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Review Article

A Comprehensive Review of *Jasminum sambac* Encompassing Its Botany, Phytochemistry, And Pharmacological Potential

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ABSTRACT

Jasminum sambac (L.) Aiton, commonly referred to as Arabian jasmine, is an evergreen flowering shrub belonging to the family Oleaceae. Native to South and Southeast Asia, it is now widely cultivated in tropical and subtropical regions across Asia, the Pacific Islands, and Africa. Morphologically, the plant grows to a height of 1–3 meters and is characterized by its fragrant, white flowers arranged in terminal clusters. This review provides a comprehensive overview of the plant's botanical characteristics, phytochemical profile, traditional medicinal applications, and pharmacological properties. Phytochemical investigations have revealed that J. sambac contains a diverse array of bioactive constituents, including flavonoids, alkaloids, terpenoids, saponins, phenolic acids, and essential oils. Traditionally, various parts of the plant, particularly the leaves and flowers, have been employed in the treatment of fever, skin disorders, wounds, menstrual irregularities, respiratory ailments, and headaches. Pharmacological studies have substantiated many of these traditional claims, demonstrating that J. sambac exhibits antioxidant, anti-inflammatory, antimicrobial, hepatoprotective, gastroprotective, anxiolytic, antidepressant, and anticancer activities. The wide spectrum of biological activities associated with Jasminum sambac underscores its potential as a promising candidate for the development of novel plant-derived therapeutic agents.

INTRODUCTION

Jasminum sambac (commonly known as Arabian jasmine) is a highly fragrant, evergreen shrub belonging to the family Oleaceae, comprising over 200 species distributed in tropical and subtropical regions worldwide. *Jasminum sambac* is native to Southeast Asia, particularly the Indian subcontinent, and has been naturalized in many parts of the world including China, the Philippines, and several Pacific islands [1,2]. The plant is widely cultivated for its aromatic white flowers

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which bloom in clusters and are used extensively in perfume industries, religious rituals, and cosmetic formulations [3-5]. Some of its common names include Mogra, Sambac jasmine, Mallika, and Bela in various regions of Asia [6,7]. The flowers are highly valued for their sweet and intense fragrance, especially during the night, and are often used in making garlands, essential oils, and herbal teas. The shrub typically grows to a height of 1.5–3 meters and prefers well-drained, loamy soils with ample sunlight. *Jasminum sambac* is well known in traditional medicine systems like Ayurveda and Unani, where it is used for the treatment of fever, wounds, eye diseases, headaches, and skin conditions [8,9]. Phytochemical studies have revealed that the plant contains several active constituents such as flavonoids, alkaloids, glycosides, tannins, and essential oils [10]. These bioactive compounds contribute to a wide range of pharmacological activities, including antimicrobial, anti-inflammatory, antioxidant, wound-healing, and sedative effects [11]. Recent research has also demonstrated the plant's potential anticancer, antidiabetic, and antiviral properties, making it a promising candidate for further therapeutic investigations [12]. This review narrates in detail about the plant biology, several phytoconstituents present in the plant and various pharmacological uses of the plant.

1. Taxonomy [13]

Kingdom	Plantae
Subkingdom	Tracheobionta
Division	Magnoliophyta
Class	Magnoliopsida
Order	Lamiales
Family	Oleaceae
Genus	*Jasminum*
Species	*Sambac*

2. Vernacular Names [6]

English	Arabian jasmine, Jasmine
Hindi	Motia, Chameli
Kannada	Mallige, Malligeya
Sanskrit	Mogra, Mallika
Malayalam	Mulla, Mullapoovu
Tamil	Malligai

3. Distribution [14]

Jasminum sambac (L.) Aiton, commonly known as Arabian jasmine, is a fragrant, evergreen shrub in the Oleaceae family. It is widely cultivated and naturalized in tropical and subtropical regions around the world. In India, it is extensively grown in states like Tamil Nadu, Karnataka, Kerala, Andhra Pradesh, Maharashtra, and West Bengal, both in home gardens and as an ornamental plant. Native to South and Southeast Asia, *Jasminum sambac* thrives in warm climates with moderate to high humidity and well-drained soils. It grows well from sea level up to 1,200 meters and adapts to various soil types, including sandy and clay loams. The plant is commonly seen in gardens, courtyards, temple premises, and along roadsides, valued for its fragrance as well as its cultural and religious significance. Beyond India, it is cultivated throughout Southeast Asia, the Philippines, the Middle East, and parts of Africa. Its adaptability to diverse climates and its economic and aesthetic value have made it a popular species in both rural and urban landscapes worldwide.

4. Description of the Plant [15]

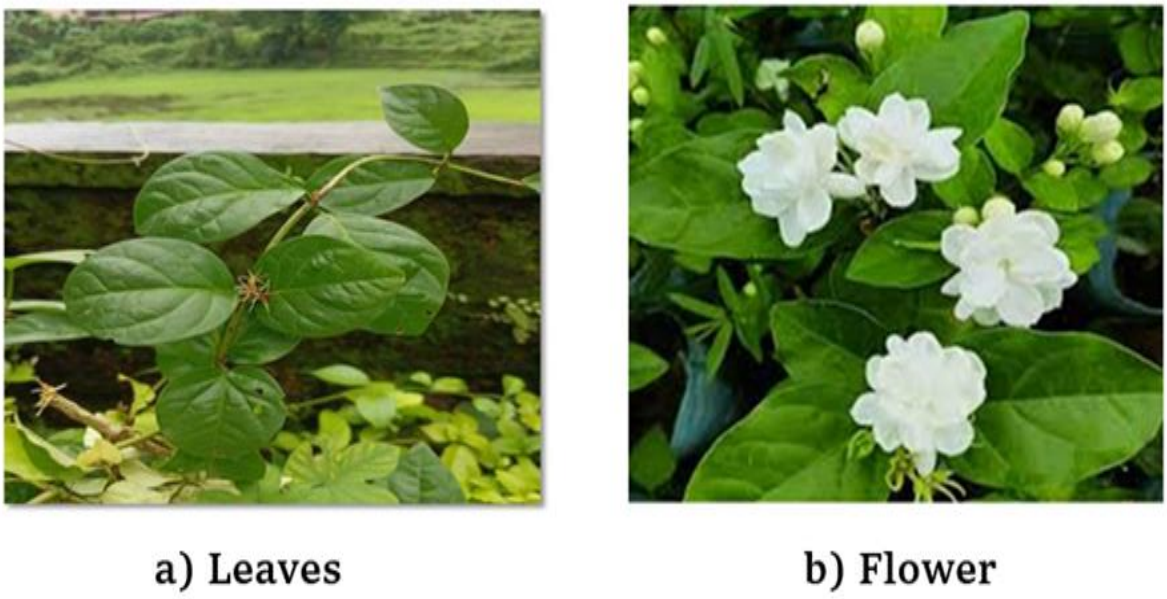

Fig. 1: *Jasminum sambac* plant

- **Leaf:** The leaves are simple, opposite, ovate to ovate-lanceolate in shape, measuring about 5–10 cm in length and 3–5 cm in width. The leaf margins are entire with a smooth texture and a glossy, dark green surface on the upper side, while the underside is lighter and slightly pubescent. The leaves emit a faint, pleasant aroma when crushed.

- **Stem:** The stems are woody, slender, and branching, with a brownish outer bark. Young stems are green and flexible but become more rigid and woody as they mature. The plant has a bushy growth habit and can be trained as a shrub or a small climber.

- **Bark:** The bark is thin, brown to grayish, and smooth when young, becoming slightly rough and fissured with age. It provides structural support for the woody branches.

- **Flower:** *Jasminum sambac* is famous for its intensely fragrant, white, tubular flowers that are usually 2–3 cm long. The flowers are borne singly or in small clusters at the ends of branches. Each flower has five to nine petals that are thick and waxy, with a strong, sweet scent, especially prominent in the evening and night, attracting pollinators such as moths.

- **Fruit and Seed:** The fruit is a small, black, berry-like drupe, about 1 cm in diameter, which contains one to two seeds. The fruit is generally not used for propagation, as the plant is mostly propagated by cuttings or layering due to its slow seed germination and low seed viability.

5. Active Constituents

Jasminum sambac leaves and flowers show the presence of chemical constituents such as flavonoids, alkaloids, saponins, tannins, and phenolic compounds, along with terpenoids, glycosides, steroids, and essential oils. The leaves contain quercetin, kaempferol, rutin, and isoquercetin as the major flavonoids [16]. The phenolic profile includes gallic acid, chlorogenic acid, ferulic acid, and p-coumaric acid,

contributing to the plant's antioxidant potential The essential oil extracted from the flowers has been found to contain linalool, benzyl acetate, methyl anthranilate, indole, and jasmone, which are responsible for its distinct fragrance and medicinal value. The aerial parts also contain β-sitosterol, stigmasterol, and ursolic acid. Phytochemical screening indicates the presence of resorcylic acid, protocatechuic acid, and vanillic acid, which exhibit free radical scavenging activity [17].

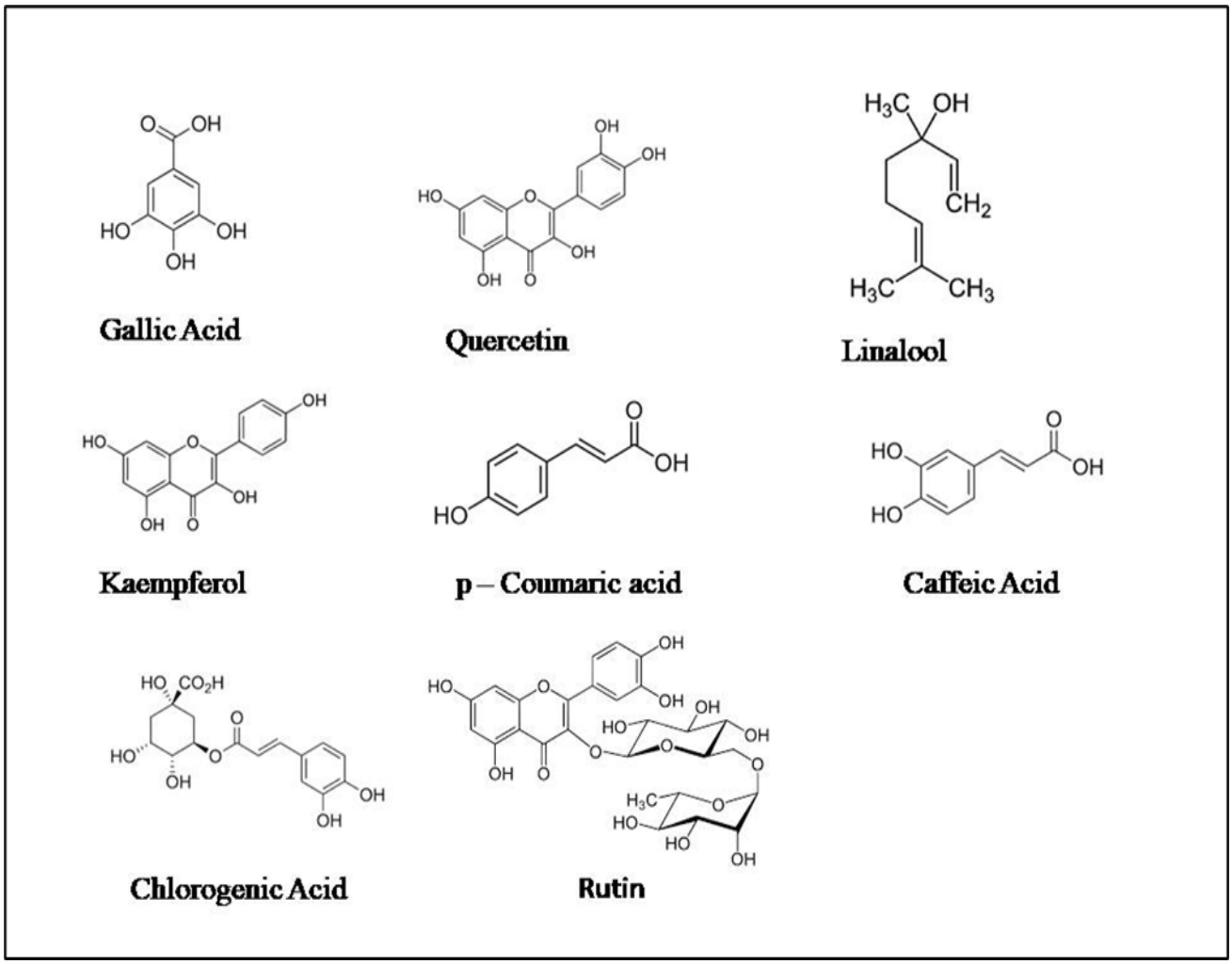

Fig. 2: Chemical Constituents of *Jasminum sambac*

6. Traditional Uses

Jasminum sambac has been widely used in traditional medicine across Asia to treat a diverse spectrum of ailments. A leaf decoction is employed for stomatitis, ulcers, dysuria, menstrual pain, kidney cleansing, and as a diuretic**,** while also being applied topically—either as a paste or oil—to treat wounds, earaches, toothaches, and hemiplegia. A flower decoction is traditionally used to gargle for sore throats, treat fever, conjunctivitis, asthma and abdominal pain**,** and is even given to nursing mothers for colds. The flowers and leaves are also valued as emollients and as a calming agent, especially in cases of anxiety, nervous tension, and insomnia [18]. Ethnic and folk medicine practices have further leveraged their antimicrobial, anti-inflammatory, antioxidant, antidepressant, analgesic, and aphrodisiac properties. Notably, flower extracts

have been tested for hepatoprotective activity in rat models. Finally, the fragrant flowers, fruits and leaves are often used in culinary and aromatherapy applications, including teas, jellies, and natural perfumery [19-20].

7. Pharmacological Uses

7.1.Antimicrobial Activity [7]

Extracts of *Jasminum sambac*, particularly those derived from its leaves and flowers, exhibit potent antimicrobial properties against a broad range of pathogenic bacteria and fungi. Studies have shown inhibition zones against *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, and *Candida albicans*, indicating both antibacterial and antifungal activities. These effects are primarily linked to phenolic compounds and essential oils, which disrupt microbial cell walls and interfere with enzyme function, making the plant valuable in treating minor infections, wounds, and skin diseases.

7.2.Anti-inflammatory and Analgesic Effects [21]

Experimental models have demonstrated significant anti-inflammatory activity of *Jasminum sambac* extracts, often comparable to standard non-steroidal anti-inflammatory drugs (NSAIDs). The mechanism involves inhibition of pro-inflammatory mediators such as prostaglandins and cytokines. Additionally, the plant shows analgesic effects, reducing both peripheral and central pain perception in rodent models. This supports its traditional use in alleviating headaches, arthritic pain, and menstrual cramps.

7.3.Antioxidant Properties [17]

The plant is rich in flavonoids and polyphenolic compounds that exhibit strong free radical scavenging activity in DPPH, FRAP, and ABTS assays. These antioxidants neutralize reactive oxygen species (ROS), thereby protecting cells from oxidative stress-related damage. This property makes *Jasminum sambac* a potential candidate for preventing degenerative diseases such as atherosclerosis, Alzheimer's disease, and certain cancers.

7.4.Anticancer Activity [22]

The anticancer activity of *Jasminum sambac* is assessed through various in vitro methods, with its cytotoxic potential commonly evaluated using the MTT assay. In this assay, the tetrazolium salt MTT [3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide] is reduced to purple formazan crystals by mitochondrial dehydrogenase enzymes in metabolically active cells. The resulting formazan intensity, measured spectrophotometrically using an ELISA reader at a wavelength of 595 nm, is directly proportional to the number of viable cells. The IC_{50} value—defined as the concentration of extract required to inhibit 50% of cell proliferation—was determined for *Jasminum sambac* leaf extract and found to be approximately 138.6 µg/mL against the MCF-7 human breast cancer cell line, indicating moderate cytotoxic activity.

7.5.Antidiabetic Potential [23]

Extracts of *Jasminum sambac* have shown hypoglycemic activity in streptozotocin-induced diabetic rat models. Administration of the extract led to significant reductions in fasting blood glucose levels, improvement in glucose tolerance, and enhancement of insulin sensitivity. The antidiabetic effect is believed to stem from the plant's ability to modulate glucose metabolism enzymes and inhibit carbohydrate-digesting enzymes like α-amylase and α-glucosidase.

7.6.Sedative, Anxiolytic, and Antidepressant Effects [4]

Essential oils extracted from the flowers contain compounds such as linalool and benzyl acetate, which exert calming effects on the central nervous system. Aromatherapy with *Jasminum sambac* oil has been found to reduce stress, anxiety, and promote restful sleep. Rodent models have shown reduced locomotor activity and prolonged sleep time, supporting its traditional use in treating insomnia, nervous tension, and mild depression.

7.7.Gastrointestinal Protective Effects [24]

The ethanolic leaf extract of *Jasminum sambac* demonstrated significant gastroprotective effects in a rat model of HCl/ethanol-induced gastric mucosal injury; oral pretreatment (62.5 – 500 mg/kg) markedly reduced ulcer area, elevated gastric wall mucus and pH, increased mucosal prostaglandin E_2 and superoxide dismutase (SOD) levels, and decreased lipid peroxidation (malondialdehyde), with immunohistochemical assays indicating upregulation of HSP70 and downregulation of Bax as key cytoprotective mediators.

7.8.Hepatoprotective activity [25]

The ethanolic flower extract of *Jasminum sambac* (250 and 500 mg/kg, p.o.) demonstrated significant hepatoprotective effects in various rat models of liver injury induced by carbon tetrachloride (CCl_4), paracetamol (PCM), thioacetamide (TAA), and alcohol. In all models, oral administration of the extract effectively attenuated elevated serum hepatic markers including AST, ALT, ALP, total bilirubin, and LDH, while enhancing antioxidant defenses through increased levels of GSH and SOD, and significantly lowering malondialdehyde (MDA) levels, indicating reduced lipid peroxidation. Histopathological studies showed marked protection against hepatic necrosis, cellular degeneration, and inflammation in treated groups. Immunohistochemical analysis revealed upregulation of heat shock protein 70 (HSP70) and downregulation of pro-apoptotic Bax, supporting the extract's cytoprotective and anti-apoptotic potential. These findings suggest that *Jasminum sambac* flower extract confers dose-dependent hepatoprotection, primarily via its antioxidant, anti-inflammatory, and anti-apoptotic activities.

8. Future Directions

Future research on *Jasminum sambac* should focus on the isolation and characterization of its active phytoconstituents to better understand their specific pharmacological roles. Detailed mechanistic studies are needed to elucidate the molecular pathways underlying its hepatoprotective, antidepressant, and anti-inflammatory effects. Standardization of extracts, toxicological evaluations, and long-term safety profiling are essential for ensuring consistency and efficacy. Clinical trials should be conducted to validate preclinical findings and explore its therapeutic potential in humans. Additionally, developing novel formulations to enhance bioavailability and investigating synergistic interactions with conventional drugs could open new avenues in integrative medicine. Agronomic improvements and biotechnological interventions may further optimize its phytochemical yield and commercial viability.

9. CONCLUSION

Jasminum sambac holds significant botanical, phytochemical, and pharmacological value. It is commonly found throughout tropical and subtropical areas, including regions of South and Southeast Asia and parts of Africa. The plant contains a wide array of bioactive constituents such as flavonoids, alkaloids, terpenoids, phenolic

compounds, and essential oils, which collectively contribute to its diverse medicinal effects. These include antioxidant, anti-inflammatory, antimicrobial, anticancer, anxiolytic, hepatoprotective, and gastroprotective properties. Beyond its medicinal uses, *Jasminum sambac* is also appreciated for culinary and aromatic purposes, often used in teas, fragrances, and traditional cultural practices. Continued research focusing on the isolation and detailed study of its bioactive compounds could lead to the development of new plant-derived therapeutics for various health conditions.

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