

# Plumeria Rubra: A Blooming Delight - A Review of Nature's Floral Gem in Asthma

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## ABSTRACT:

An ornamental tree in the Apocynaceae family is Plumeria rubra. The plant Plumeria rubra has flowers. Flowers have a strong scent and are typically rich in yellow with a crimson, pink, or purple core. According to reports, plumeria rubra possesses hepatoprotective, antioxidant, anti-inflammatory, anti-fertility, and antibacterial properties. Nonetheless, it has been utilized as an abortifacient, drastic, purgative, blennorrhagia, toothache, and carious teeth remedy in traditional medical systems throughout cultures. The fragrant, bechic flowers are used to make the widely consumed pectoral syrup.

**Keyword:** Plumeria rubra, Frangipani, Asthma, Herbs, Herbal medicines.

## I. INTRODUCTION :

Natural drug substances generally play four important and noteworthy roles in the current medical system, which fully justifies their acceptable place in the current therapeutic arsenal. [1-4]

### Plants :

Plants are the primary source of raw materials for both conventional and modern medical systems, with 80% of industrialized people relying on plant-derived medicines. Indigenous medical systems like Ayurveda use herbs for various illnesses. [5-9]

### Ayurveda :

Ayurveda suggests plants are useful and less hazardous, with lower risk of adverse effects compared to prescription drugs. Their use in underdeveloped nations is crucial for health maintenance and disease prevention. [10-12]

### Herbal Medicines:

Herbal remedies offer a safe and effective alternative to synthetic pharmaceuticals, with minimal negative effects. Medicinal plants, rich in phytoconstituents, have been used for centuries to treat diseases. As our environment becomes increasingly fragile, natural defenses are increasingly insufficient. Since ancient times, plants have been used extensively to treat various illnesses, providing a comprehensive approach to human health and well-being. [13-18]

### Present circumstances :

Currently, the pharmaceutical industry relies heavily on a wide variety of therapeutic plants, phytoconstituents, and their products as natural remedies, therapies for common ailments, and natural wealth, accounting for a significant portion of the global medicine market.

The World Health Organization defines herbal medicine as herbals, herbal preparations, herbal materials, and completed herbal products. Herbs include whole, ground-up, or broken plant parts such leaves, flowers, fruit, seeds, stems, wood, bark, roots, rhizomes, and other plant parts. Herbal materials comprise dried powdered plants, oils, extracts, latexes, and resins. In other countries, these ingredients could be prepared using regional methods including roasting, steaming, or cooking. combining alcohol, honey, or other additives with stir-baking [19-21].

Compacted or powdered medicinal plants, along with fatty oils, decoctions, and extracts of natural substances, form the basis of completed herbal remedies. Methods include extraction, purification, fractionation, concentration, and other biological or physical processes are utilized in the development of herbal medicine. Final herbal goods are those derived from one or more herbs. When

more than one plant is employed, the term "combination herbal product" might also be used. In addition to the active components, finished herbal products and herbal mixtures may contain excipients. Finished or blended commodities that comprise separated constituents of herbal materials or chemically defined active substances, such as synthetic compounds, are not classified as herbal. [22-23]

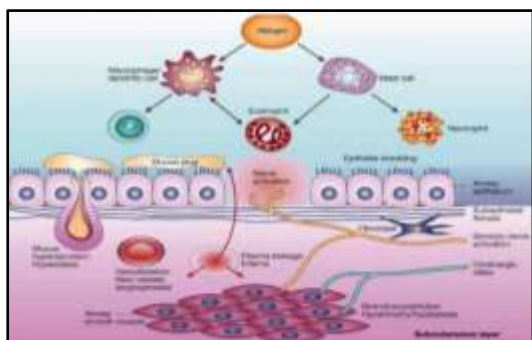
**Why take herbal remedies?**

Herbal medicine is more effective than synthetic drugs and has fewer adverse effects. lower cost, more availability, and improved patient acceptance and tolerance. noteworthy treatment progress.

Since ancient times, medicinal ingredients derived from plants and animals have been used in a straightforward method to separate pure components that are then used as galenicals or unrefined medications. A crude drug's pharmacological activity is determined by the kind of phytoconstituents that are present in it. Therefore, it is possible to think of herbal plants as a center for biosynthesis of a wide range of compounds, including steroids, triterpenoids, flavonoids, glycosides, alkaloids, and others, in addition to the biochemical compounds that are consumed as food by humans and animals, such as carbohydrates, proteins, and fats. possessing a distinct physiological activity. [24]

**Asthma:**

Asthma, derived from the Greek word for "breathing problem," can range from mild coughs to severe obstructions. Acute episodes can be caused by stressors like infections and cold air exposure. Genetic variations have been linked to asthma risk. Status asthmaticus is the most severe type, potentially fatal and resistant to standard medical interventions. Inflammation is the primary cause, with allergies affecting many patients. [25]



**Figure 1: Pathophysiology of asthma**

**Plumeria Rubra :**

**Morphological Characteristics :**

The frangipani tree is known for its fragrant, spiral-shaped, crimson brooms, which appear from June to November. The plant has thick branches, lanceolate to obovate leaves, and yellow centers. The flowers are typically crimson, pink, or purple. The plant has wide bracts and chotomous cymes. Most cultivars have fragrant flowers from March to October, with hybrids producing varying numbers of flowers. [26]



**Figure 2: Plant plumeria rubra**

**Table 1 : Plant profile of plumeria rubra**

Plant profile	Plumeria rubra
Common name	Frangipani
Vernacular name	Mar : Lal champa Eng : Frangipani
Kingdom	Plantae
Subkingdom	Tracheobionata
Division	Magnoliophyta
Super division	Spermatophyta
Class	Dicotyledons
Subclass	Asteridae
Order	Gentiales
Family	Apocynaceae
Botanical name	Plumeria rubra
Plant type	Shrub
Origin	India, Sri lanka
Height	3.5 – 6.0 meters
Leaves	Lanceolate to obovate
Oblong	2.5 – 20 cm, long
Flowers	Very fragerent, generally red, pink or purple centered with rich yellow

**Plumeria rubra species:[27]**

1. Plumeria acuminata
2. Plumeria alba
3. Plumeria acutifolia

#### 4. Plumeria rubra

##### Applications in pharmacology:

In India, fruit has been utilized as a contraceptive method. Fruit is claimed to be consumed in the West Indies. In Guiana, the root bark is mostly used as a harsh purgative for blenorragia. The fragrant, bechic blooms are used as a cough remedy. They also go into making a well-known pectoral syrup. Plumeria genus America is the natural home of the genus Plumeria. Many kinds of Plumeria, which are decorative trees grown in warmer areas across the world, are known to have medicinal properties in traditional medical systems. [28]

##### Review of Phytochemistry:

quercetin, and trace amounts of diglycosides of kaemferol and cyanidin in the flowers. The fresh leaves and bark contain plumeride and resinic acid. Fulvoplumerin, a terpenoid combination containing sterols plumeride, was detected in the bark by Lawal and coworkers. Latex coagulum formed resin substance and cautoclave from branches. [29]

##### Pharmacological Activity:[30]

- Anxiolytic impact: Using the raised plus model of anxiety, the anxiolytic effect of an ethanolic extract of plumeria rubra flowers and its fraction was assessed. It was noted that Plumeria rubra flower extract and its insoluble butanolic component may have considerable anxiolytic potential.
- The study assessed the antibacterial activity of various extracts of Plumeria rubra leaves against *S. Epidermis* and *E. Coli* using disc diffusion methods. The etanolic leaf extract showed partial antibacterial activity against *S. Epidermis* and *E. Coli*, while chloroform and aqueous extracts showed partial and complete antibacterial activity. Standard ciprofloxacin demonstrated full antibacterial action against *S. Epidermis* and *E. Coli*.
- The Plumeria rubra methanolic floral extract was tested for hypolipidemic, cytotoxic, and antioxidant properties. It showed a 72% inhibition rate in DPPH assay and notable free radical scavenging activity. However, it was found to be unstoppable against colon cancer cells.
- Hepatoprotective activity: In male albino rats that had their livers injured by CCL<sub>4</sub>, the effects of an alcoholic extract of Plumeria rubra

were assessed. Plumeria rubra alcoholic pod extract at 200 mg/kg and 100 mg/kg was found to have a strong hepatoprotective effect.

- Antifertility activity: Plumeria rubra ethanolic extract's abortifacient qualities were assessed. A dose-dependent negative impact on the fertility index and number of implantations in the uterine horn of female rats was noted at 50, 100, and 200 mg/kg body weight. Due to a rise in the post-implementation embryonic loss percentage.
- Antibacterial activity: Using the cup plate method and the minimum inhibitory concentration against *Aspergillus niger*, *Bacillus subtilis*, *Escheria Coli*, and *Staphylococcus aureus*, Plumeria rubra extracts were assessed for their antibacterial activity. A methanol extract was found to have strong antibacterial effects on various bacterial strains. In comparison to the conventional drug, ciprofloxacin. Comparing the aqueous extract to normal flucanazole, it proved more effective against fungal strains.
- Antiviral activity: Fulvoplumerin, which is present in plumeria rubra, inhibits the HIV reverse transcriptase enzyme.
- Anti-inflammatory and antioxidant activity: A phytochemical investigation revealed that Plumeria rubra had a high flavonoid and phenol content, and a methanolic extract of the flower showed notable antioxidant and anti-inflammatory activity.
- Anthelmintic activity: At a concentration of 25 mg/ml, the saponin extract of Plumeria rubra leaves had a strong anthelmintic action that was comparable to that of piperazine citrate.
- Antioxidative and proteolytic activities - On plumeria rubra lattices, antioxidative and proteolytic activities were carried out. The findings demonstrated the important enzymatic and proteolytic activity of plumeria rubra.
- The study examined the phytochemical components and antimicrobial activity of Plumeria rubra methanol extract, revealing that it lacks phalobatanins and exhibits greater inhibitory effects at concentrations of 20 mg/ml.
- Tannins, alkaloids, flavonoids, saponins, gums, and terpenoids were found in *P. Rubra* flowers. It has been demonstrated that extracts with high tannin content have strong anti-inflammatory effects. Researchers have found that flavonoids have analgesic and anti-inflammatory properties.

**Phytochemical Activity:**[31]

- Resin, quercetin, and trace amounts of cyanidin diglycosides and kaemferol are found in flowers. Resinic acid and plumeride are found in new leaves and bark. Bark has fulvoplumerin as well. Terpenoids and plumieride sterols together. Resin matter and caoutchove were produced by the latex coagulum from branches.
- The essential oil obtained through hydrodistillation of the leaves contained phytol, (Z)- $\beta$ -farnesene,  $\alpha$ -patchoulene, limonene, (E)- $\beta$ -farnesene, and  $\alpha$ -copaene. Nevertheless, (E)-non-2-en-1-ol, limonene, phenyl acetaldehyde, n-tetradecanal,  $\gamma$ -elemene, and (E,E)- $\alpha$ -farnesene were the quantitatively important components of the flower oil.
- Rubranonoside glucopyranosylnaringenin; a novel flavanone glycoside, rubranin; a new sphingolipid, rubradoid; a new iridoid galactoside, rubrajaleelol, and rubrajaleelic acid are among the compounds isolated from the ethanol soluble fraction of the methanol extract of *Plumeria rubra*.
- Eleven hydrocarbons, seventeen alcohols, thirteen esters, nine aldehydes, and fifteen other chemicals were found in the essential oil.
- Based on their physicochemical characteristics and spectral studies, five substances were identified as lupeol nanoate, lupeol heptanoate, rubrinol glucoside,  $\beta$ -sitosterol- $\beta$ -Dglucoside, and plumeiride coumarate from the alcoholic extract of the leaves. 41 compounds have been identified as *Plumeria rubra*. Ten esters (43.3%), eleven hydrocarbons (8.1%), ten alcohols (29.8%), two ethers (1.0%), four carboxylic acids (8.5%), three aldehydes (2.5%), and benzyl salicylate (20.9%) were the constituents of the oil.
- Ursolic acid, a naturally occurring pentacyclic triterpenoid carboxylic acid, can be found in *Plumeria Rubra*.
- *Plumeria rubra* gas chromatography showed that the floral oil consisted of 31 volatile components, the primary ones being alkanolic acid, lauric acid, myristic acid, and palmitic acid. The remaining components included alcohol, ether, hydrocarbons, and aldehyde, among others [28].
- Plumericin and isoplumericin, which were extracted from the heartwood of *Plumeria rubra*, showed molluscicidal, cytotoxic, and antibacterial activity, whereas hydroxyacetophenone had a modest cytotoxic effect.
- Cytotoxic components from *Plumeria rubra* bark collected in Indonesia have been identified using bioactivity-directed fractionation of *P. Rubra*. It was discovered that 2, 5-dimethoxy-p-benzoquinone were as well as three iridoids—fulvoplumerin, allamcin, and allamandin—were active ingredients.
- The study examined the volatile contents of *Plumeria rubra* L. flowers in the northern Indian foothills using GC and GC-MS. 31 components were found, accounting for 94.0% of the floral essential oil and 89.2% of the steam volatile extract. The main ingredients in flower oil and hydrodistilled volatile distillate were benzyl salicylate and benzyl benzoate.
- When the results were compared to *P. Rubra* floral compositions that had been published, thoughtful qualitative and quantitative differences were found. *P. Rubra* cultivated in India lacked the alkanolic acids, neryl phenyl acetate, phenylacetaldehyde, and  $\beta$ -phenylethyl alcohol previously documented.
- The blooms of *P. Rubra* L. Cv. Yielded the two new iridoid diastereomers. Spectroscopic techniques were used to clarify *Acutifolia* and its structure. *Plumeria rubra* heartwood yielded the following compounds: plumericin, isoplumericin, 4-hydroxyacetophenone, plumeride, 13-coumaroylplumieride, and protoplumericine. Immunoreactive cardiac glycoside was discovered to be present in the *Plumeria* in significant concentrations. *Rubra*

**II. CONCLUSION:**

In conclusion, the promise of natural compounds as sources of possible therapeutic candidates has been emphasized by pharmaceutical research in recent decades. With a focus on *Plumeria rubra*'s potential use in managing asthma, our research has confirmed the plant's historical use in medicine to treat a variety of conditions, such as fever, blennorrhoea, diarrhea, rheumatism, and venereal disease. The phytoconstituents of *Plumeria rubra* that we analyzed include a wide range of bioactive substances, including tannins, flavonoids, terpenoids, phlobatannins, reducing sugars, sterols, and carbonyl compounds. These results highlight the plant's pharmacological potential and call for more research to be done in order to create fresh medicinal approaches.

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