

GLOSSOCARDIA BOSVALLIA (L.F.) DC.: AN EMERGING MEDICINAL PLANT WITH ANTIMICROBIAL AND THERAPEUTIC PROMISE

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Abstract

Keywords:

Glossocardia bosvallia,
essential oil,
antimicrobial,
phytochemistry, tissue
culture, ethno
medicine, synthetic
seeds.

Over the past forty years, *Glossocardia bosvallia* (L.f.) DC, a relatively underexplored ethnomedicinal plant, attracted increasing scientific interest due to its rich phytochemical profile and diverse therapeutic potential. Early investigations highlighted its broad-spectrum antibacterial and antifungal properties. Subsequent studies demonstrated that petroleum ether extracts exhibited significant antibacterial activity against both Gram-positive and Gram-negative bacteria, with *Proteus vulgaris* and *Staphylococcus aureus* showing the highest susceptibility. Analysis of the essential oil revealed key volatile constituents, including β -myrcene, limonene, and β -caryophyllene, underscoring the plant's chemotypic variability and its potential for medicinal applications. Advances in plant tissue culture, including in vitro propagation and synthetic seed production, facilitated conservation efforts and enabled mass multiplication. Phytochemical screening confirmed the presence of bioactive classes such as flavonoids, terpenoids, alkaloids, tannins, and saponins. Pharmacognostic and anatomical studies further validated the plant's traditional uses, which encompassed the treatment of throat infections, diarrhea, gynecological disorders, and suggested possible anti-fertility and anthelmintic effects. This review synthesized four decades of botanical, phytochemical, pharmacological, and biotechnological research on *G. bosvallia*, emphasizing its potential for further pharmacological exploration and agronomic development.

Introduction

In regions where traditional knowledge forms the basis of primary healthcare, medicinal plants continue to play a vital role in global health systems [1]. *Glossocardia bosvallia* (L.f.) DC., a relatively underexplored member of the family Asteraceae, is one such plant that has attracted increasing scientific interest. Widely distributed across tropical and subtropical regions of Asia, the species has been traditionally employed by indigenous and rural communities for the treatment of parasitic infestations, diarrhoea, throat infections, fever, and various gynaecological disorders [2,3]. Despite its longstanding use in ethnomedicine, systematic scientific investigations into *G. bosvallia* began only in the late twentieth century. Over the past four decades, accumulating research has highlighted the plant's rich chemical diversity and broad pharmacological potential [4].

Early scientific studies on *G. bosvallia* primarily focused on validating its traditional antibacterial applications. These investigations demonstrated that plant extracts, particularly petroleum ether extracts, exhibit significant antibacterial activity against a range of pathogenic microorganisms [5]. Notably, strong inhibitory effects were observed against *Staphylococcus aureus* and *Proteus vulgaris*, indicating the plant's promise as a potential source of broad-spectrum antimicrobial agents [5,6]. Subsequent chemical profiling of the plant's essential oils further advanced understanding of its medicinal value. Major volatile constituents such as β -myrcene, limonene, and β -caryophyllene were identified, reflecting both chemotypic variability and potential applications in antimicrobial, medicinal, and aromatherapeutic formulations [7].

Parallel phytochemical investigations have consistently confirmed the presence of diverse classes of secondary metabolites, including flavonoids, terpenoids, alkaloids, tannins, and saponins [8,9]. These compounds are well recognized for their biological activities and provide biochemical support for the plant's traditional medicinal uses, while

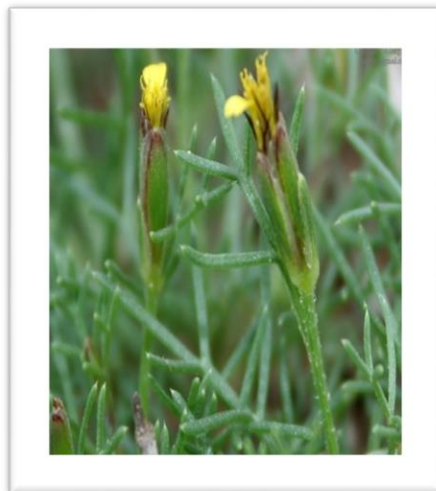
also offering opportunities for novel drug discovery. Complementary pharmacognostic and anatomical studies have further strengthened the botanical authentication and quality control parameters of *G. bosvallia*, enhancing its reliability for medicinal and scientific utilization [10]. Such studies are essential in pharmacognosy, as they establish diagnostic features that enable accurate species identification and standardization of herbal materials.

With the growing recognition of *G. bosvallia*'s medicinal importance, concerns regarding its conservation and sustainable utilization have also emerged. Like many medicinal plants, the species faces threats from overharvesting driven by increasing ethnomedicinal demand, along with habitat loss and degradation [11]. To address these challenges, several biotechnological approaches have been developed to ensure its long-term availability. Techniques such as *in vitro* propagation, micropropagation, callus culture, and synthetic seed production have demonstrated considerable potential for rapid multiplication and germplasm conservation [12,13]. Beyond conservation, these strategies also facilitate the large-scale production of bioactive compounds for pharmaceutical and industrial applications.

This review compiles and critically analyses four decades of interdisciplinary research encompassing botanical characterization, phytochemical profiling, pharmacological evaluation, and biotechnological advancements related to *Glossocardia bosvallia*. Collectively, these studies underscore the plant's emerging significance as a valuable medicinal resource and a promising candidate for future pharmacological development and agronomic innovation.

Taxonomic and Botanical Description:

Rank	Classification
Kingdom	Plantae
Clade	Angiosperms
Clade	Eudicots
Clade	Asteroids
Order	Asterales
Family	Asteraceae
Subfamily	Asteroideae
Tribe	Heliantheae
Genus	<i>Glossocardia</i> Cass.
Species	<i>Glossocardia bosvallia</i> (L.f.) DC.



GLOSSOCARDIA BOSVALLEA

General Distribution Pattern: The species' natural distribution is confined in warm, semi-arid to sub-humid tropical zones, and it is primarily found in Asia.

Ethnomedicinal Uses of *Glossocardia bosvallia* Across Regions:

Region/Country	Traditional Uses	Plant Parts Used	Form of Preparation
India	Throat infections, diarrhoea, gastrointestinal problems, menstrual disorders, gynaecological diseases, wounds & skin infections	Leaves, roots, whole plant	Decoction, leaf paste, crushed fresh leaves, powder
Sri Lanka	Fever, body pain, digestive disorders, anti-parasitic (vermifuge) use	Leaves, aerial parts	Decoction, herbal infusions
Bangladesh	Gastrointestinal infections, helminthiasis, urinary tract discomfort	Leaves, roots	Juice, decoction
Nepal	Skin infections, cold and fever	Leaves	Topical paste, decoction
Myanmar	Wound healing, respiratory congestion	Leaves, stems	Paste, hot infusions
Thailand / Asia	Minor skin ailments, digestive disturbances	Leaves	Poultice, boiled extracts

Ethnomedicinal and Therapeutic Applications of *Glossocardia bosvallia*:

Glossocardia bosvallia (synonym: *Glossocardia bosvallea*), commonly known as Patthar-suva or Pithari, is a small annual herb belonging to the family Asteraceae. Traditionally, it was employed in Indian folk medicine as a febrifuge to reduce fever. Tribal communities in western Maharashtra prepared decoctions of the plant to manage febrile conditions. The plant was noted for its bitter taste and fennel-like aroma, characteristics commonly associated with medicinal plants used for lowering body temperature. Topically, a paste made from fresh plant material was applied to scalds, wounds, blemishes, and sores to promote healing. Internally, crushed leaves were administered by indigenous practitioners to alleviate gastrointestinal disorders such as dysentery and diarrhoea. Additionally, traditional herbalists combined *G. bosvallia* with other medicinal herbs to produce a paste for application on the scalp to treat dandruff. Beyond its medicinal uses, the plant was occasionally consumed as a leafy vegetable, suggesting its role as a source of nutrition alongside its therapeutic applications.

1. Antifungal Activity

The antifungal potential of *G. bosvallia* extracts had been investigated in a recent preliminary study. The findings had indicated some inhibitory effects against phytopathogenic fungi, suggesting that the plant's bioactive constituents were capable of suppressing fungal growth. Although the study had not provided specific data, such as inhibitory concentrations or the particular fungal species tested, these observations had expanded the recognized antimicrobial spectrum of the plant beyond bacterial targets [4].

2. Antibacterial Activity:

a) Inhibition of Bacterial Growth: Previous microbiological investigations had evaluated leaf extracts of *Glossocardia bosvallia* against a range of bacterial species. The extracts had demonstrated significant inhibitory effects on the growth of the Gram-positive bacterium *Bacillus mycoides*, indicating that the plant contained bioactive compounds capable of suppressing the proliferation of certain bacterial species in vitro [5].

b) Essential Oil Antimicrobial Effects:

The essential oil from *G. bosvallia* was particularly studied in a research letter (*Planta Medica*) that claimed antibacterial action; however, the precise data (e.g., specific microbes inhibited, MIC values) are hidden behind an abstract.

Because volatile terpenes like β -myrcene, sabinene, and limonene are known to have broad-spectrum antibacterial qualities in other species, the essential oils of therapeutic plants frequently exhibit antimicrobial actions [7].

2. Possible Mechanisms Behind Antimicrobial Effects

Investigations into *G. bosvallia* had revealed the presence of multiple classes of bioactive compounds commonly associated with antimicrobial activity. Phenolic compounds and flavonoids have been reported to inhibit enzymatic

activity and disrupt microbial cell membranes. Terpenoids, which were major constituents of the plant's essential oils, such as β -myrcene, had demonstrated antibacterial and antifungal effects in other plant species. Additionally, some studies have indicated that extracts of *G. bosvallia* and related Asteraceae species contained tannins and alkaloids, which had potential antibacterial properties. The presence of these metabolites, which frequently contributed to the inhibition of microbial growth, disruption of cell walls, or interference with enzymatic function in experimental models, had collectively supported the observed antimicrobial activity of the plant [7].

4. Insecticidal & Larvicidal Activity Against Stored-Product Pests:

Insects that harm stored grains are the subject of the best-documented study on *Glossocardia bosvallia* bioactivity against insect pests:

- a) Tested Extracts: Three different plant extracts were made from the entire plant by researchers using: Hexane is a non-polar solvent, Polar organic solvent: ethanol, Water (extract from water).
- b) The insecticidal properties of these extracts were assessed against: The pulse beetle, *Callosobruchus chinensis*, the rice moth, *Corcyra Cephalonia*, the red flour beetle, *Tribolium castaneum*, is one of the main stored-grain pests in India.

With a variety of compounds that provide antioxidant, antibacterial, insecticidal, and metabolic enzyme inhibitory properties, *Glossocardia bosvallia* is a historically important medicinal herb.

Although its traditional usage is well established, more thorough pharmacological and clinical study is needed to confirm and standardize its medicinal potential.

Glossocardia bosvallia (L.f.) DC. had represented an important yet relatively underexplored medicinal species with a well-documented history in traditional healthcare systems. Over the preceding four decades, scientific investigations had identified a diverse array of bioactive secondary metabolites, including flavonoids, terpenoids, alkaloids, tannins, and saponins, while also substantiating several of its ethnomedicinal applications, particularly those related to antimicrobial activity. Phytochemical profiling and essential oil analyses had revealed considerable chemotypic diversity, supporting the plant's broad pharmacological relevance and its potential as a source of novel therapeutic agents. In addition, pharmacognostic and anatomical studies had strengthened taxonomic authentication and contributed to the establishment of quality control parameters necessary for its safe and effective medicinal use.

Despite these encouraging outcomes, most available research on *G. bosvallia* had remained confined to preliminary in vitro bioassays and descriptive phytochemical evaluations. Systematic in vivo investigations, mechanistic studies, and clinical validations had not yet been adequately conducted. Consequently, future research had been warranted to prioritize the isolation and structural elucidation of individual bioactive constituents, clarification of their molecular mechanisms of action, and assessment of their safety through detailed toxicological and pharmacokinetic analyses. Such efforts had been essential for translating traditional knowledge into scientifically validated therapeutic applications.

Concurrently, increasing ethnomedicinal utilization and ongoing habitat degradation had posed substantial risks to the natural populations of *G. bosvallia*. Biotechnological interventions, including micropropagation, in vitro conservation, and synthetic seed technologies, had emerged as viable strategies for the sustainable management and conservation of this species. The integration of these approaches with phytochemical standardization and metabolic profiling had further offered opportunities for large-scale production of pharmacologically valuable compounds without imposing additional pressure on wild resources [8].

Toxicological and Safety Profile of *Glossocardia bosvallia*:

The progression of medicinal plants from traditional practices to evidence-based therapeutic use required comprehensive toxicological and safety assessments. In the case of *Glossocardia bosvallia* (L.f.) DC, existing investigations had primarily focused on phytochemical profiling, ethnomedicinal relevance, and in vitro biological activities, leaving toxicological evaluation largely unexplored. Nevertheless, preliminary insights into the safety of this species had been inferred from available ethnobotanical documentation and limited experimental findings [11].

Clinical and In Vivo Evidence:

Robust validation of medicinal plants for therapeutic application had depended on evidence generated from in vivo experimental models and, ultimately, from clinical investigations. For *Glossocardia bosvallia* (L.f.) DC., the available scientific evidence had remained largely confined to in vitro bioactivity studies and ethnomedicinal reports, with minimal advancement toward systematic animal experimentation or human clinical assessment [6].

In Vivo Experimental Studies:

Most published investigations had focused on the in vitro antibacterial, antifungal, and insecticidal activities of crude extracts or essential oils. Such studies had not adequately addressed pharmacodynamic properties, bioavailability, metabolic pathways, or systemic toxicity in

living organisms. Nonetheless, limited indirect evidence had suggested potential in vivo relevance. The long-standing traditional application of the plant in the management of parasitic infections, febrile conditions, and gastrointestinal disorders implied possible therapeutic efficacy in humans. In addition, laboratory-based insecticidal and larvicidal assays had demonstrated biological activity at low concentrations, indicating the presence of potent bioactive constituents capable of exerting effects at the whole-organism level. However, these observations could not be directly extrapolated to clinical contexts, as the studies were not designed to evaluate mammalian safety or therapeutic outcomes [6].

Conclusion

Glossocardia bosvallia (L.f.) DC. is a traditionally important medicinal plant with demonstrated in vitro antimicrobial, insecticidal, and antioxidant properties, supported by diverse bioactive compounds such as flavonoids, terpenoids, alkaloids, tannins, and saponins. Pharmacognostic and anatomical studies have aided taxonomic authentication and quality control.

However, scientific validation remains limited, with minimal in vivo, toxicological, and clinical data. Rigorous experimental studies are needed to isolate bioactive constituents, elucidate mechanisms of action, and assess safety and efficacy. Concurrently, biotechnological approaches like micropropagation, in vitro conservation, and synthetic seed production can ensure sustainable utilization. Overall, *G. bosvallia* shows considerable therapeutic potential, but bridging the gap between traditional knowledge and evidence-based applications is essential for its integration into modern phytopharmaceutical development [11].

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