



## EFFECTIVENESS OF CENTELLA ASIATICA (BRAHMI) IN VARIOUS ILLNESSES: A REVIEW

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### ABSTRACT

Medicinal plants have been used since ancient times for the treatment of a range of diseases. Nowadays medicinal plants have attained a significant role in health system all over the world for both humans and animals not only in the diseased condition but also as potential material for maintaining proper health. In this era, focus on plant research has increased all over the world and a large body of evidence has been accumulated to highlight the immense potential of medicinal plants used in various traditional systems of medicine. Amongst various medicinal plants *Brahmi* (*Centella asiatica* Linn.) is one of the most useful plants seen in *Unani* system of medicine. *Centella asiatica* Linn. is an imperative medicinal drug which possesses significant medicinal properties, especially those involving cognition. It has been extensively used In *Unani* system of medicine, as *Muqawwi-e-Dimagh* (brain tonic), *Muqawwi-e-Asab* (nervine tonic) and *Musakkin-e-Asab* (tranquiliser) drug in various neuro-psychiatric disorders e.g. *Zof-e-Dimagh* (cerebral asthenia), *Zof-e-Asab* (neuroasthenia), *Zof-e-Hafiza* (poor memory), *Nisyan* (amnesia), *Junoon* (insanity), *Akhtanaqur Rahem* (Hysteria)

The present paper reviews *Brahmi* (*Centella asiatica* Linn.) as a medicinal plant and highlights its benefits in various health problems.

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### INTRODUCTION

Medicinal plants have been used since ancient times for the treatment of a range of diseases. Nowadays medicinal plants have attained a significant role in health system all over the world for both humans and animals not only in the diseased condition but also as potential material for maintaining proper health. In this era, focus on plant research has increased all over the world and a large body of evidence has been accumulated to highlight the immense potential of medicinal plants used in various traditional systems of medicine. Amongst various medicinal plants *Brahmi* (*Centella asiatica* Linn.) is one of the most useful plants seen in *Unani* system of medicine.

*Centella asiatica* and *Bacopa monnieri*; both of these herbs are referred to by the name *Brahmi* in *Unani* and system of medicine, both of them have shown promising effects in improving cognitive function<sup>1</sup>.

*Centella asiatica* Linn., is a small perennial creeping aromatic herb belonging to the family *Apiaceae* (*Umbelliferae*) and has been named by an array of vernacular names throughout the

world. *Centella asiatica* Linn. is called *Brahmi* in Sanskrit, Hindi, Urdu, Gujrati, Tamil and Marathi languages<sup>1,2</sup>.

*Centella asiatica* Linn. is an imperative medicinal drug which possesses significant medicinal properties, especially those involving cognition. It has been extensively used In *Unani* system of medicine, as *Muqawwi-e-Dimagh* (brain tonic), *Muqawwi-e-Asab* (nervine tonic) and *Musakkin-e-Asab* (tranquiliser) drug in various neuro-psychiatric disorders e.g. *Zof-e-Dimagh* (cerebral asthenia), *Zof-e-Asab* (neuroasthenia), *Zof-e-Hafiza* (poor memory), *Nisyan* (amnesia), *Junoon* (insanity), *Akhtanaqur Rahem* (Hysteria)<sup>3</sup>

‘Nootropic drugs’ are a group of medicines which have been asserted to enhance mental capacity, particularly dealing with those neurological and psychiatric disorders that are connected with loss of memory and various cognitive deficits. Some of these which have claimed to act on the nervous system are *Sankhaholi* (*Evolvulus alsinoides*), *Vaj* (*Acorus calamus*), *Brahmi* (*Centella asiatica* and *Bacopa monnieri*), *Assgand* (*Withania somnifera*)

Professionals and drug stores acknowledge the utilization of both, *Bacopa Monnieri* or *Centella asiatica* Linn. as *Brahmi* despite the fact that a portion of the writings have made efforts to rule out the discussion in regards to personality of correct types of *Brahmi*. Both the plants are believed to be equipotent with respect to their medicinal value while making diverse formulations<sup>4</sup>. *Bacopa Monnieri* is a well-known memory enhancer and *Centella asiatica* Linn. restores memory, longevity and has cognition enhancing effects<sup>1</sup>. In the following paper, we will review *Centella asiatica* Linn. as a medicinal plant.

### Description of the Plant

*Centella asiatica* Linn., a psychoactive medicinal plant<sup>5</sup> is found in abundance in wet soil, is a slender, tender, faintly aromatic herb which is widely cultivated in warmer parts of Asia, Australia, America and India. The herb is known as Mandookaparni in Ayurveda, *Brahmi* in Unani Medicine and Gotu Kola in the Western World<sup>6</sup>. It looks like a creeping perennial with numerous branches and small, oblong, relatively thick leaves which are arranged opposite to each other on the stem. Flowers are small and light purple or white with four to five petals. It can grow naturally in wetland, shallow water, damp and muddy shores. Because the plant is aquatic, it is especially sensitive to biological and chemical pollutants in the water, which may be absorbed into the plant. It can be cultivated in drier soils as long as they are watered regularly enough such as in a home garden arrangement (Figure-!).



Figure 1 *Brahmi (Centella asiatica)* medicinal plant

In India, the plant is sold in the market as '*Brahmi*'. The term '*Brahmi*' finds its origins in 'Bramha' the legendary creator of Hindu Pantheon and brain is the focal point of creative actions in human body as shown in figure-2.



Figure 2 Uses of *Brahmi (Centella asiatica)* in different illness

### Aiding in Brain Repair

*Brahmi* is synonymous with Brain Repair, having a particular activity on cerebrum which is ordinarily utilized among all medical experts. *Centella asiatica* Linn. is one of the prominent herbs for revitalizing the nerves and brain cells<sup>7</sup>.

Brain damage is of two types – *Traumatic* and *Acquired*. Causes of traumatic brain injury are car accidents, sports injury, blows to the head, physical violence etc. Causes of Acquired brain injury are poisoning or exposure to toxic substances, infection, strangulation, stroke, tumors, and neurological illness. Brain damage during intrauterine life and delivery can be caused by a variety of ways, including oxygen deprivation, physical trauma during labor and delivery, and infections in the mother's body. The resulting damage to the neonate's brain differs widely in severity and can lead to various disabilities and psychological issues. For decades scientists believed that a damaged brain cannot be repaired. However, cutting edge research shows that brain cells can regenerate, leading to brain repair. With its significant nootropic properties, *Centella* extract has been useful in accelerating the repairing of damaged neurons<sup>8</sup>, improving intelligence and enhancing cognitive values<sup>9</sup>, decrease in mitochondrial damage<sup>10</sup>. 'Nootropics' are those 'smart drugs' which primarily enhance brain's natural function by methods as - increasing brain's oxygen supply, increasing glucose utilization and stimulating nerve growth<sup>11</sup>. Studies report that *Centella asiatica* Linn. possesses significant antioxidant activity<sup>12</sup> and proven beneficial in reducing the effect of lead poisoning as lead has no biological function in human beings but affects the development of Central Nervous System<sup>13</sup>. Nevertheless, *Centella asiatica* Linn. is an imperative herb for boosting mental activity<sup>14</sup>.

### As a Memory Enhancer

Medicinally, the entire plant has been used in different formulations to treat various disorders, particularly those involving poor memory, intellect and anxiety since the prehistoric times. Bacosides, which are the dynamic elements of *Brahmi* are responsible for improving efficiency of transmission of signals along nerve fibers which in turn, fortifies memory and cognition<sup>15</sup>. Accounting to the multi-factorial nature of these illnesses, present day prescription based on psychoactive medications have met with constrained achievement. In this manner, there is a developing interest for novel items that could focus on numerous pathways and enhance the mental capacities either freely or in blend with regular medications<sup>5</sup>. *Centella asiatica* Linn. is appeared to be exceptionally valuable in enhancing learning and memory. It is likewise utilized as a brain tonic for promoting brain growth

and specifically, cerebrum development Research confirms that *Centella Asiatica* has neuroprotective properties and nootropic movement with helpful ramifications for patients with memory misfortune<sup>5</sup>. Findings indicate that *Centella asiatica* Linn. has the ability to repair damaged neurons<sup>16</sup> and stimulate the neuronal dendritic growth in neurodegeneration<sup>17</sup>

### Medicinal Benefits

In one of the studies, findings indicated that administration of *Centella asiatica* Linn. every day for two months reduced stress, attenuated anxiety, negated depression and enhanced adjustment and attention in patients. Therefore, *Centella asiatica* Linn. has potential action in the regulation of hypothalamopituitary-adrenocortical axis (HPA axis) especially, during stress related disorders, strengthening the opinion that *Centella asiatica* Linn. may be a safer alternative to Benzodiazepines for the therapy of stress related clinical disorders<sup>18</sup>. Another study concluded that regular use of *Brahmi* could be helpful as a supplement in treatment of neurological disorders caused by free radical damage. Free radicals or highly reactive oxygen species are formed by exogenous chemicals or endogenous metabolic processes in the human body. These are capable of oxidizing bio-molecules viz nucleic acids, proteins, lipids and DNA and can initiate different degenerative diseases like neurological disorders, cancer, emphysema, cirrhosis, atherosclerosis, arthritis etc. *Brahmi* (*Centella asiatica*) is rich in antioxidants which are compounds that terminate the attack of free radicals and thus reduce the risk of these disorders<sup>19</sup>. *Brahmi* dosage along with standard therapies is likely to improve cognition and social skills in Autistic Children<sup>20</sup>. *Centella asiatica* Linn. aids in antiepileptic activity by reducing motor activity<sup>21</sup>, restores level of growth stimulating hormone<sup>22</sup>, enhances neuronal dendrite in stress and memory disorder<sup>23</sup>. It has been used as a memory enhancing, strength promoting, immune booster, anti-anxiety, anti-epilepsy and anti-stress substance since ancient times<sup>24, 25</sup>. Clinically, *Centella asiatica* Linn. has been effective in treatment of mentally retarded children and anxiety neurosis<sup>26</sup>. This plant is also found to improve short-term memory and learning<sup>27</sup> and possesses a protective effect against oxidative damage caused by lead acetate induced neurotoxicity<sup>28</sup>. As concluded by various experimental studies, *Centella asiatica* Linn. has anti-ulcer, wound healing, neuro-protective and cardio-protective properties<sup>29</sup>. Its extract shows protective effects against cognitive deficits and oxidative stress which further results in improving memory retention<sup>30</sup>.

### Molecular pharmacology of Brahmi

*Brahmi* basically contains triterpene acids<sup>31</sup>, volatile and fatty acid that contains glycerides of palmitic, stearic, lingoceric oleic, linonic and linonic acids<sup>32</sup>, alkaloids<sup>33</sup>, Glycosides<sup>34</sup> and flavonoids which are isolated from the leaves of the *Brahmi* plants. The plant also contains amino acids, magnesium, sodium and potassium which have healing properties.

### Pharmacological studies of Brahmi

*Brahmi* is most useful medicinal plant, several research studies have suggested different biological activities. Some biological activities are as following.

#### Gastric ulcer healing

In case of gastric ulcer it prevents development of cold induced gastric ulcer which is formulated due to stress. It helps in enhancement of GABA level in the brain and generates

protective action against the stress induced ulcer due to its adaptogenic property. It also strengthens the mucosal barrier and reduces the damaging effects of free radicals<sup>35</sup>.

#### Wound healing

It helps in wound healing by producing triterpenoid fraction extracted from *Centella asiatica* Linn. which helps to increase the percentage of collagen in cell layer fibronectin and promotes wound healing<sup>36</sup>. Asiatic Acid is the extract of *Brahmi* leaves increases the peptidic hydroxyproline and helps in remodeling of collagen synthesis in wounds.

#### Memory enhancing

*Brahmi* plants have significant results on learning and memory enhancer. It helps to decrease the level of norepinephrine and dopamine in the brain that results increased cognitive ability<sup>37</sup>. It is most commonly used as a nervine tonic that enhances learning and academic performance, improves mental alertness, sharpens short-term and long-term memory and rectifies speech disorders, increase concentration and intellectual ability in children<sup>38</sup>

Aqueous extract of *Brahmi* decreased the pentylenetetrazole kindled seizure and show improvement in the learning<sup>39</sup>

#### Conclusion

*Centella asiatica* Linn. has justified its use as a panacea drug to treat a wide variety of health problems since time immemorial. Innumerable experimental and clinical investigations have demonstrated its significant role in enhancing memory and uplifting cognition, promoting brain repair, antiepileptic, anti-anxiety, wound healing, anti-stress activities. Clinical trials have proven its effectiveness in supporting treatment for autism and mental retardation. It is most commonly used as a nervine tonic that enhances learning and academic performance, improves mental alertness, sharpens short-term and long-term memory and rectifies speech disorders, increase concentration and intellectual ability in children.

#### Future Prospects

Literature till date is beneficial for multiple useful clinical effects of *Centella asiatica* Linn., specifically in the area of cognitive deficit. However, more double blind randomized clinical trials are required for understanding the drug's mechanism for ameliorating CNS related conditions and investigate its immunomodulatory, antidepressive, brain repair and antioxidant properties that have been demonstrated experimentally in animals.

#### References

1. Colleen Carkeet, Kerry Grann, R. Keith Randolph, Dawna Salter Venzon, Samantha Izzy, Phytochemicals: Health Promotion and Therapeutic Potential, CRC Press, 20-Sep-2012, PP.214
2. C. P. Khare, Ayurvedic Pharmacopoeial Plant Drugs: Expanded Therapeutics, CRC Press, 05-Nov-2015, pp.89
3. Ali, Sayed Safiuddin, 2010. Unani Advia-e-Mufreda, 4th ed. Qaumi Council Bara-e-Farogh Urdu Zaban, New Delhi, p.74-75
4. Fallah-Hoseini H, Fakhrzadeh H, Larijani B, Shikhsamani A. Review of anti-diabetic medicinal plant used in traditional medicine. *J Med Plant* 2006;5:1-8.

5. G.K.,S., Muralidhara and M.S. Bharath, M. (2011).Exploring the Role of "Brahmi" (Bocopa monnieri and Centella asiatica) in Brain Function and Therapy.Recent Patents on Endocrine, Metabolic & Immune Drug Discovery, 5(1), pp.33-49.
6. Mestry M., Dr. Bajaj A., Rane M., Lalan K., (2016). Herbal CNS Stimulants. *International Journal of Herbal Medicine*(2016), 4(6), 109-116.
7. Gohil, Kashmira J., Jagruti A. Patel, and Anuradha K. Gajjar. "Pharmacological Review on *Centella Asiatica*: A Potential Herbal Cure-All." *Indian Journal of Pharmaceutical Sciences* 72.5 (2010): 546-556. PMC. Web. 7 Oct. 2017.
8. Gohil, K., Patel, J. and Gajjar, A. (2010). Pharmacological review on *Centella asiatica*: A potential herbal cure-all. *Indian Journal of Pharmaceutical Sciences*, 72(5), p.546.
9. Soumyanath, A.,Zhong, Y., Yu, X., Bourdette, D., Koop, D., Gold, S. and Gold, B. (2005). *Centella asiatica* accelerates nerve regeneration upon oral administration and contains multiple active fractions increasing neurite elongation in-vitro. *Journal of Pharmacy and Pharmacology*, 57(9), pp.1221-1229.
10. Veenrendra Kumar M.H, Gupta Y.K (2002). Effect of different extracts of *Centella asiatica* on cognition and markers of oxidative stress in rats. *Journal of Ethnopharmacology*, 79, 253-60.
11. Gnanapragasam A, Yogeeta S, Subhashini R, Ebenezar KK, Sathish V, Devaki T (2007) Adriamycin induced myocardial failure in rats: Protective role of *Centella asiatica*. *Molecular and Cellular Biochemistry* 294: 55-63.
12. Caroline Rae, Richard B. Scoot *et al.*, Brain Bioenergetics and cognitive ability. *Dev. Neurosci.* 2003, 25: 324- 331
13. Heong S. Ariffin F, Kaur B, Karim AA, Huda N (2011) Antioxidant capacity and phenolic composition of fermented *Centella asiatica* herbal teas. *Journal of the Science of Food and Agriculture* 91: 2731-2739.
14. Saxena G and Flora SJS (2006) Changes in brain biogenic amines and haem biosynthesis and their response to combined administration of succimers and *Centella asiatica* in lead poisoned rats. *Journal of Pharmacology and Pharmacotherapeutics*, 58: 547-559.
15. Lal, R., Gupta, P. and Dubey, B. (2017). Genetic variability and associations in the accessions of Mandukarni {*Centella asiatica* (L)}. *Industrial Crops and Products*, 96, pp.173-177.
16. Deo,K.Y. & Reddy, KRC.(2013). Critical review on pharmacological properties of Brahmi. *International Journal of Ayurvedic Medicine*, 4(2), 92-99
17. Jew S, Yoo SH. Structure-activity relationship study of Asiatic acid derivatives against beta amyloid-induced neurotoxicity. *Bioorg Med Chem Lett* 2000; 10: 119-21.
18. Jana, U., Sur, T., Maity, L., Debnath, P. and Bhattacharyya, D. (2017). A clinical study on the management of generalized anxiety disorder with *Centella asiatica*. *Nepal Med Coll J* 2010, 12(1), pp.8-11.
19. Meena, H., Pandey, H., Pandey, P., Arya, M. and Ahmed, Z. (2012). Evaluation of antioxidant activity of two important memory enhancing medicinal plants *Bacopa Monnieri* and *Centella Asiatica*. *Indian Journal of Pharmacology*, 44(1), p.114.
20. Mukherjee A. *et al.*, Studies of Brahmi based Unani compound formulation on Autism to assess its efficacy. *International Journal of Ayurveda and Pharma Research*. 2017; 5(5):62-64
21. Khare, CP., Geriatric Tone, Introductory note on intellect promoting herbs, Indian herbal therapies, Vishv Vijay Pvt. Ltd. 2000: 121-131
22. Kumar A, Dogra S, Prakash A: Neuroprotective effects of *Centella Asiatica* against intra cerebroventricular colchicines induced cognitive impairment and oxidative stress. *International J. Alzheimer's disease*. Vol.2009. Article ID – 972178
23. Rao *et al.*, *Centella Asiatica* (L.) leaf extract treated during the growth spurt period enhances hippocampal CA3 Neuronal dendritic arborization in rats. 2006, 3(3): 349-357.
24. Kartni T. Herbs, Spices and Medicinal Plants. In: Cracker LE, Simon JE, editors. Vol. 3. Arizona, USA: Oryx Press; 1998. pp. 145-73.
25. Chen Y, Han T, Qin L, Rui Y, Zheng H. Effect of total triterpenes from *Centella asiatica* on the depression behavior and concentration of amino acid in forced swimming mice. *Zhong Yao Cai*. 2003;26:870-3.
26. Appa Rao MV, Srinivasan K, Rao K. The effect of Mandukaparni on the general mental ability of mentally retarded children. *J Res Indian Med*. 1978;8:9-16.
27. Rao Mohandas KG, Rao Muddanna S, Rao Gurumadhva S. Treatment with *Centellaasiatica* (L) fresh leaf extract enhances learning ability and memory retention power in rats. *Neuroscience*. 2007; 12:236-41.
28. Ponnusamy K, Mohan M, Nagaraja HS. Protective antioxidant effect of *Centella asiatica* bioflavonoids on lead acetate induced neurotoxicity. *Med J Malaysia*. 2008;63:102.
29. Dora B. & Khatri J., (2011). *Centella Asiatica*: The Elixir Of Life. *International Journal of Research in Ayurveda and Pharmacy* (2011), 2(2), 431-438.
30. Kumar MHV *et al.*, Effect of *Centella asiatica* on cognition and oxidative stress in an intracerebroventricular streptozotocin model of Alzheimer's disease in rats, *Clinical and Experimental Pharmacology and Physiology*, 2003; 30:336-342.
31. The wealth of India : A dictionary of indian raw material and industry product –Raw material series, Publication and information directorate, CSIR, New Delhi, *Rev Ser*, 1992 , vol.3 (ca-ci), pp. 428-430.
32. Schaneberg BT, Mikell JR, Bedir E and Khan IA, An improved HPLC method for qualitative determination of six triterpenes in *centella asiatica* extract and commercial products. *Pharmazie*, 2003, 58(6), 381-384.
33. Chopra RN, Nayar SL and Chopra IC, Glossary of Indian Medicinal Plants, council for Scientific and industrial research New Delhi, 1956, pp.58.
34. Rastogi RP and Mehrotra BN, compendium of indian medicinal plants central drug institute lucknow and publication and informationa directorate CSIR, new delhi, Indian, 1993, vol.3(1980-1984), pp.59.
35. Cheng CL and Koo MW, effect of *centella asiatica* on ethanol induced gastric mucosal lesions in rats. *Life sci*, 2000, 67 (21), 2647-2653.
36. Tenni R. Zanabani G. Cetta G. Effect of the tripenoid fraction of *centella asiatica* on macromolecules of the connective matric in human skin fibroblast culture, *Ital ,J, Biochem*, 1988 37 (2), 69-77.

37. Nalini K, Aroor AR, effect of centella asiatica fresh leaf aqueous extract on learning and memory and biogenic amine turnover in albino rats, *Fitoterapia*, 1992, 63, 232-237.
38. Hashmidawakhana.co.in. (2017). Brahmi Buti, Manduki, Indian Pennywort, Kharbrahmi Unani Medicine | Herbal Products | Natural Treatment. [online] Available at: <http://www.hashmidawakhana.co.in/centella-asiatica-linn.html> [Accessed 13 Sep. 2017].
39. Gupta YK, Veerendra Kumar MH, Srivastava AK, Effect of Centella asiatica on pentylentetrazole-induced kindling, cognition and oxidative stress in rats, *Pharmacol Biochem Behav.* 2003 Feb;74(3):579-85.

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