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Review Article

Phytochemical and Pharmacological Activities of Plumeria Species. a Comprehensive Review

Aditi Gejage^{1*}, Dr. Dhanraj Jadage², Umesh Gaikwad³, Prathmesh Kurane⁴

¹ Tattasaheb Kore College Of Pharmacy , Warananagar Maharashtra 416113.

² Womens College of Pharmacy ,Pethvadgaon , Maharashtra 416112.

^{3,4} Appasaheb Birnale College of Pharmacy, Sangli, Maharashtra 416416.

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ABSTRACT

Since ancient times, plants have been an exemplary source of medicine. Research conducted in last few decades on the plant mentioned in ancient literature or used traditionally In Indian system of medicine, a large number of drugs of either herbal or mineral origin have been advocated for various types of diseases, India has been one of the pioneers in the development and practice of well-documented indigenous systems of medicine, particularly Ayurveda, Siddha and Unani. For millennia, the Indian population has depended mainly upon plant based crude drugs for a variety of ailments. This alternative system of medicine is gaining increasing popularity world wide Plumeria species are widely used as a purgative, remedy for diarrhea, cure of itch, bronchitis, cough, asthma, fever bleeding piles, dysentery, blood disorders and tumors etc. This review on plumeria species focuses over the plant sources, chemical compositions, pharmacological activities ,its ethnomedicinal uses, linked from ancient times to the present with a scope of development in future.

INTRODUCTION:

Plumeria L. (Family: Apocynaceae) is indigenous to tropical America and is found from southern Mexico to northern South America and also most abundant in India. However, due to its ease of propagation through cuttings, many species and hybrids of Plumeria are now widely cultivated and distributed in the warmer regions

of the world ¹ The trees were introduced to Malaysia and at least three main species are commonly found: *Plumeria obtusa*, *P. rubra* and *P. acuminata* ,*p.alba* ²

***Corresponding Author:** Aditi Gejage

Address: Tattasaheb Kore College Of Pharmacy , Warananagar Maharashtra 416113

Email ✉: aditigejage2711@gmail.com

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Figure 1: Plumeria

TAXONOMICAL CLASSIFICATION OF PLUMERIA GENUS

Kingdom: Plantae

Subkingdom: Tracheobionta

Super division: Spermatophyta

Division: Magnoliophyta

Class: Magnoliopsida

Sub class: Asteridae

Family: Apocynaceae

Genus: Plumeria

PLUMERIA ACUMINATA

INTRODUCTION:

Plumeria acuminata is used as medicinal plant native to Mexico, Central America, the Caribbean and South America spreaded throughout the tropics. About 155 genera and 2000 species are distributed primarily in the tropical and subtropical region. About eight species are known in India and of which *Plumeria acuminata* and *P. rubra* are commonly grown. They are commonly known as "Temple tree" or "Champa" in India.³

Depending on location many other common names also exists like "Kembang kamboja" in Indonesia. "Kalachuchi" in the Phillipines, Champa in Laos and Dead man's fingers in Australia. The plant material is widely used as purgative, remedy for pain, fever, diarrhoea and cure for itch. The milky juice is employed for the treatment of inflammation. The excessive doses of the latex derived from *Plumeria acuminata* are poisonous and the root is a violent cathartic. The essential oil from the flowers possesses

antifungal activity. In Unani practice, the medicinal herb is used to treat tumors and rheumatic pains. This review compiles the botany, pharmacology, folkloric and traditional medical applications of the plant on the basis of data obtained from various sources.³

It is a tiny tree that ranges in height from 3 to 7 m. Its stem is smooth and shiny, and its plentiful white latex is readily broken. The leaves clustered at the branch's tip were typically rectangular in shape and measured 40 cm long by 7 cm wide. Simple, opposite, infrequently whorled or alternate, with either absent or infrequently present stipules. The stamens are inserted inside the corolla tube of the cymose, terminal, or axillary inflorescence. The flowers are aromatic, bisexual, and 5–6 cm long, with an inner lower half that is yellow and an upper portion that is white.⁴



Figure 2: Plumeria Acuminata

TAXONOMICAL CLASSIFICATION OF PLUMERIA ACCUMINATA

Common Name: Frangipani

Kingdom :Plantae

Phyllum: Trachyophyta

Class: Magnoliopsida

Order: Gentianales

Botanical Name : *Plumeria accuminata*

Family: Apocynaceae

Species : *Plumeria rubra*

PHYTOCHEMICAL CONSTITUENTS OF PLUMERIA ACUMINATA

Phytochemical studies of the genus *Plumeria* started as far back as 1870 when Peckolt and Boorsma have reported the isolation of the Plumieride as the main

irridoid glucoside from the stem bark of *P. rubra* and *P. lancifolia*. The stigmast-7-enol, lupeol carboxylic acid, lupeol acetate and ursolic acid had been isolated from leaves. The researchers have successfully isolated Fulvo plummierin, Plumericin along with three new compounds isoplumericin, β -dihydroplumericin and β dihydroplumericinic acid from roots of *Plumeria acuminata*. The steam distillate of *Plumeria acuminata* yields an essential oil (0.04-0.07 %) which mainly consist of primary alcohols, geraniol, citronellol, farnesol and phenylethylalcohol with little amount of aldehyde and ketones (6.8 %).

These oils have acid value (20.2) and saponification value. Stigmast-7-enol, Lupeol carboxylic acid, lupeol acetate, Urosolic acid had isolated from ethanolic extract of leaves of *Plumeria acuminata* & also shows significant antimutagenic activity³. The steam distillate of *P. acuminata* yields an essential oil (0.04-0.07 %) which mainly consist of primary alcohols, geraniol, citronellol, farnesol and phenylethyl alcohol with little amount of aldehyde and ketones (6.8 %).

PHARMCOLOGICAL ACTION OF PLUMERIA ACUMINATA

Anti-inflammatory activity:

The methanolic extract of *Plumeria acuminata* exhibited significant anti-inflammatory activity on the tested experimental animal models. The extract (500 mg) exhibited maximum anti-inflammatory effect. Carageenan-induced oedema has been commonly used as an experimental animal model for acute inflammation and is believed to be biphasic. The cotton pellet method is widely used to evaluate the transudative and proliferative components of the chronic inflammation. The results obtained in this study indicated that the methanol extract of *P. acuminata* possess potent anti-inflammatory activity in both acute and chronic models⁵.

Antioxidant activity:

The laboratory experimental study on animal models exhibited that the antioxidant activity of methanolic extract of *P. acuminata* (MEPA) increases in a dose dependent manner 50, 100, 200, 300, 400, and 500 μ g. Like antioxidant activity, the effect of MEPA on

reducing power increases in a dose dependent manner. In DPPH radical and nitric oxide radical scavenging assays, MEPA exhibited maximum activity at the concentration of 125 μ g/ml. The methanol extracts of leaves of *P. acuminata* possesses potent antioxidant and free radical scavenging⁵.

Antimutagens from *Plumeria acuminata*:

The ethanolic extract of the green leaves of *Plumeria acuminata* showed antimutagenic activity. Four isolates A1, C1, D3, and F2 from the bioactive hexane and carbon tetrachloride fraction of the ethanolic extract of leaves of *Plumeria acuminata*. The structure elucidation studies indicated that C1 is stigmast-7-enol, D3 is lupeol carboxylic acid and F2 is ursolic acid. The structure of A1 not fully elucidated but MS data suggested that it contained a long hydrocarbon chain. These fractions were proved to possess antimutagenic effect.⁵

Antimicrobial activity:

Methanol extracts of leaves of *Plumeria acuminata* Ait9 Methanol extracts of leaves of *Plumeria acuminata*. (MEPA) was investigated for their in vitro antimicrobial properties by agar disc diffusion method. The methanolic extracts of MEPA inhibited the growth of both Gram positive bacteria (*Bacillus subtilis*, *Staphylococcus aureus* and *Micrococcus luteus*) and Gram negative bacteria (*Escherichia coli*, *Pseudomonas aeruginosa* and *Salmonella typhimurium*). The Gram positive bacteria tested appeared to be more susceptible to the extracts than the Gram negative bacteria. The extracts at the concentration ranging between 250 μ g/ml and 1000 μ g/ml showed inhibitory activity against all tested bacteria except *S. typhimurium* which was not inhibited at 250 μ g/ml concentration. MEPA was found neutral against *M. luteus*, *E. coli*, *P. aeruginosa* and *S. typhimurium*. It is concluded that the plant possesses potent antimicrobial activity.⁵

PLUMERIA RUBRA

INTRODUCTION:

Plumeria rubra L. is a deciduous, commonly ornamental, tropical plant grown in home premises, parks, gardens, graveyards, because of its beautiful and



attractive flowers of various colours and size. The different parts of the plant are used traditionally to treat various diseases and conditions like leprosy, inflammation, diabetic mellitus, ulcers, wounds, itching, acne, toothache, earache, tongue cleaning, pain, asthma, constipation and antifertility.⁶

Plumeria rubra is a deciduous, semi-succulent shrub or small tree with a broad crown that is often as wide as the tree is tall; it can grow up to 12 metres tall in the wild but is usually smaller in cultivation. Frangipani is well-known for its intensely fragrant, lovely, spiral-shaped, reddish blooms which appear at branch tips June through November. The tree itself is rather unusual in appearance; the 12 to 20-inch-long, coarse, deciduous leaves cluster only at the tips of the rough, blunt, sausage-like, thick, grey-green branches.

Branches are upright and rather crowded on the trunk forming a vase or umbrella shape with age. They are rather soft and brittle and can break but are usually sturdy unless they are mechanically hit or disturbed. The crown loses its leaves for a short time during the winter displaying the coarse-textured, stubby branches. A milky sap is exuded from the branches when they are bruised or punctured⁶.

There is a lore which says that the name Frangipani derives from a perfume created by an Italian family of the same name. Frangipani, also known as the Plumeria, is native to warm tropical areas of the Pacific Islands, Caribbean, South America and Mexico. They can grow to be large shrubs or even small trees in mild areas of the U.S. In tropical regions, Plumeria may reach a height of 30' to 40' and half as wide.

Their widely spaced thick succulent branches are round or pointed, and have long leather, fleshy leaves in clusters near the branch tips. Leaves tend to fall in early winter since they are deciduous and sensitive to cold. Common White Frangipani has very fragrant white flowers with yellow centers. The petals are small and strongly overlapping, giving the impression of a flower in the process of unfolding⁶



Figure 3: *Plumeria Rubra*

TAXONOMICAL CLASSIFICATION OF PLUMERIA RUBRA

Vernacular Common Name : Frangipani

English : Frangipani

Kingdom : Plantae

Subkingdom : Tracheobionta

Division : Magnoliophyta

Class : Dicotyledons

Order : Gentiales

Family : Apocynaceae

Botanical Name : *Plumeria rubra*

PHYTOCHEMICAL CONSTITUENTS OF PLUMERIA RUBRA:

Plumeria rubra is a good source of ursolic acid, is a natural pentacyclic triterpenoid carboxylic acid. The gas chromatography of *Plumeria arubra* revealed that floral oil comprises 31 volatile component mainly of alkanolic acid, lauric acid, myristic acid and palmitic acid, were major component, rest of oil contains hydrocarbon, alcohol, ether, aldehyde etc.

A variety of chemical compounds have been isolated and identified from *P. rubra*, including iridoids, triterpenoids, flavonoids, glycosides, phenolics, alkaloids, carbohydrates, amino acids, fatty acid esters, spinogolipid, lignin, monoglyceride, coumarin and some organic compounds.

The compounds were isolated from the heartwood of *Plumeria rubra*, Plumericin and isoplumericin displayed molluscicidal, cytotoxic and antibacterial activity, hydroxyl acetophenone was weakly cytotoxic.

By bioactivity-directed fractionation of the *P. rubra*, cytotoxic constituents have been reported from the bark of *Plumeria rubra* collected in Indonesia. Threeiridoids, fulvoplumerin, allamcin, andallamandin, as well as 2, 5-dimethoxy-p-benzoquinonewere found to be active constituents.

The flower volatile constituents of *Plumeria rubra* L. grown in foothills of north India were analyzedby gas chromatography (GC) and GC-mass spectrometry (GCMS). Altogether 31 constituents, representing 94.0% of flower essential oil and 89.2% of steam volatile extract were identified. Benzyl esters (49.0%, 41.4%), aliphatic alkanes (25.8%, 7.2%), oxygenated monoterpenes (0.1%, 27.1%), oxygenated sesquiterpenes (9.5%, 8.8%), and diterpene (9.4%, 0.2%), were the major class of constituents. Benzyl salicylate (26.7%, 33.5%), benzyl benzoate (22.3%, 7.9%), geraniol .⁷

PHARMACOLOGICAL ACTIVITY OF PLUMERIA RUBRA

Anxiolytic effect-

Ethanollic extract of flower of *plumeria rubra* and its fraction was evaluated for anxiolytic effect using elevated plus model of anxiety. It was observed that the flower extract of *Plumeria rubra* and its insoluble butanollic fraction might possess significant anxiolytic potential.

Antibacterial activity-

In vitro antibacterial activity of ethanol, chloroform and ethyl acetate and aqueous extract of leaves of *Plumeria rubra* was performed using disc diffusion method against *S. epidermis* and *E. coli*. Of bacterial strains. It was observed that etanollic extract of leaves showed partial antibacterial activity against *S. epidermis* at 750and 1000 µg/ml and at 1500 µg/ml in *E. coli*. Chloroform extract showed partial antibacterial activity against *S. epidermis* at 750and 1000 µg/ml and showed complete antibacterial activity against *E. coli* at 1500 µg/ml. ethyl acetate extract showed partial antibacterial activity against *S. epidermis* at 1000 µg/ml and complete against *E. coli* at 1500 µg/ml aqueous extract shows partial antibacterial activity against *S. epidermis* at 750 and 1500 µg/ml and

complete antibacterial activity at 1500 µg/ml for *E. coli* respectively. Standard ciprofloxacin showed complete antibacterial activity against *S. epidermidis* and *E. coli* at 500 µg/ml and 750 µg/ml respectively.

Antioxidant, cytotoxic and hypolipidemic activityMethanolic flower extract of *Plumeria rubra* were evaluated for antioxidant potential, cytotoxic and hypolipidemic activity. DPPH assay showed 72% inhibition and total phenolic content was found 167.3 µg/ml, also observed significant free radical scavenging activity at 1.67 mg/ml. ant cholesterol assay demonstrated that *Plumeria rubra* had highest hypolipidemic activity 60%. It was revealed that MTT assay using HCT cell lines 116 was failed to control proliferation of colon cancer cell by *Plumeria rubra*

Hepatoprotective activity- Alcoholic extract of pod *Plumeria rubra* was evaluated on CCL4 induced hepatic injury in male albino rats. It was found that alcoholic pod extract of *Plumeria rubra* at 200mg/kg and 100mg/kg possess significant hepatoprotective effect ⁴

Antifertility activity-Ethanollic extract of *Plumeria rubra* evaluated for abortifacient properties. it was observed that at dose of 50,100 and 200 mg/kg body wt produces dose dependent adverse effect on fertility index and number of implantation in the uterine horn of the female rats.

Antimicrobial activity- *Plumeria rubra* extracts were evaluated for antimicrobial activity using cup plate method and minimum inhibitory concentration against *Escheria Coli*, *Bacillus subtilis*, *Staphylococcus aureus* and *aspergillus niger*.it was observed that a methanol extract exhibited significant activity against bacterial strains. As compared with Ciprtofloxacin as a standard. Aqueous extract was active against fungal strains as compared with standard Flucanazole⁸

Antiviral activity- *plumeria rubra* containing fulvoplumerin act as inhibitors of human immunodeficiency virus type 1 (HIV) reversal transcriptase.

Anti-inflammatory and antioxidant activity- Methanolic extract of flowers of *Plumeria rubra* showed significant antioxidant and anti-inflammatory activity and phytochemical analysis indicate that *plumeria rubra* was rich in flavonoid and phenol contents .



Anthelmintic activity- Saponin extract of leaves of *Plumeria rubra* exhibited significant anthelmintic effect in concentration of 25 mg/ml comparable with the standard piperazine citrate.

Anti-oxidative and proteolytic activities -Anti-oxidative and proteolytic activities were performed on lattices of *plumeria rubra*. results revealed that *plumeria rubra* possesses relevant enzymatic and proteolytic activities .

P. rubra flowers revealed the presence of tannins, alkaloids, flavonoids, saponins, gums and terpenoids. ~ 206 ~ Journal of Medicinal Plants Studies Strong occurrence of tannins in extract has been shown to possess potent anti-inflammatory properties. Analgesic and anti inflammatory effects have been observed in *plumeria rubra*⁸

PLUMERIA ALBA

INTRODUCTION:

The Genus *Plumeria* (Apocynaceae) contains a large number of shrubs and flowering trees which are grown throughout the tropics. *Plumeria alba*, locally known as forget-me-not in Ghana, is an essential member of the *Plumeria* genus .

It is indigenous to South America and primarily cultivated for its blossoms and fragrant flowers. Ethnomedicinally, different parts of forget-me-not are used in treating several diseases, such as abdominal tumors, leprosy, rheumatism, and malaria. The latex of the leaf and stem is used to treat skin diseases like ulcers, scabies, and herpes . The bark of *P. alba* is used as a plaster for challenging tumors, and the fruit is known as a natural source of antioxidants that can reduce free radical-mediated diseases such as diabetes, cancer, and coronary heart disease. Reports on essential oils from *P. alba* from various countries indicate varying chemical compositions. Lawal et al. in Nigeria identified 43 compounds as the constituents of *P. alba* flower essential oil⁹

Since essential oils isolated from *P. alba* plant parts in different countries possess varying chemical constituents (qualitative and quantitative) and different biological activities, likely as a result of the differences in chemical composition, the flower and leaf essential

oils of Ghanaian cultivars of *P. alba* were studied in this work. Gas chromatography-mass spectrometry was used to identify the essential oils' chemical constituents, whereas standard *in vitro* assays were used to evaluate the antioxidant, antimicrobial, and antibiofilm activities of oils. In the flower and leaf essential oils, 17 and 24 compounds, respectively, were identified, with linalool (flower) and hexadecane (leaf) being the major components. Both oils possessed appreciable antioxidant and antimicrobial activities. Again, both oils were able to inhibit biofilm formation in *Pseudomonas aeruginosa*

Plumeria alba Linn. is a small latex bearing tree or shrub native of South America. *P. alba* is known for its pungently fragrant flowers and spiral shaped blooms. Different parts of *P. alba* are used in traditional medical systems for the treatment of various diseases. Extracts of *P. alba* have displayed antimicrobial , antifungal and anti arthritic potentials . In addition, the extracts exhibited both significant antitumor and hepatoprotective activities in mice and rats. Leaf extracts of *P. alba* was found to exhibit larvicidal activity against *Aedes aegypti* mosquitoes . Extracts are less toxic to rats at tested doses . Phytochemical studies showed that *P. alba* contains amyris acetate, β -sitosterol, scopoletin, the iridoid isomer plumericin, plumieride, plumieridecoumarate and plumieridecoumarate glucoside. Antibacterial triterpenoids were isolated from the plant .

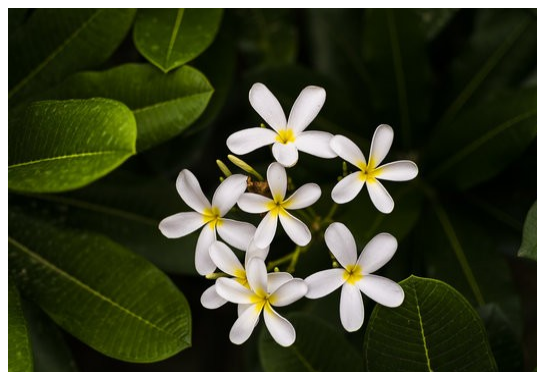


Figure 4: *Plumeria Alba*

TAXONOMICAL CLASSIFICATION OF PLUMERIA ALBA

Kingdom : Plantae

Synonym: *Plumeria revolutifolia* Stokes



Family : Apocynaceae

Binomial Name: *Plumeria alba*

Species : *P. alba*

Genus : *Plumeria*

PHYTOCHEMICAL CONSTITUENTS OF PLUMERIA ALBA

The essential oils were extracted using the Clevenger-type apparatus and characterized using GC-MS. In the flower essential oil, a total of 17 compounds were identified, with linalool (23.91%), α -terpineol (10.97%), geraniol (10.47%), and phenyl ethyl alcohol (8.65%) being abundant. In the leaf essential oil, a total of 24 compounds were identified, with benzofuran, 2,3-di, hydro-(3.24%), and murolol (1.40%) being present.⁹

A total of 46 volatile constituents were identified, representing 98.11 ± 0.5 % of the total essential oil. The essential oil was rich in esters comprising 48.61 ± 0.3 % of the essential oil followed by oxygenated monoterpene (15.41 ± 0.1 %), oxygenated sesquiterpene (10.43 ± 0.08 %) and sesquiterpene hydrocarbons (10.39 ± 0.1 %), etc. The dominant components of the essential oil were benzyl salicylate (33.98 ± 0.04 %), benzyl benzoate (12.37 ± 0.03 %), germacrene B (10.30 ± 0.05 %), and linalool (8.17 ± 0.11 %). Other notable constituents identified in the essential oil were (2Z,6Z)-farnesol, *n*-heneicosane, *n*-nonadecane, (Z, E)-geranyl linalool, *trans*-sabinene hydrate acetate, (2E,6Z)-farnesol, α -terpineol, *n*-docosane, geranyl benzoate, *n*-tricosane, α -bisabolol, nerol and 8-cedren-13-ol, etc. (1.17 % - 4.76 %).¹⁰

In India, 46 volatile constituents have been characterized in the *P. alba* flower essential oil, accounting for 98.1% of the total essential oil constituents. Esters were the major compound class (48.6%) identified in that study. Other studies have focused on the biological activities of essential oils from *P. alba*.

The bark of *P. alba* containing alkaloids, carbohydrates, flavonoids, phenolic compounds and tannins. The plant is reported as medicinally important being having amyris acetate, mixture of amyris, β -sitosterol, scopoletin, the iridoid isomer plumericin, plumieride, plumieride, coumarate and plumieridecoumarate

glucoside. The flower oil mainly consists of primary alcohol, such as geraniol, citronellol, farnesol and phenyl ethyl alcohol and some linalool. The flowers contain quercetin and kaempferol. The oil of *P. obtuse* was found to be rich in benzyl salicylate (45.4%) and benzyl benzoate (17.2%), but also minute concentrations of aliphatic acids.¹⁰

PHARMACOLOGICAL ACTIVITY OF PLUMERIA ALBA

Antimicrobial activity: *P. alba* appears to have significant antimicrobial capacity resembling a broad spectrum antibiotic against the common uro-gastro pathogenic *Escherichia coli*, one of the common bacteria with pathogenic strains and are relatively resistant towards synthetic drugs. This aromatic plant can be a potential source of evolving newer antimicrobial compound and as a non-toxic antibiotic producer agent. The extracts of frangipani have a potential as a natural anti-toxic antibiotic producer, especially against *E. coli*.¹¹

Antibacterial activity : (Frangipani) petals methanolic extracts were evaluated against *E. coli*, *Proteus vulgaris*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *P. aeruginosa*, *Staphylococcus saprophyticus*, *Enterococcus faecalis*, and *Serratiamarcescens* using disk diffusion method. Frangipani extract also showed high antibacterial activity against *S. saprophyticus*, *P. vulgaris*, and *S. marcescens*, but not more than the zones of the positive control used.¹²

Larvicidal activity: Leaves extract of *P. alba* found (LC50 218.8 ppm) against *Aedes aegypti* mosquitoes.

Hepatoprotective Activity: Hepatoprotective activity of *P. alba* extract against paracetamol induced hepatotoxicity in rats. The methanol extract at different doses (100, 200, and 400 mg/kg) of the plant *P. alba* Lam. syn. *Plumeria acutifolia*. Poir were tested for its efficacy against paracetamol-induced acute hepatic damage in Wistar rats. Methanolic extract of *P. alba* did not produce any toxic symptoms or mortality up to the dose level of 2000 mg/kg body weight in mice, and hence the extract was considered to be safe and non-toxic for further pharmacological screening. The normal control group showed a normal liver architecture, hepatocytes very well arranged, central vein without alterations.



Antiarthritic activity: The anti-arthritic potential of ethyl acetate and n-butanol fractions (100 and 200 mg/kg, p.o.), respectively of hydroalcoholic extract from leaves of *P. alba* were evaluated in vivo models of rodents by using formaldehyde-induced acute non-immunological and Freund's Complete Adjuvant-induced chronic immunological arthritis in Sprague-Dawley rats. Antiarthritic potential of fractions may be due to the protection of synovial membrane, vascular permeability, prevention of cartilage destruction. Antifungal activity Antifungal activities of methanolic extract and the isolated fraction of the plant *P. alba* was assessed by standard dilution test using Mueller Hinton agar (MH) medium. The zone of inhibition was compared with that of Standard antibiotic ciprofloxacin (5 mg/disc) by disc diffusion method. The anti-fungal activity was assessed by standard dilution technique using Sabouraud dextrose agar medium.¹²

PLUMERIA OBTUSA

INTRODUCTION:

P. obtusa is commonly grown for ornamental purpose and consist of sweetly fragrant flowers. The beautiful flowers of plant are used for ornamental purpose because of their fragrance . As the flowers are highly fragrant and bright in colour they become the most attractive feature of the plant. The flowers are also used to make necklaces and as offerings to the deities in Combodia .The plant is a symbol of immortality in India because the plant produces leaves and flowers even after it has been removed out of the soil .Different parts of the plant mentioned traditionally are used to treat various diseases. This review is aimed towards providing an overview and critically analyse the reported traditional uses, morphology, phytochemistry, pharmacological activities and toxicological studies of *P. obtusa* and to identify the remaining gaps and thus supply a basis for further investigations.¹³

Plumeria obtusa L. (Apocynaceae) is a deciduous, ornamental, tropical plant grown in premises, parks, gardens, graveyards, because of its attractive and fragrant flowers. The different parts of the plant are coming future.used traditionally to treat various diseases like diabetes mellitus, wounds and skin disease, diuretic, purgative, abortion and also used in cosmetics,

aromatherapy, necklaces and as offerings. In spite of the many pharmacological properties reported for *P. obtusa*, there is not a review that studies all the phytochemicals and pharmacological activities and critically analyse all of them.¹³

Plumeria obtusa L. (Apocynaceae) commonly known as Gulechin, Graveyard Tree or Frangipaniries a small, much-branched, evergreen or partly deciduous tree. The plant has been used in the management of diabetes mellitus, asthma, gonorrhea and constipation and also as a contraceptive, expectorant and anthelmintic¹⁴

Plumeria (Apocynaceae) is a genus comprising mostly of lactiferous trees and deciduous shrubs. *Plumeria obtusa* L.. *Plumeria obtusa* is a mainly evergreen tree bearing spreading branches and a rounded dome. Although the common name of the plant is "Singapore", but its origin is from Colombia. Its height ranges to 8m and circumference to 4m. Leaves are pointed and oval shaped up to the length of 18cm. During summer–autumn tubular fragrant bearing flowers occur.¹⁵



Fig.5.Plumeria Obtusa

TAXONOMICAL CLASSIFICATION OF PLUMERIA OBTUSA

Kingdom: Plantae

Synonym: *Plumeria marchiiurb*

Family : Apocynacy

Genus: *Plumeria*

Species : *plumeria obtusa*

PHYTOCHEMICAL CONSTITUENT OF PLUMERIA OBTUSA



A variety of chemical compounds have been isolated and identified from *P. obtusa*, including essential oils, iridoids, triterpenoids, flavonoids, phenolic acids, cardiac glycosides, coumarin, cardenolide, fatty acid esters and steroids which were previously reviewed to an extent by Begum et al., 1994 and Sharma et al., 2011 but both doesn't contain all the phytochemical and the classification of phytochemicals is also not made in Begum et al., 1994. Hence, in this review we have summarized all the phytochemicals with classification in Table 3 and the chemical structures of all are attached as supplementary material with the paper, shown in Notice, environmental and other factors such as geographical source, harvest time and storage time may cause variability of chemical components contained in *P. obtusa*.¹⁶

Kaneroside, oleandrin, -amyrin, neriucoumaric acid, isoneriucoumaric acid, aliphatic acid, oleanonic acid, methyl p-E-coumarate, and scopoletin are pentacyclic triterpenoids found in *P. obtusa*. Oacetylplumieride. Plumieride Pcoumarate Obtusilin, Oleandrin, and Obtusol are examples of antacids. Obtusin, -Hydroxy-27-[(Z)-p-coumaroyloxy]-urs-12-en-28-oic acid, -urs-12-en-28-oic acid, -urs-12- Obtusin, Obtusilin (14 3b-hydroxy-11-oxours- 12-en-28- oic acid), Obtusinidin, Obtusidin, Ob 27-[p-(E)-Coumaroyloxy] 20Z ursolic acid-Dammara-, 20 (22)-dien (3,20Z)Dammara-12,20 (22)-dien-3-ol, (327-diol, 27-Hydroxyolean-12-en-3Urs-12-en-3-one, (3 β)[(Z)-Feruloyloxy] -273-hydroxyurs-12-en-28-oic acid. 14 (3b)-3,28-dihydroxyurs-12-ene (uvaol). 6"-Oacetylplumieride p-E-coumarateiridoids.

The areal portions of *P. obtusa* include pentacyclic triterpenoids such as kaneroside, oleandrin, -amyrin, neriucoumaric acid, isoneriucoumaric acid, aliphatic acid, oleanonic acid, methyl p-E-coumarate, and scopoletin, all of which have previously been unreported from this source.⁸ . Two new iridoids and three recognize iridoids were isolated from *P. obtusa* fresh, entire spring leaves. The new iridoids are 6"-Oacetylplumieride p-E-coumarate^{42,43} and 6"-Oacetylplumieride p-Z-coumarate⁴⁴, while the remaining compounds are plumieride, plumieride p-Z-coumarate^{42,43} and plumieride p-Z-coumarate⁴⁴.¹⁶

PHARMACOLOGICAL ACTIVITY OF PLUMERIA OBTUSA

Gastroprotective activity:

The methanolic extract of *Plumeria obtusa* from the stem bark was evaluated for gastric ulcer and inhibited gastric secretion in pylorus ligated rats.⁶⁵ . 5.7 Antiarthritic activity The anti-arthritic potential of ethyl for gastroprotective activity by pylorus ligation and indomethacin models. The extract showed activity due to reduction of gastric acid secretion, gastric cytoprotection and proton pump inhibition mechanism.⁶⁴ . Antiulcerogenic property of hydroalcoholic extract and fractions obtained from the leaves of *Plumeria alba* L were performed using the protocols of ulcer induced by non-steroidal anti-inflammatory drugs, ethanol and pylorus ligation. The hydroalcoholic extract (200 and 400 mg/kg), ethyl acetate and n-butanol fractions (100 and 200mg/kg, p.o.), respectively showed gastric ulcer healing effect in indomethacin induced ulcer model. Both EAPA and BPA showed gastric cytoprotective effect in ethanol-induced¹⁷

Other activity:

P. obtusa is used in traditional medicine as healers to diabetes mellitus. Leaves are used as purgative, treat headache, skin defects, abortifacient, healing wrap. Roots are used in treatment of skin and liver diseases, leprosy, tumors, ulcers, etc. The plant is also reported to have anticancer properties. The latex is used as diuretic and purgative. Flowers are used as ornamental purpose, perfumes, etc. In Asia, decoction of leaves of the plant is used for treating wounds and skin diseases. Vietnamese people believed that the plant has healing powers and also used it to treat various skin disease.¹⁷

CONCLUSION:

Our pharmaceutical industry is focused towards the expansion of new innovative/indigenous plant based drugs through examination of leads from traditional system of medicine. In recent years, traditional uses of natural compounds, especially of plant origin received much attention as they are well tested for their efficacy and generally believed to be safe for human use. It is best classical approach in the search of new molecules for management of various diseases. *Plumeria* species



has wide scope to isolate various phytochemical constituent and evaluate their pharmacological screening to get better therapeutic value. *P. rubra* is a valuable medicinal source and further study in this topic can validate the traditional and ethnobotanical use of the plant. However, many aspects of the plant have not been studied yet

However, many aspects of plumeria species have not been studied yet. For example, the activity of the active chemical constituents from *P. obtusa* has been reported only for one pharmacological activity, while the rest have been proven from the crude extracts, i.e., lack of bioguided isolation strategies and unclear mechanism of action is observed. In addition, the bioavailability, pharmacokinetics and structural activity relationship studies of active ingredient to be isolated need to be studied, which will contribute to the development of a phyto preparation containing *P. obtusa* extracts. Toxicity studies of the plant are poorly investigated and need to be further explored. Studies are also required on long term *in vivo* toxicity, toxicity in humans and the clinical efficacy of the plant species. Based on the results of the review, it can be concluded that frangipani flowers have the potential as an antibacterial

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