International Journal of Pharmacognosy and Pharmaceutical Research

ISSN Print: 2664-7168
ISSN Online: 2664-7176
Impact Factor: RJIF 8.2
IJPPR 2026; 8(1): 01-06
www.pharmacognosyjournals.com
Received: 02-11-2025
Accepted: 04-12-2025

Jalpa Kotecha
Assistant Professor, Shree M. P. Shah Arts and Science College, Surendranagar, Gujarat, India

Corresponding Author:
Jalpa Kotecha
Assistant Professor, Shree M. P. Shah Arts and Science College, Surendranagar, Gujarat, India

Herbal adaptogens in stress management: A comparative study of mandukparni (*Centella asiatica*) and Brahmi (*Bacopa monnieri*)

Jalpa Kotecha

DOI: https://www.doi.org/10.33545/26647168.2026.v8.i1a.137

Abstract
A crucial part of maintaining overall wellness is stress management, especially considering the relentless pace of modern lifestyles. Because of their ability to reduce stress, adaptogenic herbs like Brahmi (*Bacopa monnieri*) and Mandukparni (*Centella asiatica*) have long been used in ancient healthcare practices like Ayurveda. This review explores the traditional use, pharmacological mechanisms, chemical composition, clinical effectiveness, and possible synergistic benefits of these two herbs in stress management. *Centella asiatica* has strong anti-inflammatory, antioxidant, and neuroprotective qualities. It is well-known for its active ingredients, asiaticoside and madecassoside. These help it to improve cognitive abilities, lower cortisol levels, and control the hypothalamic-pituitary-adrenal (HPA) axis. Clinical research supports its effectiveness in lowering anxiety and enhancing memory. Likewise, *Bacopa monnieri*, which has bacosides A and B, has neuroprotective, anti-inflammatory, and antioxidant properties. It affects the amounts of neurotransmitters, especially dopamine and serotonin, which lowers anxiety and elevates mood. Its benefits in reducing stress and improving cognitive function have been reported. The ability of both herbs to influence neurotransmitter systems, improve synaptic plasticity, and offer neuroprotection seems promising. When combined, their complimentary systems may have synergistic advantages that give a comprehensive approach to stress treatment. In order to fully investigate the clinical advantages of Mandukparni and Brahmi and to optimise their combined usage, more study is needed, since this work highlights their therapeutic potential in reducing stress.

Keywords: Mandukparni, Brahmi, neurotransmitters, stress resilience, anxiety reduction, cognitive functions

Introduction
Stress is an unavoidable part of modern life, impacting both physical and mental health. Stress-related medical conditions are on the rise due to the stresses and expectations of modern living. Adaptogens, natural compounds that help the body adjust to stress and preserve homeostasis, have received attention for their potential therapeutic benefits (1). Mandukparni (*Centella asiatica*) and Brahmi (*Bacopa monnieri*) are two well-known herbal adaptogens utilised in ancient medical systems such as Ayurveda (2). This thorough study will examine the antistress properties of these two herbs, looking at their chemical composition, pharmacological processes, clinical effectiveness, and potential synergistic effects [3, 4].

2. History and Traditional Applications of Mandukparni (*Centella asiatica*) and Brahmi (*Bacopa monnieri*)
Mandukparni (*Centella asiatica*), also referred to as Gotu Kola, is an essential component of traditional Indian, Chinese, Indonesian, and Ayurvedic medicine. It is a small herbaceous plant, that belons to the Apiaceae family (Figure 1) [5]. It has been used in the past to boost memory, reduce anxiety, and improve cognitive processes [6]. It is regarded as a potent brain tonic in Ayurveda and is frequently recommended for longevity and mental clarity [7].
Bacopa monnieri commonly known as Brahmi or herb of grace, has long been used in Ayurvedic treatment. It is named after the Hindu deity Brahma. *Bacopa monnieri* is a perennial creeping herb that is a member of the Plantaginaceae family (Figure 2) [8, 9]. Its

natural habitats include the wetlands of North and South America, Europe, Africa, Asia, and southern and eastern India. Its nootropic (cognitive-enhancing) and antianxiety effects are what make it most well-known [10]. Brahmi has been utilised for centuries as a remedy for a number of mental health issues, including anxiety and depression, as well as to enhance cognition, memory, and focus [11]. Brahmi is renowned for its ability to soothe and lessen tension and anxiety. In Ayurveda, it is regarded as a powerful "Medhya Rasayana" and is used to treat a variety of mental health issues, including as epilepsy, depression, and anxiety [12, 13].

Fig 1: *Centella asiatica*

Fig 2: *Bacopa monnieri*

3. Chemical composition

Mandukparni

The main active compounds of *Centella asiatica* are, triterpenoids that include asiaticoside, aadecassoside, asiatic acid, and madecassic acid. These components are well-known for having neuroprotective, antioxidant, and anti-inflammatory qualities [14, 15]. Flavonoids, tannins, phytosterols, and essential oils are some of the other ingredients that give *Centella asiatica* its medicinal properties as shown in Figure 3 [16, 17].

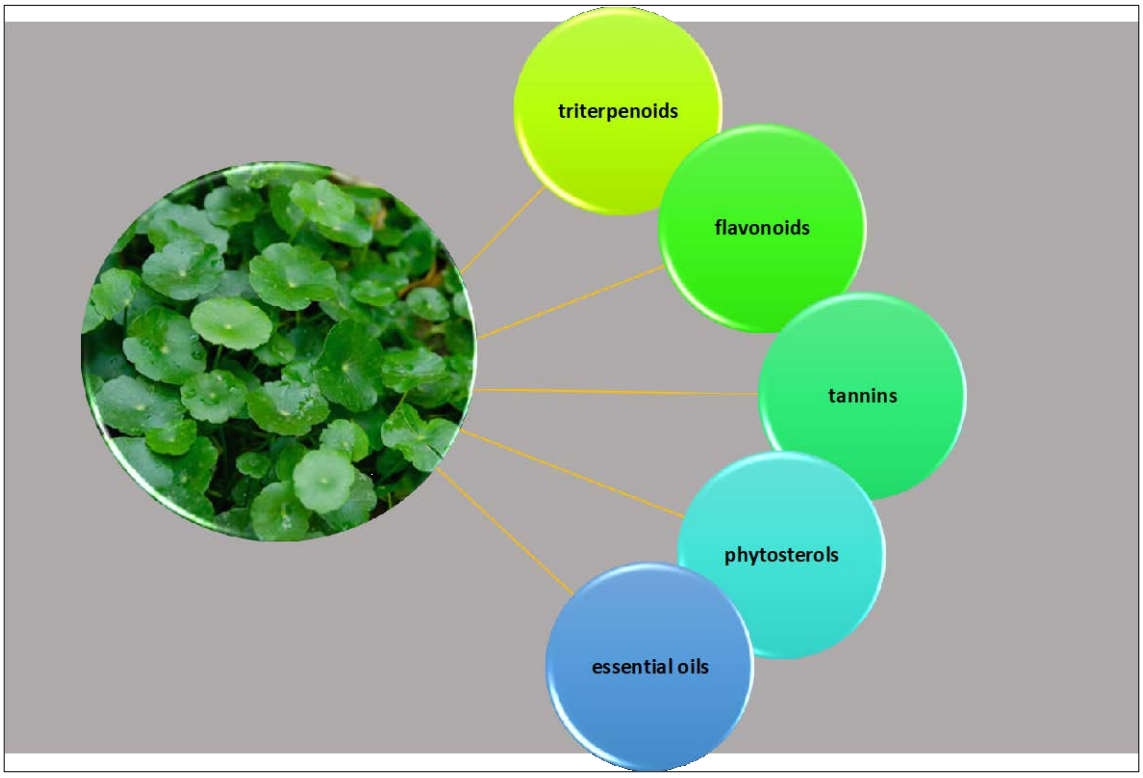

Fig 3: Chemical composition of *Centella asiatica*

Brahmi

Several bioactive substances are present in *Bacopa monnieri*, most notably the saponins referred to as bacosides A and B. *Bacopa monnieri*'s cognitive and antistress properties are mainly attributed to its abundance of saponins, including bacosides A and B [18]. Betulic acid, glycosides, alkaloids, and flavonoids are some of the other important components as shown in Figure 4 [19]. Together, these substances provide brahmi its anti-inflammatory, antioxidant, and neuroprotective properties [20, 21].

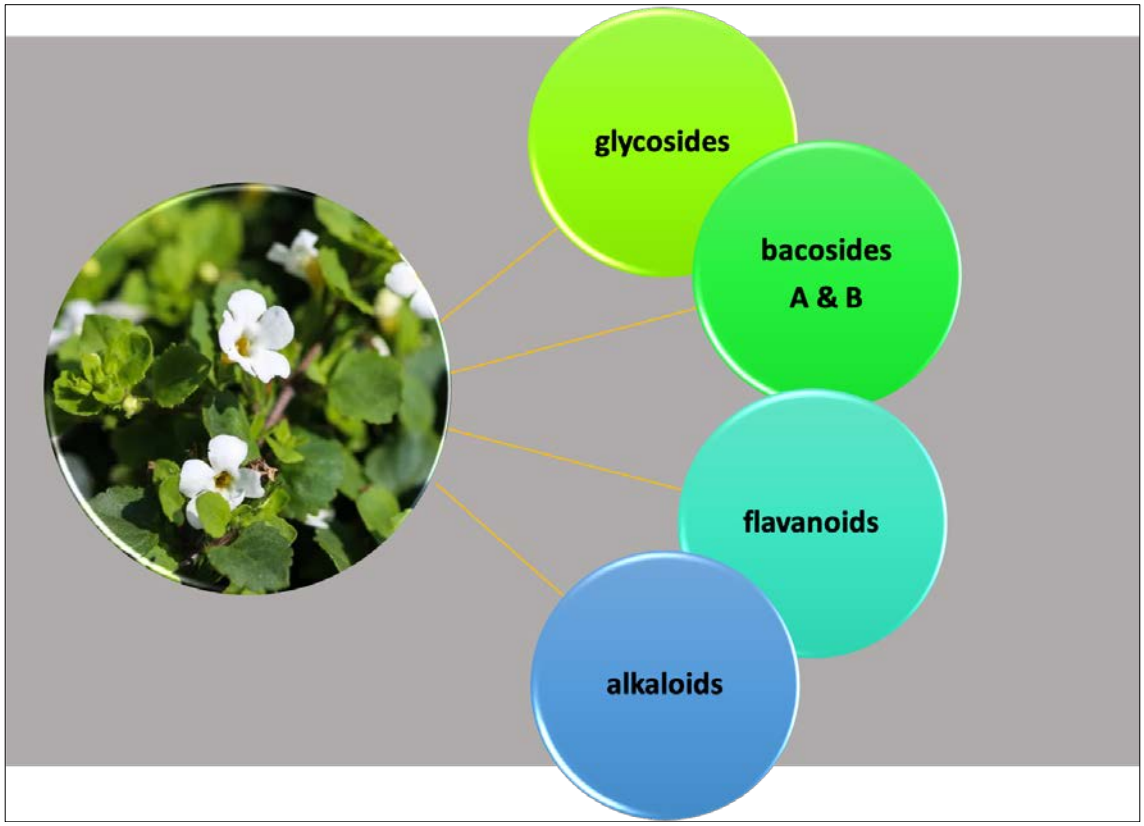

Fig 4: Chemical composition of *Bacopa monnieri*

4. Biochemical and Pharmacological Mechanisms of Action

Effects on Neurotransmitters

Mandukparni and Brahmi both have an impact on neurotransmitter systems, which are essential for managing stress. Neurotransmitter systems are influenced by both Brahmi and Mandukparni. Gamma-aminobutyric acid (GABA), a neurotransmitter that lowers neuronal excitability and promotes serenity and reduces anxiety, is increased in the body when *Centella asiatica* is consumed [22]. Dopamine and serotonin, two neurotransmitters involved in mood regulation, are modulated by *Bacopa monnieri* [4, 23]. Through the regulation of these neurotransmitters, these herbs aid in stress reduction and mood enhancement [24, 25].

Antioxidants and Anti-Inflammation Pathways

These herbs' anti-inflammatory and antioxidant qualities are essential to their ability to reduce stress. They shield the brain from stress-related damage by lowering oxidative stress and inflammation, promoting general mental health and stress-resilience [26, 27].

Improvement of Cognitive Capabilities

Chronic stress frequently results in cognitive deterioration. By increasing neural pathways and stimulating synaptic plasticity, both herbs improve cognitive abilities. Mandukparni increases neurotrophic factor production, which enhances cognitive function; Brahmi, on the other hand, protects and repairs neurons, which promotes memory and learning [28, 29].

5. Mechanisms of Antistress Activity

Making modifications to the HPA Axis

The hypothalamic-pituitary-adrenal (HPA) axis is a key stress response mechanism that is modulated by both Brahmi and Mandukparni. In times of stress, these herbs assist the body in maintaining homeostasis by controlling the release of stress hormones like cortisol.

- **Mandakparni:** Research has indicated that *Centella asiatica* lowers cortisol levels, which in turn reduces stress. Gamma-aminobutyric acid (GABA), an inhibitory neurotransmitter that promotes relaxation and lowers anxiety, is released more readily when this substance is released [30]
- **Brahmi:** *Bacopa monnieri* affects the neurotransmitter levels of dopamine and serotonin, which are important in mood control. Through the regulation of these neurotransmitters, Brahmi alleviates stress and improves mood [31].

Impacts on Neuroprotection

In order to effectively manage stress, these herbs' neuroprotective qualities are significant. Mood flaws, cognitive decline, and neurological impairment can result from prolonged stress.

- **Mandukparni:** Promotes neuron development and survival by upregulating the expression of neurotrophic factors such brain-derived neurotrophic factor (BDNF). Research has demonstrated that *Centella asiatica* might lessen anxiety and enhance cognitive abilities [32].
- **Brahmi:** Prevents inflammatory and oxidative damage to neurons. Bacosides found in brahmi improve memory and learning by promoting synaptic plasticity and facilitating the healing of injured neurons [33].

Antioxidant Activity

An important part of the pathophysiology of illnesses associated with stress is oxidative stress. Strong antioxidant properties are shown by both herbs, which scavenge free

radicals and increase the activity of antioxidant enzymes including catalase and superoxide dismutase (SOD).

- **Mandukparni:** Rich in flavonoids and triterpenoids with strong antioxidant properties. Research has indicated that *Centella asiatica* can enhance antioxidant defences and considerably lower oxidative stress indicators [34].
- **Brahmi:** *Bacopa monnieri*'s bacosides have potent antioxidant qualities. They assist in lowering lipid peroxidation and preventing oxidative damage to cellular membranes [35].

Reducing Inflammation

Prolonged stress can cause inflammation throughout the body, which can aggravate a number of physical and mental health conditions. Brahmi and mandukparni both have anti-inflammatory qualities that aid in the management of inflammation brought on by stress.

- **Mandukparni:** Inhibits inflammatory pathways and lowers pro-inflammatory cytokine levels. This anti-inflammatory impact serves in lowering the damaging effects that long-term stress has on the body [36]
- **Brahmi:** By reducing the synthesis of pro-inflammatory cytokines, this herb modulates the immune system and lowers inflammation. This function aids in preventing damage to the brain and other organs caused by stress [37, 38].

6. Comparison of Antistress Effectiveness

Centella asiatica and Brahmi monnieri's both have been well-researched and proven in several clinical trials to have antistress and cognitive-enhancing properties anti-stress and cognitive benefits [39, 40].

7. Clinical Research on Mandukparni

- **Anxiety Reduction and Cognitive Function Improvement:** An investigation that was published in the Journal of Ethnopharmacology discovered that extract from *Centella asiatica* considerably decreased anxiety and enhanced cognitive abilities in elderly individuals. The study demonstrated how the herb may improve cognition and lower stress levels [41, 42].
- **Neuroprotective and Antioxidant Effects:** *Centella asiatica* was shown to increase antioxidant defences and lower oxidative stress indicators in a different research done, emphasising the herb's potential for neuroprotection and stress management [43].

8. Clinical Research on Brahmi

- **Anxiety Reduction and Cognitive Performance Enhancement:** Brahmi considerably decreased anxiety and enhanced cognitive performance in individuals with generalised anxiety disorder (GAD), according to a placebo-controlled experiment conducted by Kean and group in 2022. Strong evidence for Brahmi's antistress effects was found in the study [44].
- **Memory Improvement and Stress Reduction:** Brahmi was shown to improve memory and lower stress indicators in healthy people in a different research performed by Abhishek and group. According to the study, Brahmi has the ability to enhance cognitive performance and lessen the negative effects of stress on the brain [45].

9. Combined Use and Synergistic Impacts

Brahmi and Mandukparni when used together may have synergistic effects on stress reduction. Their synergistic modes of action including neuroprotection, antioxidant, anti-inflammatory, and HPA axis modulation, can render a complete means of stress management and cognitive function enhancement [46]. To investigate the possible synergistic effects and ideal doses for combination usage, more study is required.

10. Effectiveness and Adverse Reactions

When used as directed, both mandukparni and brahmi are usually regarded as safe. They may, however, create adverse effects in certain people, just like any herbal medications. Headaches, allergic reactions, and gastrointestinal problems are common adverse effects [47, 48]. Before beginning any herbal regimen, it is essential to consult with healthcare professionals, particularly for people who are on other drugs or have pre-existing medical issues.

11. Conclusion

Brahmi (*Bacopa monnieri*) and mandukparni (*Centella asiatica*) are two strong adaptogenic herbs with notable antistress qualities. They are useful for stress management and cognitive function enhancement because of their capacity to modify the HPA axis, improve neuroprotection, lower oxidative stress, and reduce inflammation. Even though both herbs exhibit beneficial effects when used alone, using them together could have more advantages. Standardised doses should be established for maximum safety and efficacy, and future research should concentrate on investigating these synergistic effects.

References

1. Panossian A. Understanding adaptogenic activity: specificity of the pharmacological action of adaptogens and other phytochemicals. Ann N Y Acad Sci. 2017;1401:49-64.
2. Perry NL, Camfield DA. Adaptogens. In: Evidence-based herbal and nutritional treatments for anxiety in psychiatric disorders. Cham: Springer International Publishing; 2016. p. 33-55.
3. Raj AG, Uppinakudru S, Narasimha Rao P. Nutraceuticals and functional foods in Ayurvedic perspective. 2016. p. 172-199.
4. Alsenani F. Unraveling potential neuroprotective mechanisms of herbal medicine for Alzheimer's diseases through comprehensive molecular docking analyses. Saudi J Biol Sci. 2024;31(6):103998.
5. Jantwal A, Durgapal S, Upadhyay J, Rana M, Tariq M, Dhariwal A, *et al*. *Centella asiatica*. In: Naturally occurring chemicals against Alzheimer's disease. 2021. p. 257-269.
6. Gohil KJ, Patel JA, Gajjar AK. Pharmacological review on *Centella asiatica*: a potential herbal cure-all. Indian J Pharm Sci. 2010;72(5):546.
7. Sabaragamuwa R, Perera CO, Fedrizzi B. *Centella asiatica* (Gotu kola) as a neuroprotectant and its potential role in healthy ageing. Trends Food Sci Technol. 2018;79:88-97.
8. Lansdown RV, Knees SG, Patzelt A. *Bacopa monnieri*, water hyssop. IUCN Red List Threatened Species. 2013:eT164168A17722668.

9. Joshi T, Gupta A, Kumar P, Singh A, Kumar A. *Bacopa monnieri* (Brahmi). In: Naturally occurring chemicals against Alzheimer's disease. 2021. p. 243-256.
10. Abdul Manap AS, Vijayabalan S, Madhavan P, Chia YY, Arya A, Wong EH, *et al*. *Bacopa monnieri*, a neuroprotective lead in Alzheimer disease: a review on its properties, mechanisms of action, and preclinical and clinical studies. Drug Target Insights. 2019;13:1-14.
11. Banerjee S, Anand U, Ghosh S, Ray D, Ray P, Nandy S, *et al*. Bacosides from *Bacopa monnieri* extract: an overview of the effects on neurological disorders. Phytother Res. 2021;35:5668-5679.
12. Santos AF, Souza MMQ, Pauli KB, da Silva GR, Marques MW, Auth PA, *et al*. *Bacopa monnieri*: historical aspects to promising pharmacological actions for the treatment of central nervous system diseases. Bol Latinoam Caribe Plant Med Aromat. 2022;21:131-155.
13. Pattnaik P, Panda C, Minocha T, Yadav SK, Dwivedi N, Singh SK. *Bacopa monnieri* and neural health: an Indian herb. In: Traditional medicine for neuronal health. 2023;17:160-176.
14. Wright KM, McFerrin J, Alcázar Magaña A, Roberts J, Caruso M, Kretzschmar D, *et al*. Developing a rational, optimized product of *Centella asiatica* for examination in clinical trials: real-world challenges. Front Nutr. 2022;8:1-12.
15. Butterfield DA, Wright KM, Bollen M, David J, Speers AB, Brandes MS, *et al*. Pharmacokinetics and pharmacodynamics of key components of a standardized *Centella asiatica* product in cognitively impaired older adults: a phase 1, double-blind, randomized clinical trial. Antioxidants. 2022;11(2):215.
16. Gray NE, Alcázar Magaña A, Lak P, Wright KM, Quinn J, Stevens JF, *et al*. *Centella asiatica*: phytochemistry and mechanisms of neuroprotection and cognitive enhancement. Phytochem Rev. 2018;17:161-194.
17. Srivastava R, Shukla YN, Kumar S. Chemistry and pharmacology of *Centella asiatica*: a review. Plant Sci. 1997;1049-1056.
18. Parveen R, Shamsi TN, Kumar H, Fatima S. Phytochemical analysis and in vitro biological characterization of aqueous and methanolic extract of *Bacopa monnieri*. Int J Pharm Pharm Sci. 2016;8(12):90-96.
19. Bhandari P, Sendri N, Devidas SB. Dammarane triterpenoid glycosides in *Bacopa monnieri*: a review on chemical diversity and bioactivity. Phytochemistry. 2020;172:112276.
20. Channa S, Dar A, Anjum S, Yaqoob M, Atta-ur-Rahman. Anti-inflammatory activity of *Bacopa monnieri* in rodents. J Ethnopharmacol. 2006;104(1-2):286-289.
21. Fatima U, Roy S, Ahmad S, Al-Keridis LA, Alshammari N, Adnan M, *et al*. Investigating neuroprotective roles of *Bacopa monnieri* extracts: mechanistic insights and therapeutic implications. Biomed Pharmacother. 2022;153:113469.
22. Sun B, Wu L, Wu Y, Zhang C, Qin L, Hayashi M, *et al*. Therapeutic potential of *Centella asiatica* and its triterpenes: a review. Front Pharmacol. 2020;11:568.
23. Khasanov AR, Matveeva NA, Gruzd AA. The development of a functional adaptogenic beverage using plant extracts of *Centella asiatica* and *Hoodia gordonii*. IOP Conf Ser Earth Environ Sci. 2021;666:012045.
24. Tan SC, Bhattamisra SK, Chellappan DK, Candasamy M. Actions and therapeutic potential of madecassoside and other major constituents of *Centella asiatica*: a review. Appl Sci. 2021;11:847.
25. Shalini VT, Neelakanta SJ, Sriranjini JS. Neuroprotection with *Bacopa monnieri*: a review of experimental evidence. Mol Biol Rep. 2021;48:2653-2668.
26. Wanasuntronwong A, Tantisira MH, Tantisira B, Watanabe H. Anxiolytic effects of standardized extract of *Centella asiatica* (ECa 233) after chronic immobilization stress in mice. J Ethnopharmacol. 2012;143(2):579-585.
27. Vishnupriya P, Padma V. A review on the antioxidant and therapeutic potential of *Bacopa monnieri*. Reactive Oxygen Species. 2017;3:1-10.
28. Ahuja M, Patel M, Majrashi M, Mulabagal V, Dhanasekaran M. *Centella asiatica*, an Ayurvedic medicinal plant, prevents the major neurodegenerative and neurotoxic mechanisms associated with cognitive impairment. In: Medicinal plants and fungi: recent advances in research and development. 2017. p. 3-48.
29. Sukumaran NP, Amalraj A, Gopi S. Neuropharmacological and cognitive effects of *Bacopa monnieri* (L.) Wettst.: a review on its mechanistic aspects. Complement Ther Med. 2019;44:68-82.
30. Scatton B, Bartholini G. Gamma-aminobutyric acid receptor stimulation. IV: Effect of progabide (SL 76002) and other GABAergic agents on acetylcholine turnover in rat brain areas. J Pharmacol Exp Ther. 1982;220(3):689-695.
31. Simpson T, Pase M, Stough C. *Bacopa monnieri* as an antioxidant therapy to reduce oxidative stress in the aging brain. Evid Based Complement Alternat Med. 2015;2015:1-9.
32. Gofir A, Wibowo S, Hakimi M. Potential neurological applications of *Centella asiatica*: a brief review. Indones J Pharm Ther. 2021;2(3):55-61.
33. Valotto Neto LJ, Reverete de Araujo M, Moretti Junior RC, Mendes Machado N, Joshi RK, dos Santos Buglio D, *et al*. Investigating the neuroprotective and cognitive-enhancing effects of *Bacopa monnieri*: a systematic review focused on inflammation, oxidative stress, mitochondrial dysfunction, and apoptosis. Antioxidants. 2024;13(4):393.
34. Abbas S, Shafie NS, Ghazali MI, Abidin NAZ, Mustafa MK, Kormin F. A review of antioxidant and anti-acetylcholinesterase activities of *Centella asiatica* (L.) Urb. for the treatment of Alzheimer's disease. Food Res. 2020;4:1-11.
35. Subashri B, Justin Y, Pillai K. A comparative study of antioxidant activity of *Bacopa monnieri* (L.) Pennell using various solvent extracts and its GC-MS analysis. Int J Pharm Pharm Sci. 2014;6:456-462.
36. Abdullah N, Mazlan M. Comparative antioxidant and anti-inflammatory activity of different extracts of *Centella asiatica* (L.) Urban and its active compounds, asiaticoside and madecassoside. Med Health. 2012;7(2):62-72.
37. Dinh TPA, Thuy LT, Thuy My NT, Nguyen VT, Tram LH, Nguyen TA, *et al*. Phenyl glycosides from *Bacopa*

monnieri with their antioxidant and anti-inflammatory activities. Nat Prod Res. 2023;37:1-6.
38. Garai S, Mahato SB, Ohtani K, Yamasaki K. Dammarane-type triterpenoid saponins from *Bacopa monnieri*. Phytochemistry. 1996;42(3):815-820.
39. Husain GM, Mishra D, Singh PN, Rao CV, Kumar V. Ethnopharmacological review of native traditional medicinal plants for brain disorders. Pharmacogn Rev. 2007;1:20-28.
40. Vyas S, Kothari SL, Kachhwaha S. Nootropic medicinal plants: therapeutic alternatives for Alzheimer's disease. J Herb Med. 2019;17-18:100291.
41. Wattanathorn J, Mator L, Muchimapura S, Tongun T, Pasuriwong O, Piyawatkul N, *et al*. Positive modulation of cognition and mood in healthy elderly volunteers following the administration of *Centella asiatica*. J Ethnopharmacol. 2008;116(2):325-332.
42. Gupta R, Flora SJS. Effect of *Centella asiatica* on arsenic-induced oxidative stress and metal distribution in rats. J Appl Toxicol. 2006;26(3):213-222.
43. Tiwari S, Singh S, Patwardhan K, Gehlot S, Gambhir IS. Effect of *Centella asiatica* on mild cognitive impairment and other common age-related clinical problems. Dig J Nanomater Biostruct. 2008;3(4):215-220.
44. Kean JD, Downey LA, Sarris J, Kaufman J, Zangara A, Stough C. Effects of *Bacopa monnieri* (CDRI 08®) in males exhibiting inattention and hyperactivity aged 6-14 years: a randomized, double-blind, placebo-controlled trial. Phytother Res. 2022;36(2):996-1012.
45. Abhishek M, Rubal S, Rohit K, Rupa J, Phulen S, Gurjeet K, *et al*. Neuroprotective effect of the standardized extract of *Bacopa monnieri* (BacoMind) in a valproic acid model of autism spectrum disorder in rats. J Ethnopharmacol. 2022;293:115199.
46. Puttarak P, Dilokthornsakul P, Saokaew S, Dhippayom T, Kongkaew C, Sruamsiri R, *et al*. Effects of *Centella asiatica* (L.) Urb. on cognitive function and mood-related outcomes: a systematic review and meta-analysis. Sci Rep. 2017;7:10646.
47. Jorge OA, Jorge AD. Hepatotoxicity associated with the ingestion of *Centella asiatica*. Rev Esp Enferm Dig. 2005;97(2):115-124.
48. Brimson JM, Brimson S, Prasanth MI, Thitilertdecha P, Malar DS, Tencomnao T. The effectiveness of *Bacopa monnieri* (Linn.) Wettst. as a nootropic, neuroprotective, or antidepressant supplement: analysis of the available clinical data. Sci Rep. 2021;11:596.