study.^[25]

C. PANICULATUS

Description

C. paniculatus is a woody liana commonly known as black oil plant, climbing staff tree, and intellect tree. The plant grows throughout India at elevations up to 1800 m. *C. paniculatus* is a deciduous vine with stems up to 10 cm in diameter and 6 m long with rough, pale

brown exfoliating bark covered densely with small, elongated lenticles. The leaves are simple, broad, and oval, obovate or elliptic in shape, with toothed margins. The seeds contain fatty acids and alkaloids and have sedative and antidepressant actions.^[26]

Traditional Uses

For thousands of years, Ayurveda medicine men have used the *Celastrus* seeds for their potent medicinal properties. It was used for many different ailments, but mainly it was administered as a powerful brain tonic, appetite stimulant, and emetic. The oil of the *Celastrus* seed was used to treat physical weakness, mental confusion, alleviate asthma symptoms, reduce headaches, cure joint pain, and arthritis. The medicine men made a tonic of the seed oil, they used this tonic to mitigate mental fatigue, memory loss, as well as to boost memory recall, retention, and other thought processes.^[27]

Chemical Composition

The seeds yield brownish-yellow oil 52.2% with an unpleasant taste. This oil is reported to contain acetic acids and benzoic acids in addition to the higher amount of the fatty acids.^[28]

Memory Enhancement

C. paniculatus has reportedly shown good results in treating mental depression and in hastening the process of learning and memory in experimental animals. It also gave excellent results in treating panic attacks without any side effects. In one experimental study, the effect of *Celastrus* oil on learning and memory in a two-compartment passive avoidance task in rats was studied. The effects on the contents of norepinephrine (NE), dopamine (DA), and serotonin (5-HT) in the brain and on the levels of their metabolites both in the brain and urine were also assessed.^[29] Significant improvement was observed in the retention ability of the medicine-treated rats compared with the saline-administered controls. The contents of NE, DA, and 5-HT and their metabolites in the brain were significantly decreased in the medicine-treated group. These studies clearly indicate that *Celastrus* oil causes an overall decrease in the turnover of key chemicals that directly support learning and memory.^[30]

CONCLUSION

Herbal nootropics are effective options to treat brain-related or mental disorders, whereby both its individual and combined effects tend to increase the overall activity of the brain performance. In addition to that, the quality of good lifestyle will be ensured with appropriate nootropic herbal extract treatment to heal the cognitive conditions followed with proper diet, exercise, and mindfulness to support all along. To summarize, herbal nootropics have more to offer

compared to modern chemically derived drugs due to higher safety drug profile along with fewer side effects but to act equally as efficient and good as modern chemically derived drugs.

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