



Review Article

Review of Protective Role of Bacopa Monnieri Plant Extract against Ethylene Glycol–Induced Urolithiasis in Experimental Rats

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Article Info: Received: 15-07-2025 / Revised: 27-08-2025 / Accepted: 28-09-2025

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DOI: <https://doi.org/10.32553/jbpr.v14i5.1365>

Conflict of interest statement: No conflict of interest

Abstract:

Bacopa monnieri (L.) Pennell commonly referred to as Jalabrahmi, belongs to the family Plantaginaceae. This deciduous Herb is native to the hot-temperate regions of Africa and Asia and is well recognized for its resilience in harsh climates. The plant has garnered significant attention due to its nutritional and medicinal potential, widely explored in traditional and modern pharmacology. Bacopa monnieri (L.) exhibits notable adaptability and thrives in varied ecosystems, including mountainous regions, coastal areas, and semi-arid landscapes. The plant plays an ecological role in preventing soil erosion, contributing to habitat restoration, and promoting biodiversity in challenging terrains. The genus Bacopa consists of multiple species, with Bacopa monnieri being the most extensively studied. It falls within the Plantaginaceae family, characterized by nitrogen-fixing capabilities via root nodules that engage in symbiosis with actinobacteria. Bacopa monnieri (L.) contains a series of chemical compounds including Triterpenoid, saponins, Alkaloids, Flavonoids, Sterols, Other compounds etc. These compounds are of interest not only from the chemical point of view, but also because many of them possess biological and therapeutic activity including Antioxidant, Anti-inflammatory, Diuretic, Nootropic (memory enhancer), and Neuroprotective properties. Because of these effects, Bacopa monnieri (L.) containing bioactive compounds is often used in traditional medicine. We can expect many scientific evidence supporting the benefits of the Jalabrahmi to maintain health and to cure the diseases by rationalizing it in proper Ayurvedic dosages form for this plant.

Keywords: Bacopa monnieri, Pharmacognosy, Traditional medicine, Anti-Urolithiatic.

1. Introduction

An urolithiasis is a disorder that affects the urinary system and is caused by the production of Urinary stones.

Despite the fact that the likelihood of having kidney stones varies from country to country, this is still a public health issue. This disorder is also known as nephrolithiasis or Kidney stones. [1] It is common and long- lasting health disease that affects individuals all around the world.

Kidney stones are one of the oldest recognised medical diseases, as well as one of the most common ones. This disease today affects a significant number of people all over the world in every region of the world.

When doing epidemiological research on renal calculi, researchers often use the terms "incidence," "prevalence," and "lifetime prevalence" in their analyses. In the context of

this discussion, new instances of kidney stones detected in a certain group at a specific period are known as "incidence. [2] Excessive or inadequate physical exercise; being overweight or obese; undergoing weight reduction surgery; eating meals high in salt or sugar; and drinking alcohol all contribute to dehydration.

An infection or genetic predisposition might be to blame for the disease in certain persons. It is possible to acquire kidney stones if you ingest a large amount of fructose. All forms of sugar, including table sugar, include fructose, including high fructose corn syrup (HFCS). [3]

Phytochemistry and Pharmacological Profile of *Bacopa monnieri*

Bacopa monnieri (L.) Pennell commonly referred to as Jalabrahmi, belongs to the family Plantaginaceae. This deciduous Herb is native to the hot-temperate regions of Africa and Asia and is well recognized for its resilience in harsh climates. The plant has garnered significant attention due to its nutritional and medicinal potential, widely explored in traditional and modern pharmacology. *Bacopa monnieri* (L.) exhibits notable adaptability and thrives in varied ecosystems, including mountainous regions, coastal areas, and semi-arid landscapes. The plant plays an ecological role in preventing soil erosion, contributing to habitat restoration, and promoting biodiversity in challenging terrains. [4]



Figure 1:

Table 1: Taxonomy of Plant: [5]

Kingdom	Plantae
Subkingdom	Tracheobionta (Vascular plants)
Superdivision	Spermatophyta (Seed plants)
Division	Magnoliophyta (Angiosperms)
Class	Magnoliopsida (Dicotyledons)
Order	Lamiales
Family	Plantaginaceae
Genus	<i>Bacopa</i>
Species	<i>Bacopa monnieri</i> (L.) Pennell
Common Names	Brahmi (Hindi), Jalabrahmi, Water Hyssop (English), Nirbrahmi (Sanskrit), Jalamimba (Marathi)

Geographical Distribution:

Bacopa monnieri is widely distributed throughout the tropical and subtropical regions of the world, including India, Nepal, Sri Lanka, Pakistan, Bangladesh, Taiwan, Vietnam, Florida, Hawaii, and Africa. In India, it grows abundantly in wetlands, riverbanks, and paddy fields across states like Uttar Pradesh, West Bengal, Assam, Tamil Nadu, and Kerala. [6]

Major Phytoconstituents:

Key bioactive compounds identified in *B. monnieri* include: [7]

- Saponins: The so-called “bacosides” (bacoside A, bacoside B) and bacopasaponins are major constituents. Flavonoids, phenolics, alkaloids, glycosides, sterols (e.g., β -sitosterol) and triterpenoids.
- Its extracts show strong antioxidant potential: scavenging reactive oxygen species (ROS), enhancing endogenous antioxidant enzyme activities (SOD, CAT, GSH), and reducing lipid peroxidation.

Pharmacological activities relevant to urolithiasis:

Although much of the research on *B. monnieri* has focused on neuroprotection and cognition, some activities are highly relevant to the pathophysiology of urolithiasis: [8-10]

Antioxidant: A study demonstrated that *B. monnieri* alleviated azathioprine-induced renal damage in rats (reduced serum creatinine, urea; enhanced SOD activity) via antioxidant and anti-inflammatory mechanisms.

Anti-inflammatory: Chronic inflammation in renal tissue contributes to crystal retention and stone growth; *B. monnieri*'s anti-inflammatory potential may mitigate that.

Potential modulation of urinary parameters:

While less evidence exists specifically for diuretic or citrate/oxalate modulation by *B. monnieri*, its general nephroprotective profile suggests it might favourably influence urinary milieu.

Crystal-inhibition potential: Although direct studies on *B. monnieri* in urolithiasis are limited, plant extracts with flavonoids/saponins often demonstrate inhibition of CaOx crystallisation (nucleation, aggregation, growth) in vitro. For example, an in vitro study of *B. monnieri* aqueous extract showed moderate inhibition of CaOx crystal nucleation/aggregation/growth.

Reference:

1. Alelign T, Petros B. Kidney stone disease: An update on current concepts. *Advance Urology*;3;068365(2018).
2. Ramaswamy K, Killilea DW, Kapahi P, Kahn AJ, Chi T, Stoller ML. The elementome of calcium based urinary stones and its role in urolithiasis. *Nature Reviews Urology*;12:543 57(2015).
3. Khan, S. R. et al. Kidney stones. *Nature Review Disease Primers* 2, 16008. <https://doi.org/10.1038/nrdp.2016.8> (2016).
4. Kittanamongkolchai, W. et al. The changing incidence and presentation of urinary stones over 3 decades. *Mayo Clinic's Proceedings* 93, 291–299. <https://doi.org/10.1016/j.mayocp.2017.11.018> (2018).
5. Liu, Y. et al. Epidemiology of urolithiasis in Asia. *Asian Journal Urology*. 5, 205–214. <https://doi.org/10.1016/j.ajur.2018.08.007> (2018).
6. Karagiannis, A. et al. Epidemiologic study of urolithiasis in seven countries of South-Eastern Europe: S.E.G.U.R. 1 study. *Archivioitaliano di urologia, andrologia :organoufciale Societaitaliana di ecografaurologica e nefrologica* 89, 173–177. <https://doi.org/10.4081/aiua.2017.3.173> (2017).
7. Scales, C. D. Jr., Smith, A. C., Hanley, J. M., Saigal, C. S. & Urologic Diseases in America, P. Prevalence of kidney stones in the United States. *European Urology*. 62, 160–165. <https://doi.org/10.1016/j.eururo.2012.03.052> (2012).
8. Chopra, R. N., Nayar, S. L., & Chopra, I. C. (2002). *Glossary of Indian Medicinal Plants*. NISCAIR, New Delhi.
9. Deepak, M., et al. (2005). *Quantitative*

determination of the major saponin mixture bacoside A in *Bacopa monnieri* by HPLC. *Phytochemical Analysis*, 16(1), 24–29.

10. Kaur, T., et al. (2011). Protective role of *Bacopa monnieri* against cisplatin-induced nephrotoxicity. *Renal Failure*, 33(3), 288–293.