



Received on 27 August 2022; received in revised form, 01 November 2022; accepted 18 November 2022; published 01 June 2023

A SYSTEMATIC REVIEW ON THE SCAVENGING AND ELUCIDATING EFFICACY OF *BACOPA MONNIERI* AS A THYROID STIMULANT

Surbhi Chourasiya and Payal Mahobiya *

Endocrinology Lab, Department of Zoology, School of Biological Sciences, Dr. Harisingh Gour Vishwavidyalaya Sagar - 470003, Madhya Pradesh India.

Keywords:

Bacopa monnieri, Ayurveda, Thyroid stimulants, Oxidative stress, Brahmi

Correspondence to Author:

Dr. Payal Mahobiya

Assistant Professor,
Department of Zoology,
Dr. Harisingh Gour Vishwavidyalaya
Sagar - 470003, Madhya Pradesh, India.

E-mail: 1607payal@gmail.com

ABSTRACT: In Indian and Chinese medicine, the herb *Bacopa monnieri*, (Neer Brahmi) has long been used to treat a wide range of illnesses. Brahmi offers a wide range of pharmacological advantages, including improving memory in the treatment of schizophrenia and Alzheimer's disease. The effectiveness of Brahmi in scavenging and illuminating as well as comprehensive analyses based on its pharmacological effects on the thyroid are the focus of the current review. Up until April 2022, PubMed, Scopus, and Google Scholar were searched to find information about the effectiveness of *Bacopa monnieri* in treating thyroid disorders. The review's conclusions provide an overview of the information gathered over the preceding five years from various platforms and database libraries. For all calculated data, a number of outcomes were combined into verified constructs to enable direct comparisons. Four papers satisfied the criteria for inclusion in this review. This extensive study provided a summary of *Bacopa monnieri's* effectiveness in scavenging free radicals and deciphering thyroid disorders. It's time to move on to other prevalent problems because a recent research on Brahmi's efficacy in treating neurological conditions has generated considerable interest. In order to address thyroid hormone dysregulation and oxidative stress brought on by specific environmental stimuli, the focus of this review is on the safe application of *Bacopa monnieri* as a thyroid therapy. However, reproducible trial designs and rigorous statistical analysis are crucial for validating the efficacy of *Bacopa monnieri* in future therapies for thyroid hormone dysregulation and oxidative stress in the body.

INTRODUCTION: Medicinal plants have played an essential role in preventing and controlling ailments in human society from the dawn of humanity. According to the World Health Organization, herbal medicines help over 80% of the world's population, notably millions living in rural parts of poor nations. *Bacopa monnieri* is a medicinal plant in the Scrophulariaceae family that has been used in traditional medicine to treat a variety of neurological diseases as well as to

improve memory and cognition. Neer Brahmi is the local name for this medicinal plant ¹. *Bacopa monnieri* is a creeping perennial herb that grows in wetlands and muddy beaches. The leaves are succulent, thick, oblanceolate, and oppositely placed on the stalk. It can be found in moist marshy and damp areas all over India. It can also be found in Nepal, Sri Lanka, China, Taiwan, Vietnam, and a few southern states in the United States ².

Bacopa monnieri extract contains bacosides, which are B triterpenoid saponins. Bacosides are a group of 12 analogs that have been identified. Bacosides I–XII are new saponins that have just been discovered. Along with D-mannitol, apigenin, hersaponin, monnierasides I–III, cucurbitacins and plantain side B, the alkaloids brahmin, nicotine, and herpes time have been cataloged. Alkaloids,

<p>QUICK RESPONSE CODE</p> 	<p>DOI: 10.13040/IJPSR.0975-8232.14(6).2645-50</p> <hr/> <p>This article can be accessed online on www.ijpsr.com</p> <hr/> <p>DOI link: http://doi.org/10.13040/IJPSR.0975-8232.14(6).2645-50</p>
---	---

saponins, and sterols are compounds responsible for Bacopa's pharmacological actions. Over 40 years ago, India identified many active ingredients, including the alkaloids Brahmin and her pastime, saponins d-mannitol and hersaponin, acid A and monnier. Betulin, stigmasterol, beta-sitosterol, and a variety of bacosides and bacopa saponins have all been discovered as active constituents³.

The therapeutic characteristics of *Bacopa monnieri* have emphasized the importance of using the plant to treat a variety of illnesses. *Bacopa monnieri's* unique properties have led to its usage in Ayurvedic formulations and traditional medicine, either alone or in combination with other therapeutic plants. The synergistic effects of several herbs may also aid in the speedier treatment of certain disorders. Hypothyroidism is a state of hormone deficit that is caused by intrinsic dysfunction of the thyroid gland. This dysfunction impairs the synthesis and production of T4 and T3 hormones in the body, leading to hypothyroidism. Hypothyroidism, which affects five percent of the general population, is one of the endocrine diseases that are most prevalent. There is a possibility that up to 15 percent of older persons have a mild form of hypothyroidism⁴.

Women are more likely to be affected than males. According to a survey carried out by the Indian thyroid society, one in every ten persons in India has hypothyroidism. According to the survey findings, hypothyroidism is three times more common in women than in males, particularly among people aged 46 to 54 years old. A significant section of the patient population may go undiagnosed and untreated, even though the condition will continue to hurt the daily quality of life, work performance and economic output⁵. The herb Brahmi (*Bacopa monnieri*) is used to treat depression, anxiety and chronic stress⁶. Much of the research looked at the effects of this medication combination in hypothyroidism. But no studies should be done on toxicological thyroid dysfunction due to environmental factors like pesticide toxicity²³. Most pharmacological investigations have demonstrated that these herbal medicines can stimulate the thyroid gland to generate more T4 hormones⁷⁻⁹. Ayurvedic scriptures mention *Bacopa monnieri's* usage in additional pathophysiological diseases besides

neuroprotection. Antidepressant activity¹⁰, anticancer impact¹¹, anti-inflammatory¹², antistress action¹³, bronchodilatory effect¹⁴ and endocrine effect⁷, effect all assessed by researchers. Several investigations have shown that *B. monnieri* has therapeutic promise in a variety of diseases¹⁵. Pretreatment with extracts of *B. monnieri* and bacoside reduced toxicity in animal models of diabetes, ischemia, aluminum toxicity and cigarette smoking-induced toxicity. Reduced lipid peroxidation and increased the activity of antioxidant enzymes²⁴.

MATERIALS AND METHODS: To evaluate the effectiveness of *Bacopa monnieri* as a treatment for thyroid problems, searches were conducted in PubMed, Scopus, and Google Scholar between April (2018-2022) **Fig. 1**. This review was carried out over five years. The conclusions of this study are a summary of the data obtained over the last five years from various platforms and database libraries. To make it easier to do direct comparisons, several results have been gathered into validated constructs, and their values have been determined for all of the calculated data.



FIG. 1: BACOPA MONNIERI PLANT

For data retrieval keywords like "*Bacopa monnieri* thyroid" and "Thyroid stimulant *Bacopa monnieri*" are searched. Relevant articles' reference lists were also checked for trials with a comparable design. Extensive research was conducted on the effectiveness of the extracts, and any safety and tolerability information or data was compiled. The websites offering extracts containing *Bacopa monnieri* were investigated to see which studies satisfying the inclusion criteria of this study were provided as proof of *Bacopa monnieri's* efficacy. The following inclusion criteria were used in **Fig. 2 & 3**.

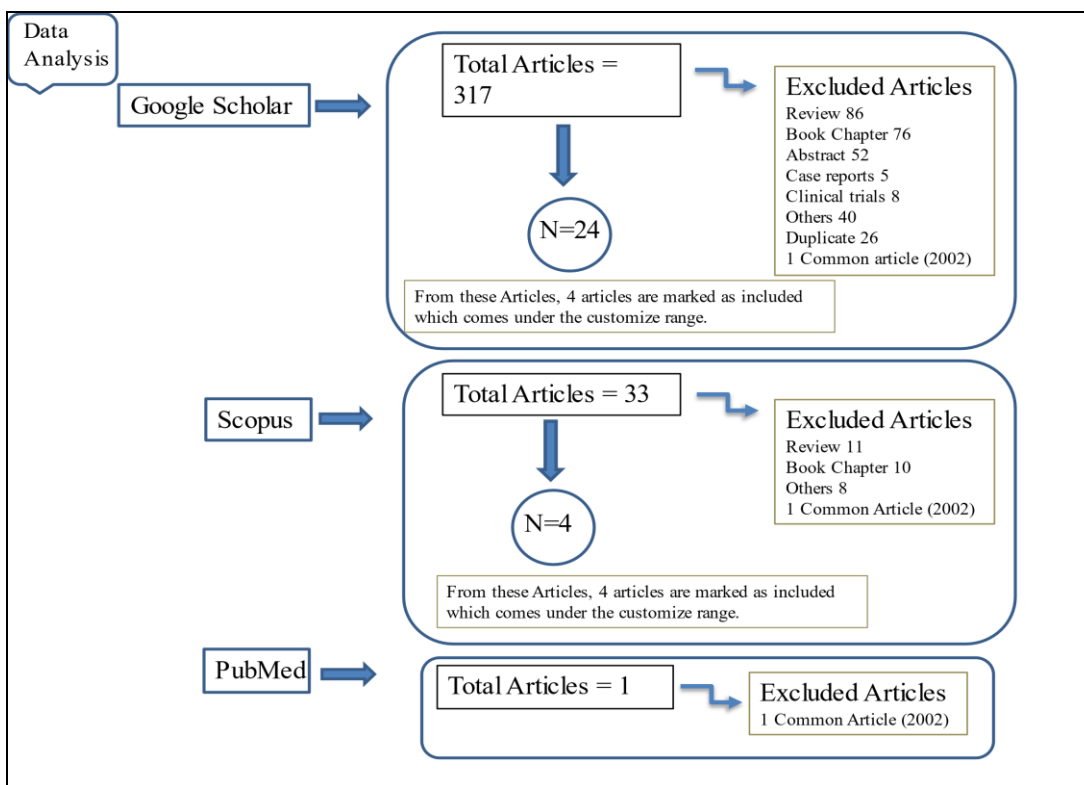


FIG. 2: ARTICLES ANALYSIS FROM DIFFERENT DATABASES

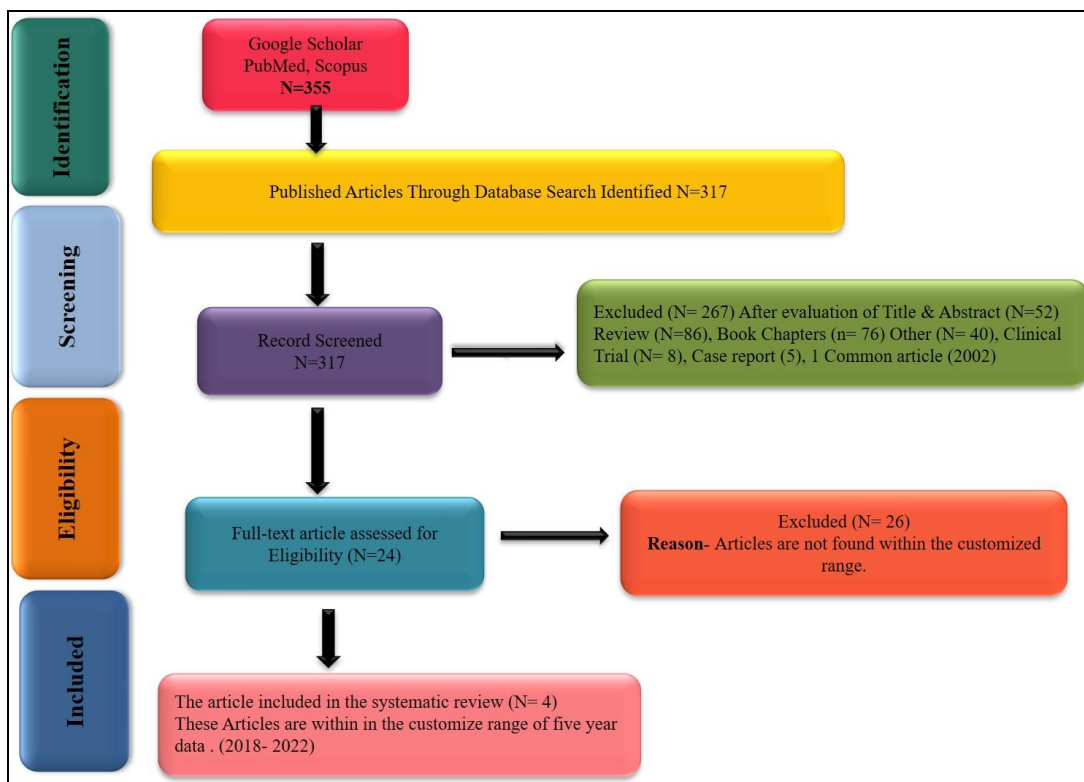


FIG. 3: SYSTEMATIC ANALYSIS ACCORDING TO PRISMA THEME 2020

Bacopa monnieri as Free Radical Scavenger: The DPPH assay revealed that the methanol extract is more effective in preventing DNA damage than chloroform, hexane, acetone, ethyl acetate, and methanol/aqueous extracts in preventing hydroxyl

radical damage. A dose-dependent free radical Russo discovered that a methanolic extract of *B. monnieri* had a scavenging ability and a protective impact against DNA damage¹⁶⁻¹⁷. Bacopa therapy dramatically decreased lipid peroxidation caused

by FeSO₄ and cumene hydroperoxide in animal models by chelating Fe²⁺ 18. The radical quenching efficacy of *B. monnieri* ethanol and aqueous extracts has also been frequently documented 19. By exposing the lung epithelial cell line, L132 cells, to a nitric oxide (NO) donor, Sodium nitroprusside (SNP), a producer of RNS, the effect of *B. monnieri* extract on ROS formation and lipid peroxidation is assessed. The researchers discovered that pretreatment with *B. monnieri* extracts decreased nitrosative stress in SNP-treated cells by reducing the production of RNS. By maintaining mitochondrial integrity, *B. monnieri* extract pretreatment modulated the SNP-induced up-regulation of Bax, cytochrome c and caspase 3 expression and a down-regulation of Bcl2 expression, indicating a cytoprotective role for *B. monnieri* extract against SNP-induced damage 21. *B. monnieri* methanolic extract and its isolated constituent bacoside A showed significant wound-healing activity 20 These findings suggest that *B. monnieri* could be useful in treating human diseases in which free radical production is a major factor.

Bacopa monnieri as Thyroid Stimulant: Brahmi has a long history of use and study in Indian

traditional medicine. The therapeutic potential of *Bacopa Monnieri* (200 mg/kg) leaf extracts in controlling hypothyroidism in mice were investigated. T4 concentration was enhanced by *B. monnieri* extract without increasing hepatic lipid peroxidation (LPO), indicating that it is a thyroid-stimulating medication 7.

However, only T4 levels were observed to be elevated by the Brahmi extract, not T3, indicating that it has direct conversion or releasing potency of T4 rather than T3 conversion. Furthermore, the thyroid stimulatory activity was tested independently of any induced hypothyroidism paradigm, suggesting that Brahmi has significant potential as a thyroid stimulator, equivalent to allopathic drugs available today.

There has been very little research on the efficacy of Bacopa as a thyroid stimulant in isolation; much more toxicological research is needed to demonstrate the appropriate potential of Bacopa as a thyroid stimulant and as a radical scavenger to elucidate the toxicological dysfunction and oxidative stress induced by various environmental stimulants such as pesticides and radiations in everyday life.

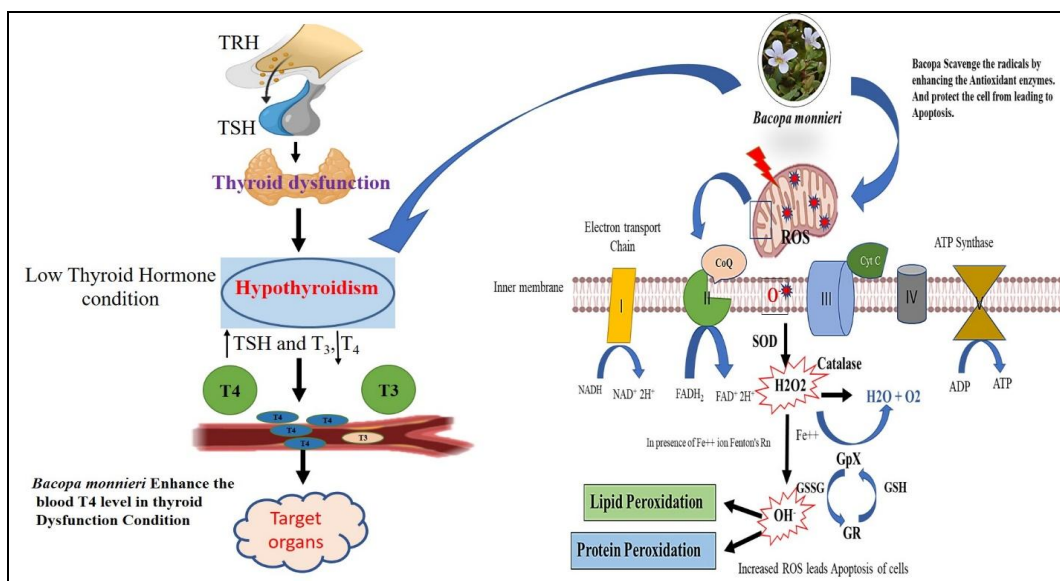


FIG. 4: BACOPA MONNIERI AS THYROID STIMULANT AND FREE RADICAL SCAVENGER

TABLE 1: SHOWS THE RESEARCH ARTICLES CONSIDER IN THIS STUDY

Study	Effect	Year	Type of study	Reference
A randomized control Trial on <i>Bacopa monnieri</i>	On Hyperactivity and Inattention in Male Children and Adolescents	2015	placebo-controlled, double-blind randomized trials	21
Management of Qillat-i-Darqiyat (Hypothyroidism)	Unani drugs Asgand (<i>Withania somnifera</i>) and Brahmi (<i>Bacopa</i>)	2021	A Case Study	5

with a Combination of Unani Drugs Asgand (<i>Withania somnifera</i> (L.) Dunal) and Brahmi (<i>Bacopa monnieri</i> (L.) Wettst.) Hypothyroidism	<i>monnieri</i> have demonstrated significant improvement in subjective & objective parameters and Zulewski's clinical scores	2002		7
Thyrogeenic, hypolipidemic and antioxidant effects of <i>Bacopa monnieri</i> (Brahmi) on experimental hypothyroidism in rats	BM shoes regenerative changes in hypothyroid mice.	2021	Research Article	22

CONCLUSION: This article concludes the safe use of *Bacopa monnieri* in treating thyroid problems to improve thyroid hormone dysregulation and oxidative stress caused by environmental stimuli. However, repeatable study designs and thorough statistical analysis are required to validate the importance of *Bacopa monnieri* in further treatments of thyroid hormone malfunction and oxidative stress in the body. This review could only include four studies because they fulfilled the requirements. This comprehensive investigation reviewed and summarized the effectiveness of *Bacopa monnieri* in scavenging radicals and clarifying thyroid diseases. Because the success of Brahmi in treating neurological ailments has prompted a sufficient amount of research in recent years, it is time to begin looking into other widespread problems.

ACKNOWLEDGMENT: Authors gratefully acknowledge the HOD, Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya, Sagar, (M.P.) India for providing infrastructure and experimental facilities and also for ICMR for providing SRF fellowship.

CONFLICTS OF INTEREST: There is no conflict of interest.

REFERENCES:

1. SLal and Baraik B: Phytochemical and pharmacological profile of *Bacopa monnieri*-an ethnomedicinal plant, International Journal Pharmaceutical Sciences and Research 2019; 10(3): 1001-13.
2. Promsuban C, Limsuvan S, Akarasereenont P, Tilokskulchai K, Tapechum S and Pakaprot N: *Bacopa monnieri* extract enhances learning-dependent hippocampal long-term synaptic potentiation. Journal of Neuro Report 2017; 28(16): 1031-1035.
3. Dey A, Hazra A, Nongdam P, Nandy S, Tikendra L, Mukherjee A, Banerjee S, Mukherjee S and Pandey D: Enhanced bacoside content in polyamine treated *in-vitro* raised *Bacopa monnieri* (L.) Wettst, South African Journal of Botany 2019; 123: 259-269.
4. Unnikrishnan AG, Kalra M S, Sahay RK, Bantwal G, John N and Tewari: Prevalence of hypothyroidism in adults: An epidemiological study in eight cities of India, Indian Journal of Endocrinology Metabolism 2013; 17(4): 647.
5. Jabeen J: Management of Qillat-i-Darqiyyat (Hypothyroidism) with a combination of Unani Drugs Asgand (*Withania somnifera* (L.) Dunal) and Brahmi (*Bacopa monnieri* (L.) Wettst.)-A Case Study, J Haya Saudi Journal of Life Sciences 2021; 6(10): 225-229.
6. Cho JH, Kim HJ, Lee JH, Park IR, Moon JS, Yoon JS, Lee IK, Won KC and Lee HW: Poor glycemic control is associated with the risk of subclinical hypothyroidism in patients with type 2 diabetes mellitus. Korean Journal International Medicine 2016; 31(4): 703.
7. Kar A, Panda S and Bharti S: Relative efficacy of three medicinal plant extracts in the alteration of thyroid hormone concentrations in male mice. Journal of Ethnopharmacology 2002; 81(2): 281-285.
8. Bharti G, Singh K, Kumari R and Kumar U: Prevalence of hypothyroidism in subfertile women in a tertiary care center in North India, International Journal of Research and Medical Science 2017; 5(5): 1777-1780.
9. Sharma M, Ahuja A, Gupta R and Mallubhotla S, Enhanced bacoside production in shoot cultures of *Bacopa monnieri* under the influence of abiotic elicitors. Journal of Natural Product 2015; 29(8): 745-749.
10. Brimson JM, Brimson S, Prasanth MI, Thitilertdech P, Malar DS and Tencommao: The effectiveness of *Bacopa monnieri* (Linn.) Wettst. as a nootropic, neuroprotective, or antidepressant supplement: Analysis of the available clinical data. J of Scientific Reports 2021; 11(1): 1-11.
11. Ghosh S, Khanam R and Acharya Chowdhury: The Evolving Roles of *Bacopa monnieri* as Potential Anti-Cancer Agent: A Review. American Journal of Nursing 2021; 73(11-12): 2166-2176.
12. Jain P, Sharma H, Basri F, Priya K and Singh P: Phytochemical analysis of *Bacopa monnieri* (L.) Wettst. and their anti-fungal activities. Indian Journal of Traditional Knowledge 2017; 16(2): 310-318.
13. A Singh B, Pandey S, Ruman M, Kumar S, Kushwaha PP, Verma R and Mahdi AA: Neuroprotective and Neurorescue Mode of Action of *Bacopa monnieri* (L.) Wettst in 1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine-Induced Parkinson's Disease: An *in-silico* and *in-vivo* study. Frontiers in Pharmacology 2021; 12: 61641316.
14. Choudhary S, Kumari I, Thakur S, Kaurav H, Choudhary GJ, Research P: Brahmi (*Bacopa monnieri*)-A potential ayurvedic cognitive enhancer and neuroprotective herb. International Journal of Obstetric Anesthesia 2021; 41-49.

15. Chaudhari KS, Tiwari NR, Tiwari RR and Sharma RS: Neurocognitive Effect of Nootropic Drug biBrahmi/b (*Bacopa monnieri*) in Alzheimer's Disease. *Annals of Neurosciences* 2017; 24(2): 111-122.
16. Radha P and Sumathi: Biomolecular Protective Effects of *Bacopa Monnieri* (L.) Pennell Leaf Extracts against Oxidative Damage. *Saudi Journal of Biological Sciences* 2022; 51(1): 123-129.
17. Peth-Nui T, Wattanathorn J, Muchimapura S, Tong-Un T, Piyavhatkul N, Rangseekajee P, Ingkaninan K and Vittaya-Areekul S: Effects of 12-Week *Bacopa monnieri* Consumption on Attention, Cognitive Processing, Working Memory and Functions of Both Cholinergic and Monoaminergic Systems in Healthy Elderly Volunteers. *Evidence-based complementary and alternative medicine* 2012; 606424.
18. Mohana M and Padma PR: Free radicals scavenging activity of the Bacoside fraction from *Bacopa monnieri*. *International Journal of Current Pharmaceutical Research* 2016.
19. Velaga MK, Basuri CK, Robinson Taylor KS, Yallapragada PR, Rajanna S and Rajanna B: Ameliorative effects of *Bacopa monniera* on lead-induced oxidative stress in different regions of rat brain. *Drug and Chemical Toxicology* 2014; 37(3): 357-364.
20. Ravishankar K, Kiranmayi GVN, Prasad YR and Devi L: Wound healing activity in rabbits and antimicrobial activity of *Hibiscus hirtus* ethanolic extract. *Journal of Bone Joint and Surgery* 2019; 54.
21. Kean JD, Kaufman J, Lomas J, Goh A, White D, Simpson D, Scholey A, Singh H, Sarris J and Zangara A: A randomized controlled trial investigating the effects of a special extract of *Bacopa monnieri* (CDRI 08) on hyperactivity and inattention in male children and adolescents: Bachi Study Protocol (ANZCTRN12612000827831). *Journal of Nutrients* 2015; 7(12): 9931-9945.
22. Vigneshwar R, Arivuchelvan A and Mekala P: Thyrogenic, hypolipidemic and antioxidant effects of *Bacopa monnieri* (Brahmi) on experimental hypothyroidism in rats. *Journal Pharmacognosy and Phytochemistry* 2021; 10(1): 454-458.
23. Vishnupriya P and Padma VV: A review on the antioxidant and therapeutic potential of *Bacopa monnieri*. *Reactive Oxygen Species* 2017; 1(3): 111-20.
24. Banerjee S, Anand U, Ghosh S, Ray D, Ray P, Nandy S, Deshmukh GD and Tripathi V Dey: Bacosides from *Bacopa monnieri* extract: An overview of the effects on neurological disorders. *Asian Journal of Pharmaceutical Research* 2021; 35(10): 5668-5679.

How to cite this article:

Chourasiya S and Mahobiya P: A systematic review on the scavenging and elucidating efficacy of *Bacopa monnieri* as a thyroid stimulant. *Int J Pharm Sci & Res* 2023; 14(6): 2645-50. doi: 10.13040/IJPSR.0975-8232.14(6).2645-50.

All © 2023 are reserved by International Journal of Pharmaceutical Sciences and Research. This Journal licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

This article can be downloaded to **Android OS** based mobile. Scan QR Code using Code/Bar Scanner from your mobile. (Scanners are available on Google Playstore)