



BLUMEA BALSAMIFERA (SAMBONG): A REVIEW OF ITS PHYTOCHEMISTRY AND MEDICINAL PROPERTIES

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ABSTRACT

Blumea balsamifera (L.) DC., popularly known as Sambong, is a cornerstone of traditional medicine in Southeast Asia, particularly within the Philippines where it is officially recognized by the Department of Health (DOH) for its therapeutic efficacy in renal care. This review provides a comprehensive synthesis of the current scientific literature regarding the plant's phytochemical profile and diverse pharmacological activities, bridging the gap between indigenous knowledge and modern evidence-based pharmacy. Utilizing a narrative review design, data were aggregated from peer-reviewed journals and botanical databases, revealing that *B. balsamifera* is characterized by a rich secondary metabolite profile, most notably volatile oils containing L-borneol and camphor, alongside bioactive flavonoids such as blumeatin and quercetin. These constituents underpin its primary clinical application as a diuretic and anti-urolithiasis agent, while also exhibiting potent anti-inflammatory, antimicrobial, and antioxidant properties. This review emphasizes the necessity for continued clinical standardization and exploration into advanced pharmaceutical delivery systems to maximize the bioavailability of its therapeutic compounds.

KEYWORDS: *Blumea balsamifera*, Sambong, Phytochemistry, L-borneol, Diuretic, Anti-urolithiasis.

1. INTRODUCTION

Blumea balsamifera (L.) DC., a member of the Asteraceae family, is an aromatic perennial herb or subshrub native to the tropical and subtropical regions of Asia, flourishing in countries such as the Philippines, India, and Southern China (Huang et al., 2022). Reaching heights of up to four meters, the plant is easily identified by its distinctive hairy, oblong-lanceolate leaves that emit a pungent, camphor-like odor when crushed, a trait that has led to its industrial use as a primary source of natural L-borneol (Masyudi et al., 2022). In the Philippines, Sambong holds a prestigious status as one of the ten herbal medicines clinically validated and promoted by the Institute of Traditional and Alternative Health Care (PITAHAC), making it a staple in local community-based health programs (Jose et al., 2024). Historically, the plant has been utilized in various indigenous systems of medicine to address a

wide array of ailments, ranging from common respiratory infections to complex musculoskeletal issues like rheumatism and arthritis (Widhiantara & Jawi, 2021). As global interest in botanical medicine surges, *B. balsamifera* stands out as a high-potential candidate for pharmaceutical development due to its well-documented safety profile and multi-targeted therapeutic effects.

1.1. Botanical and Taxonomic Description of *Blumea balsamifera*

Blumea balsamifera is a robust, aromatic subshrub characterized by an upright growth habit that typically reaches heights of 1 to 4 meters. Its physical structure is defined by stems that are woody at the base and transition into softer, branching upper sections, providing a sturdy framework for its dense, expansive foliage (Masyudi et al., 2022). The plant is notable for its pervasive pubescence; a layer of fine, soft hairs or

trichomes covers its various organs, serving as the primary reservoir for the volatile essential oils that give the species its medicinal value (Huang et al., 2022).

The vegetative and reproductive features of the species are highly specialized for its tropical environment. It bears large, alternate, oval-to-oblong leaves with serrated margins and a distinctive wrinkled texture, while its reproductive phase is marked by the appearance of small yellow flower heads arranged in large, branched terminal clusters (Masyudi et al., 2022; Huang et al., 2022). Following flowering, the plant produces dry, ribbed fruits equipped with a hairy pappus, a specialized structure that facilitates widespread seed dispersal via wind (Masyudi et al., 2022).

Beyond its physical form, the plant is taxonomically distinguished by its chemical profile, which manifests as a powerful, cooling aroma released whenever the plant tissue is bruised. This fragrance is the result of a high concentration of terpenoids—specifically L-borneol, camphor, and limonene—distributed throughout the entire organism (Huang et al., 2022). This combination of woody structural integrity, specialized hairy surfaces, and a rich terpenoid composition defines its botanical identity within the Asteraceae family.

1.2. Traditional Medicinal Use of *Blumea balsamifera*

The traditional therapeutic application of *B. balsamifera* utilizes the entire plant, often prepared through methods such as boiling, crushing, or steam inhalation to address a diverse range of health conditions. In many rural communities, systemic preparations like decoctions are commonly ingested to promote diuresis, facilitate the passage of kidney stones, and manage gastrointestinal issues like gastric ulcers or diarrhea (Pang et al., 2014; Huang et al., 2022; Jose et al., 2024). These liquid preparations are also widely used to regulate internal functions, serving as an expectorant for respiratory congestion, an antipyretic for lowering fevers, and an analgesic for dysmenorrhea or localized pain (Widhiantara & Jawi, 2021; Huang et al., 2022).

Beyond internal consumption, the plant serves a vital role in topical and aromatherapeutic traditional practices. It is frequently employed in wound healing through direct application as a poultice, or incorporated into aromatic baths to support postpartum recovery and soothe musculoskeletal ailments like rheumatism (Masyudi et al., 2022). Additionally, the plant's volatile properties are harnessed through steam inhalation to provide immediate relief for nasal congestion and headaches, reflecting its versatile role as a holistic remedy in indigenous medicine (Huang et al., 2022; Jose et al., 2024).

Table 1: Traditional Medicinal Uses of *Blumea balsamifera*.

Plant Part	Traditional Medicinal Uses	References
Leaves	Internal: Diuresis, kidney stone treatment, expectorant for coughs, and relief for menstrual cramps. Topical: Wound healing, aromatic baths for rheumatism, and postpartum recovery.	Masyudi et al. (2022); Pang et al. (2014); Widhiantara & Jawi (2021)
Roots	Antipyretic and management for localized physical pain.	Huang et al. (2022)
Whole Plant	Steam inhalation for nasal congestion and headaches; oral consumption for gastric ulcers and diarrhea.	Huang et al. (2022); Jose et al. (2024)

2. METHODOLOGY

This review employed a narrative synthesis methodology to aggregate and interpret existing scientific literature concerning the botanical, phytochemical, and pharmacological attributes of *B. balsamifera*. Comprehensive literature searches were conducted across international digital repositories, including Google Scholar, PubMed, ResearchGate, and ScienceDirect, using specific Boolean operators and keywords such as "Sambong phytochemistry," "*Blumea balsamifera* anti-urolithiasis," and "L-borneol medicinal properties." The selection criteria prioritized peer-reviewed articles, meta-analyses, and official government health reports published between 2000 and 2026 to ensure the integration of contemporary research findings with established traditional knowledge.

Information was systematically categorized into domains covering botanical taxonomy, bioactive chemical constituents (including volatile terpenoids and non-volatile flavonoids), and documented pharmacological mechanisms. Special emphasis was placed on studies highlighting the plant's effect on calcium oxalate crystal inhibition and its anti-inflammatory pathways, providing a structured foundation for future clinical investigations.

3. Phytochemistry of *Blumea balsamifera*

The phytochemical composition of *B. balsamifera* is characterized by a complex array of bioactive secondary metabolites, with over 100 compounds identified to date. These constituents are unevenly distributed across the plant's anatomy, with the highest concentrations typically found in the aerial sections (Pang et al., 2014; Widhiantara & Jawi, 2021).

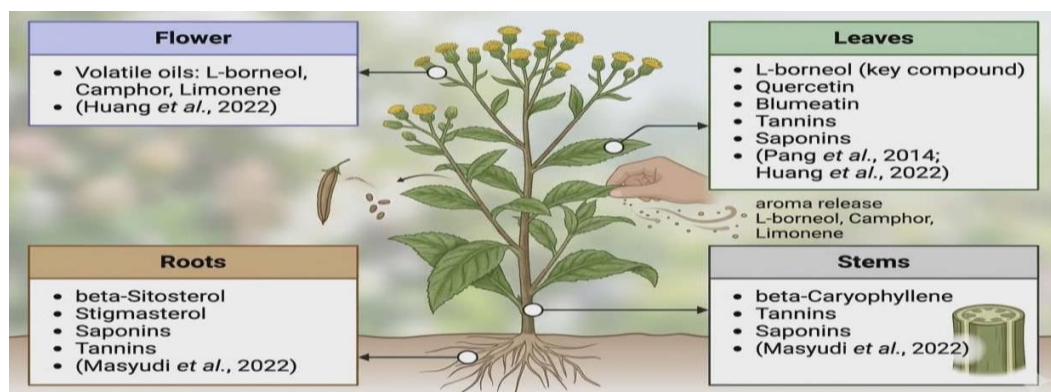


Figure 1: Distribution of Major Phytochemical Compounds of *Blumea balsamifera*.

Table 2: Major Phytochemical Compound Identified in Different Parts of *Blumea balsamifera*.

Plant Part	Major Compounds	Reported Pharmacological Activities	Reference
Flowers	Limonene, alpha-Pinene, Monoterpenes	Antimicrobial, Aromatic properties	Masyudi et al. (2022)
Leaves:	L-borneol, Camphor, Quercetin, Blumeatin, Luteolin	Anti-urolithiatic (Kidney stones), Diuretic, Anti-inflammatory, Antioxidant;	Huang et al. (2022); Pang et al. (2014); Wang et al. (2023)
Stems:	beta-Caryophyllene, Tannins, Saponins, Lignins:	Antimicrobial, Structural defense, Anti-inflammatory;	Huang et al. (2022); Masyudi et al. (2022)
Roots:	beta-Sitosterol, Daucosterol, Phenylpropanoids;	Antipyretic (Fever relief), Analgesic	Huang et al. (2022); Widhiantara & Jawi (2021)

Flowers

The yellow capitula contain flavonoids and essential oils similar to the leaves, though in smaller quantities, along with anthocyanins that provide pigmentation and additional radical-scavenging capabilities (Masyudi et al., 2022; Widhiantara & Jawi, 2021).

Leaves

The leaves are the primary reservoir of bioactive compounds. They are exceptionally rich in volatile essential oils, predominantly L-borneol, camphor, limonene, and cineole (Huang et al., 2022). Additionally, the leaves contain high concentrations of flavonoids (such as blumeatin, quercetin, and luteolin), which are responsible for the plant's potent antioxidant and anti-inflammatory properties (Wang et al., 2023).

Stems

The woody stems contain lower concentrations of volatile oils compared to the leaves but are characterized by the presence of tannins, saponins, and various triterpenoids that contribute to the structural and defensive mechanisms of the plant (Masyudi et al., 2022).

Roots

Phytochemical screening of the roots reveals the presence of specific diterpenoids and phenolic acids. While the volatile oil content is minimal, the roots contain unique glycosides that have been traditionally utilized for antipyretic applications (Huang et al., 2022; Widhiantara & Jawi, 2021).

4. Pharmacological Activities of *Blumea balsamifera*

The pharmacological profile of *B. balsamifera* is characterized by its broad range of clinically validated bioactivities.

Table 3: Summary of Reported Pharmacological Activities of *Blumea balsamifera*.

Extract/Compound	Experimental Model	Observed Effects	Mechanism Proposed	Reference
Ethanollic leaf extract	Rat maze & avoidance test	Improved memory retention and learning ability	Enhanced cholinergic activity in the hippocampus	Taranali & Cheeramkuzhy (2000)
Volatile Oil (L-borneol)	In vitro & animal studies	Reduced pain and inflammation	Inhibition of pro inflammatory cytokines and NF-kB pathways	Huang et al. (2022)
Root extract	Enzyme inhibition assay	Anti- urolithiasis and Diuretic effects	Inhibition of calcium oxalate crystal nucleation and aggregation	Jose et al. (2024)
Leaf extract	Rat paw edema model	Anti- inflammatory and Analgesic effects	Stabilization of lysosomal membranes and protease inhibition	Pang et al. (2014)

Anti-urolithiatic and Diuretic Activity

Blumea balsamifera is most widely recognized for its clinical efficacy in treating renal conditions, specifically as a potent anti-urolithiatic and diuretic agent. It works by promoting the dissolution of kidney stones and preventing the formation of new crystals while simultaneously increasing urinary frequency to flush out mineral deposits. This dual action has made it a standardized pharmaceutical intervention in the Philippines, where it is commonly prescribed to manage urolithiasis and reduce edema in patients with normal kidney function.

Anti-inflammatory and Analgesic Properties

The plant exhibits significant anti-inflammatory and pain-relieving effects, which are primarily attributed to its ability to inhibit pro-inflammatory mediators such as TNF- α , IL-6, and nitric oxide. Bioactive compounds like blusamiferoids facilitate these effects by downregulating the NF- κ B signaling pathway, a central regulator of the body's inflammatory response (Huang et al., 2022). This scientific mechanism supports its traditional and clinical use in alleviating the chronic pain and swelling associated with musculoskeletal disorders like rheumatism and arthritis (Huang et al., 2022).

Wound Healing and Antimicrobial Efficacy

In dermatological health, *B. balsamifera* acts as a regenerative agent that accelerates the healing of burns and open wounds. It stimulates tissue repair by activating the PI3K/AKT signaling pathway, which enhances cell migration and proliferation at the injury site. This healing process is further bolstered by the plant's natural antimicrobial properties, as its essential oils and flavonoids effectively inhibit the growth of common bacterial pathogens like *Staphylococcus aureus*, preventing secondary infections.

Antioxidant and Hepatoprotective Effects

The high concentration of flavonoids and phenolic acids within the plant provides robust antioxidant protection against oxidative stress. These compounds, such as quercetin and luteolin, serve as radical scavengers that neutralize superoxide radicals and protect cellular integrity. These antioxidant mechanisms also translate into hepatoprotective benefits, where the plant helps shield the liver from chemical-induced toxicity and promotes overall metabolic stability.

Anticancer Potential

Emerging oncological research has highlighted the plant's ability to inhibit the proliferation of specific cancer cell lines, particularly hepatocellular carcinoma. Studies indicate that methanolic extracts can induce cell cycle arrest at the G1 phase by reducing the expression of cyclin-E and inhibiting the phosphorylation of the retinoblastoma (Rb) protein. This targeted action allows the extract to suppress tumor growth with high selectivity, presenting a promising avenue for the

development of non-toxic, botanical-based cancer therapies.

5. DISCUSSION AND LIMITATIONS

While *B. balsamifera* is highly regarded in ethnomedicine and officially recognized by the Philippine DOH, the transition from traditional use to global pharmaceutical standardization faces several hurdles. Current research heavily favors the leaves, leaving the therapeutic potential of the roots and stems under-explored (Huang et al., 2022). Furthermore, many studies are limited to in vitro or animal models; while these provide a foundational understanding of the molecular pathways, they do not always accurately predict human clinical outcomes (Widhiantara & Jawi, 2021). A significant limitation is the lack of standardized dosing across different geographical regions, as environmental factors like soil quality and altitude significantly alter the concentration of L-borneol in the plant (Pang et al., 2014)

6. Future Research

The trajectory of future research into *Blumea balsamifera* must transition from laboratory-based observation to rigorous clinical validation and advanced pharmaceutical engineering to fully unlock its global potential. Primary focus should be directed toward conducting large-scale, multicenter, double-blind human clinical trials that aim to substantiate traditional claims regarding the plant's hepatoprotective and antitumor properties, moving beyond current in vitro models to establish definitive safety and efficacy profiles in human subjects (Wang et al., 2023). Parallel to clinical evaluation, the field of formulation science presents a critical opportunity for innovation; researchers should prioritize the development of advanced drug delivery systems, such as nano-emulsions, lipid-based carriers, or standardized roll-on gels, which are specifically designed to enhance the stability and percutaneous absorption of volatile constituents like L-borneol (Masyudi et al., 2022; Jose et al., 2024). Furthermore, there is significant promise in exploring synergy studies that investigate the therapeutic outcomes of combining *B. balsamifera* with other indigenous Philippine medicinal species, such as *Clitoria ternatea*, to address multi-systemic conditions through multifaceted chemical interactions. By integrating molecular biology, nanotechnology, and ethnobotany, future investigations can bridge the gap between traditional heritage and modern evidence-based medicine, ensuring that this botanical resource meets international pharmaceutical standards.

7. CONCLUSION

The synthesis of data presented in this review underscores that *Blumea balsamifera* (L.) DC. has transitioned from a traditional Philippine remedy to a scientifically validated candidate for modern drug development. Our analysis confirms that the therapeutic efficacy of Sambong, particularly in renal health, is not accidental but is driven by a sophisticated interplay

between L-borneol and specific flavonoids like blumeatin. This molecular synergy offers a compelling explanation for its success in clinical urolithiasis management. However, a significant translational gap persists. Despite decades of phytochemical screening, there is a redundant focus on identifying compounds that have already been well-characterized, while critical areas such as long-term hepatoprotective safety and oncological pathways remain largely speculative in human cohorts. The future of *B. balsamifera* research must therefore shift its paradigm. Priority should be given to solving the volatility and low bioavailability of its essential oils through advanced lipid-based nano-carriers. By moving toward multicenter clinical validation and refining pharmaceutical delivery, Sambong can finally evolve from its status as a regional ethnomedical staple into a globally competitive pharmaceutical agent.

REFERENCES

1. Huang, X. L., Wang, D. W., Liu, Y. Q., & Cheng, Y. X. (2022). Diterpenoids from *Blumea balsamifera* and their anti-inflammatory activities. *Molecules*, 27(9): 2890. <https://doi.org/10.3390/molecules27092890>
2. Jose, S., Garcia, M., Lopez, J., Reyes, A., & Cruz, L. (2024). Pharmacological evaluation of Sambong (*Blumea balsamifera*) on diuretic and kidney stone dissolution effects. *Journal of Advances in Medicine and Pharmaceutical Sciences*, 3(1): 29–37. <https://doi.org/10.36079/lamintang.jamaps-0301.734>
3. Masyudi, M., Hanafiah, M., Usman, S., & Marlina, M. (2022). Effectiveness of gel formulation of capa leaf (*Blumea balsamifera* L.) on wound healing in white rats. *Veterinary World*, 15(8): 2059–2066. <https://doi.org/10.14202/vetworld.2022.2059-2066>
4. Pang, Y., Wang, D., Fan, Z., Chen, X., Yu, F., Hu, X., Wang, K., & Yuan, L. (2014). *Blumea balsamifera*—A phytochemical and pharmacological review. *Molecules*, 19(7): 9453–9477. <https://doi.org/10.3390/molecules19079453>
5. Wang, J., He, H., Zhou, Z., Bai, L., She, X., He, L., He, Y., & Tan, D. (2023). Chemical constituents and bioactivities of *Blumea balsamifera* (Sambung): A systematic review. *Food Science and Technology*, 43: e132322. <https://doi.org/10.1590/fst.132322>
6. Widhiantara, I. G., & Jawi, I. M. (2021). Phytochemical composition and health properties of Sembung plant (*Blumea balsamifera*): A review. *Veterinary World*, 14(5): 1185–1196. <https://doi.org/10.14202/vetworld.2021.1185-1196>