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Review Paper

Review On Plumeria Alba Linn Leaves

Pooja Bhardwaj[1]*, Kakli Rai[2], Sapna Yadav[3], Km. Shveta Yadav[4]

*[1]*Research Scholar, Pharmacy College Azamgarh, B. pharm, Pharmacy College Azamgarh, Dr. A.P.J. Abdul Kalam Technical University, Lucknow, Uttar Pradesh, India, 226031*
[2]Assistant Professor, Pharmacy College Azamgarh, Dr. A.P.J. Abdul Kalam Technical University, Lucknow, Uttar Pradesh, India, 226031
[3]Assistant Professor, Pharmacy College Azamgarh, Dr. A.P.J. Abdul Kalam Technical University, Lucknow, Uttar Pradesh, India, 226031
[4]Research Scholar, B. pharm, Pharmacy College Azamgarh, Dr. A.P.J. Abdul Kalam Technical University, Lucknow, Uttar Pradesh, India, 226031

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ABSTRACT

Plumeria alba, a small laticiferous tree or shrub native to tropical America, is commonly referred to as White Champa. Its leaves and stems have been studied for their phytochemical content, as they are utilized in traditional medicine to treat a variety of ailments. The plant is primarily cultivated for its decorative and fragrant flowers, and is also recognized for its medicinal value. Its leaves are lance-shaped to reverse lance-shaped, and the white, fragrant flowers grow in corymb-like clusters. The fruit is edible. The medicinal benefits of these substances are often attributed to their latex, which is typically strong and corrosive. Latex is used to treat ulcers, herpes, and scabies, while the seeds have properties that help stop bleeding. Additionally, its bark is crushed and used as a poultice for treating large tumors. In hypotensive properties. The medicinal significance of this Plumeria species in addressing a wide range of human ailments is documented in Ayurveda, Charaka Samhita, and Sushrita Samhita. For thousands of years, the people of India have relied primarily on plant-based herbal remedies to treat various health conditions. This alternative form of medicine is becoming more widely recognized and embraced globally.

INTRODUCTION

Plumeria, also known as frangipani, is a genus of flowering plants in the dogbane family (Apocynaceae). It mainly includes deciduous

***Corresponding Author:** Pooja Bhardwaj
Address: *Research Scholar, Pharmacy College Azamgarh, B. pharm, Pharmacy College Azamgarh, Dr. A.P.J. Abdul Kalam Technical University, Lucknow, Uttar Pradesh, India, 226031*
Email ✉: pb191228@gmail.com
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shrubs and small tree. The flowers originate from Central America, Mexico, the Caribbean, and South America, extending to Brazil in the south, but they can also thrive in tropical and subtropical areas. Plumeria alba is a small tree or shrub with laticiferous properties, native to tropical America (Henry, 1988). It typically reaches a height of 4.5 meters and is sometimes cultivated in gardens. The plant is primarily grown for its attractive and fragrant flowers. The leaves are lance-shaped to inversely lance- shaped, and the flowers are white and fragrant, arranged in clusters (Chopra RN, 1956). The fruit is edible, while the latex is used to treat ulcers, herpes, and scabies. The seeds have properties that help stop bleeding, and the bark, when bruised, is applied as a plaster to treat hard tumors (Esra M. M. Ali, 1971). The latter species is used as a purgative, cardiotonic, diuretic, and hypotensive agent. (K. Harathi, 1935) A methanolic extract demonstrated antimicrobial properties against *Bacillus anthracis* and *Pseudomonas aeruginosa*. (Md. Azim Uddin, 1992) The plant is said to contain amyrin acetate, a blend of amyrins, ß- sitosterol, scopotetin, and iridoids such as isoplumericin, plumieride, plumieride coumerate, and plumieride coumerate glucoside.

Plumeria alba

Geography

Frangipani is native to tropical regions but thrives in frost-free areas. Its branches and stems are thick and fleshy, and the tree typically has a V-shaped form. The bark is soft, and when cut, it releases a white sap that can be irritating. The flowers are large and funnel-shaped, featuring white petals with a yellow center and a delightful fragrance. Once the flowers fall, they can create litter around the plant. It is resilient to drought and can withstand some salt. Frangipani is famous for its strong, aromatic fragrance and beautiful, spiral-shaped flowers that bloom at the tips of its branches from June to November. The tree has a unique look, with coarse, 20-inch-long deciduous leaves that are grouped at the ends of its thick, grey- green branches. These branches, which have a rough, blunt, sausage-like appearance, grow upright and become densely packed around the trunk, creating a vase or umbrella shape as the tree matures. Although the branches are soft and brittle, they are prone to breaking, yet typically remain intact. They are durable unless impacted or disturbed mechanically. A milky sap leaks from the branches when they are injured or pierced.

Growing Season and Type

1. Plant the white Plumeria in a location that receives full summer sunlight and has fertile, well-draining soil. This tree thrives in soil with a pH range of 6.1 to 7.5 and can grow in loamy, sandy, or clay-based soils, though it performs best in a nutrient- rich environment.
2. Water the young white Plumeria regularly when it doesn't rain. Providing one inch of water per week during the growing season is enough. Be careful not to overwater, as it can cause the plant's roots to rot.
3. Fertilize white Plumeria twice a month during the growing season with a high- phosphorus, water-soluble fertilizer.

- Flower of P. alba
- Leaf of P. alba
- P. alba tree

General information

❖ Scientific Name: Plumeria alba

❖ Common Name: White Frangipani, Caterpillar Tree, Pagoda Tree, Pigeon Wood, Nosegay Tree

❖ Family; Apocynaceae

❖ Availability: Commonly available in many regions within its hardiness range

❖ Native Range: Puerto Rico and the lesser Antilles

❖ Hardiness Range: USDA Zones 10-12

❖ Height: 15 to 25 feet

❖ Spread: 15 to 25 feet

Leaves

The leaves are simple, alternate, and oblong to elliptical in shape, thick and leathery. They can grow up to 14 inches long and 1½ inches wide, with strongly curved edges. The upper surface is smooth and hairless, while the underside is whitish. There are many lateral veins that almost form a right angle with the central vein.

Flowers

The flower has five waxy white petals with yellow centers, grouped in cymes at the ends of the branches.

Fruits

Not visible. Brown, long, pointed follicles, typically found in pairs.

Morphological characteristics

The White Frangipani can either grow as a small shrub or a tree, reaching heights between 0.9 and 6.1 meters. Its thick, succulent branches are widely spaced and often have “knobby” growths. The leaves are typically found clustered at the branch tips. The leaves are dark, leathery, and tend to have a shiny appearance on the upper side, featuring prominent parallel secondary veins that stretch from the central vein to the edges. The flowers of this species are grouped together in clusters that grow at the branch tips, supported by a long, sturdy stalk. Each inflorescence consists of numerous white flowers with a small yellow center. The flowers have five petals that are joined at the base to form a short funnel-shaped tube, which gradually expands as the petal lobes spread. The fruit of this species is a dry follicle that opens along one side to release its winged seeds.

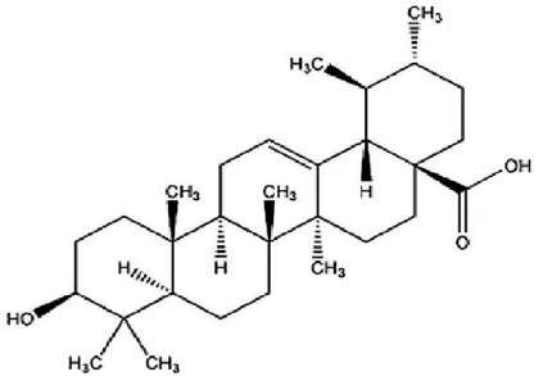
Microscopy

The powdered bark is brown, slightly bitter, and odorless. On microscopic examination reveals the presence of sclerenchyma, parenchyma cells, phloem fibers, starch grains, and cork cells. The values for various parameters, including total ash, acid-insoluble ash, water soluble ash, loss on drying, and swelling index, were determined to be 6.0, 2.3, 1.8, 1.33, and 20.2, respectively. The bark of P.alba contains a high concentration of hot

water-soluble extractives. Preliminary phytochemical analysis shows the presence of alkaloids, carbohydrates, flavonoids, phenolic compounds, and tannins in this plant.

Phytochemical Constituents

The bark of P. alba contains alkaloids, carbohydrates, flavonoids, phenolic compounds, and tannins. This plant is considered medicinally significant due to its composition, which includes amyrin acetate, a blend of amyrins, ß-sitosterol, scopotetin, and iridoids such as iso-plumericin, plumieride, as well as plumieride coumerate glucoside. The flower oil is primarily composed of primary alcohols like geraniol, citronellol, farnesol, and phenyl ethyl alcohol, along with some linalool. The flowers also contain quercetin and kaempferol.



Ursolic Acid

Pharmacological activity

1. Antimicrobial activity

P. alba demonstrates notable antimicrobial properties similar to a broad-spectrum antibiotic, effectively targeting common uro-gastrointestinal pathogenic strains of *Escherichia coli*, which are known for their resistance to synthetic drugs. This aromatic plant could serve as a potential source for developing new antimicrobial compounds and act as a non-toxic antibiotic agent. Frangipani extracts have shown promise as a natural anti-toxic antibiotic, particularly effective against E. coli. (Chemical Characterization, 2023) The antibacterial properties of methanolic extracts from P. alba (Frangipani) petals were assessed using the disk diffusion method against several bacteria, including Escherichia coli, Proteus vulgaris, Staphylococcus aureus, Klebsiella pneumoniae, Pseudomonas aeruginosa, Staphylococcus saprophyticus, Enterococcus faecalis, and Serratia marcescens. Frangipani extract demonstrated strong antibacterial activity against S. saprophyticus, P. vulgaris, and S. marcescens, although its effectiveness was not greater than that of the positive control used. (R. Radha, INDIAN JOURNAL)

2. Larvicidal activity

The leaf extract of P. alba exhibited an LC50 value of 218.8 ppm when tested against
Aedes aegypti mosquitoes. (mosquitoes, 2009)

3. Hepatoprotective activity

The hepatoprotective effects of P. alba extract were evaluated in rats with paracetamol- induced liver toxicity. The study used methanol extracts of the plant *P. alba Lam.*, also known as *Plumeria acutifolia*, at various doses (100, 200, and 400 mg/kg). Poir was evaluated for its effectiveness in treating paracetamol-induced acute liver damage in Wistar rats. The methanolic extract of *P. alba* did not cause any toxic effects or fatalities at doses up to 2000mg/kg body weight in mice, indicating that the extract is safe and non-toxic for further pharmacological testing. The normal control group displayed a typical liver structure, with hepatocytes neatly organized and the central vein unchanged. (chowdhur, 2012)

4. Antiarthritic activity

The anti-arthritic effects of ethyl acetate and n-butanol fractions (100 and 200 mg/kg, orally) from the hydroalcoholic extract of *P. alba* leaves were

assessed in rodent models. These models included formaldehyde-induced acute non-immunological arthritis and Freund's Complete Adjuvant-induced chronic immunological arthritis in Sprague-Dawley rats. The antiarthritic effects of the fractions could be attributed to their ability to protect the synovial membrane, reduce vascular permeability, and prevent cartilage damage.

5. Antifungal activity

The antifungal activities of the methanolic extract and the isolated fraction of *P. alba* were evaluated using the standard dilution test on Mueller-Hinton (MH) agar medium. The inhibition zones were compared to those produced by the standard antibiotic ciprofloxacin (5 mg/disc) using the disc diffusion method. The antifungal effect was also assessed using the standard dilution technique with Sabouraud dextrose agar medium, with results compared to the standard antifungal Clotrimazole (125 mcg/ml). (Shaili Kumari, 2012)

6. Gastroprotective activity

The methanolic extract derived from the stem bark of Plumeria obtusa was assessed for its gastroprotective properties. The extract demonstrated effectiveness by decreasing gastric acid secretion, enhancing gastric mucosal protection, and inhibiting the proton pump mechanism. (singh, 2012) Anti-ulcer activity of the hydoalcoholic extract and its fractions from Plumeria alba l. (Choudhary, 2013)

7. Anticancer activity

Triterpenoids extracted from a variety of plants are widely recognized for their anti- cancer properties established. However, despite reports that P. alba contains triterpenoids, its potential anti-cancer effects have not been thoroughly studied. Therefore, this research aims to investigate the plantds anti-cancer activity and identify any novel compounds with potential anti-cancer properties.

Phyto constituents

P. alba is known to have several bioactive compounds, including sterols, carbohydrates, tannins, triterpenoids, and iridoid glycosides. Its aerial parts, such as the leaves and stems, contain steroids, flavonoids, and alkaloids. Additionally, the plant is said to possess a combination of amyrins, ß-sitosterols, copotein, iridoids, isoplumericin, plumeride, plumeride coumerate, and plumeride coumerate glucoside. The fresh bark and leaves are especially rich in plumeride, resinic acid, and fulvoplumierin, which comprise a blend of terpenoids, sterols, and plumeride. Additionally, the bark harbors several cytotoxic constituents such as iridoids, fulvoplumierin, allamcin, allamandin, 2,5-dimethoxy-p-benzoquinone, plumericin, and the lignan liriodendrin. Additionally, the root bark of *P. alba* is known to have iridoids, tannins, and alkaloids. The bark of *P. alba* composed alkaloids, carbohydrates, flavonoids, phenolic constituents, and tannins. This plant is known for its medicinal properties and contains substances like amyrin acetate, a mix of amyrins, ß-sitosterol, scopotetin, and iridoids such as isoplumericin, plumieride, plumieride coumerate, and plumieride coumerate glucoside. (Jagdish Sura, Pharmacological, phytochemical, and traditional uses of Plumeria alba LINN. an Indian medicinal plant, 2018). The essential oil of the flowers is primarily composed of alcohols like geraniol, citronellol, farnesol, and phenyl ethyl alcohol, with some linalool. Additionally, the flowers contain the flavonoids quercetin and kaempferol. (The Wealth of India: A Dictionary of Indian Raw Materials and Industrial Products (Industrial Products—Part I), 1949)

Uses

Different parts of *P. alba* have been traditionally used to treat various ailments, including malaria, leprosy, rheumatism, and abdominal tumors. The milky latex extracted from the stem and leaves is used in the treatment of skin ailments such as herpes, scabies, and ulcers. (Supriya Gaur, 2012) The bark is used as a plaster for treating hard tumors, while the seeds are utilized for controlling bleeding. Moreover the latex exhibits purgative, cardiotonic, diuretic, and blood pressure-lowering effects. Plumeria alba is utilizedin the treatmentof conditions such as ulcers, herpes, and scabies, while its seeds are known for their hemostatic activity. (Kolakaluri*, 2015). The bark is mashed into a plaster and applied to hard tumors. (R.A.)

CONCLUSION

The entire *P. alba Linn.* plant is used as Medicinal Plant.

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