COMPREHENSIVE REVIEW ON TRADITIONAL MEDICINAL PLANT: *PLUMERIA RUBRA* LINN.

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Abstract

Plumeria rubra is commonly known as ornamental plant in parks and home garden. It belongs to family Apocynaceae. This plant is widely distributed all over the world and in the traditional medicine system different parts of the plant have been useful in the treatment of a variety of diseases. The plant is known to possess biological activities viz., antipyretic, antifungal, antiviral, analgesic, anticancer, antioxidative and hypolipidemic, proteolytic, cytotoxic activities, etc. In this review article various established facts related to the plant *Plumeria rubra* have been compiled so that it may be a source of potential drugs in the days to come.

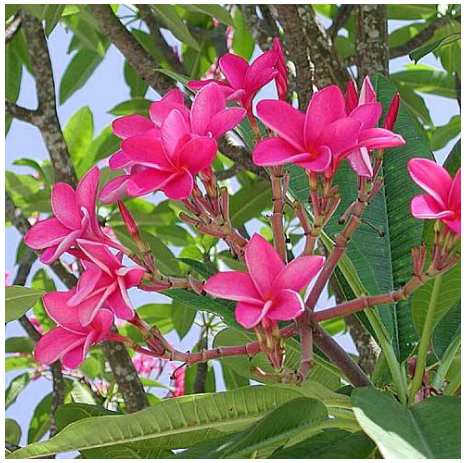
Keywords: *Plumeria rubra,* Ornamental, Anti-inflammatory, Antimicrobial

Introduction:

Indian traditional system of medicine for instance Rigveda, Yajurveda, Atharvaveda, Charak Samhita and Sushrut Samhita defines the plants use for the treatment ofdifferent health issues[1]. Ayurveda, the ancient Indian therapeutic measure is renowned as one of the major systems of alternative and complementary medicine. From ancient literature it is evidence that the various parts of the plants were used in Siddhha, Ayurveda and Unani medicines for the treatment of diseases of human being. As other herbal systems, greater parts of its medicaments are based on indigenous herbals. In the recent years, the interest in medicinal plants has increased in a great deal. Apart from this, people from the west have also taken this matter seriously by conducting various researches on plant based medicines[2].

Plumeria is genus of laticiferous trees and shrubs. Native of tropical America, some ornamental species are grown in warmer region of world. About eight species are reported from India, but owing to the overlapping character of some species, it become difficult to fix their identity. In traditional system of medicine of India, *Plumeria* species are widely used as purgative, remedy for diarrhea, cure of itch, bronchitis, cough, asthma, fever, piles, dysentery, blood disorder and tumors. *Plumeria rubra* is commonly grown for their ornamental purpose. The plant is propagated through cuttings. It sets seed rarely in India. The plants raised from the seed shown a wide variation in character evidenly being different strains. *Plumeria rubra* is small tree 3.5-6.0 m in high, commonly grown in gardens, leaves lanceolate to obovate –oblong. Flowers are very fragrant, generally red pink or purple center rich with yellow. Common name of the plant is Frangipani, Vernacularly it is named as Lalchampa belonging to kingdom Plantae. The plant is belonging to family Apocynaceae. The plant is found as shrub and is native of Mexico, India, Sri Lanka

The main aim of this review is to provide an overview and critically analyze the reported ethnomedical uses, phytochemistry, pharmacological activities of various parts of *Plumeria rubra*. This review also focuses on an overview of the current literature on *Plumeria rubra* and its extracts, highlighting the importance of the compounds found from different parts of the plant so as to draw attention of people and researchers about the wide spread pharmaceutical properties of the plant for its better utilization in the coming future.



Bioactive compounds present in different parts of *Plumeria rubra* and their pharmacological applications:

Over the time, research has shown that *Plumeria rubra* is rich in a wide range of compounds, of which several have wide pharmacological potential.

Leaves

In vitro antibacterial activity[3] of aqueous extract of leaves in organic solvents ethanol, chloroform and ethyl acetate was studied against S. epidermis and E. coli. by disc diffusion method. It was observed that ethanolic extract of leaves showed partial antibacterial activity against S. epidermis at 750 and 1000 µg/ml and at 1500 µg/ml in E. coli whereas chloroform extract showed partial antibacterial activity against S. epidermis at 750 and 1000 µg/ml and showed complete antibacterial activity against E. coli at 1500 µg/ml. It was compared with standard drug ciprofloxacin. Saponin extract of leaves of *Plumeria rubra* exhibited significant anthelmintic effect in concentration of 25 mg/ml comparable with the standard piperazine citrate[4]. Fresh leaves and bark contain plumeride, resinic acid. Bark also contain fulvoplumerin. a mixture of terpenoids and sterols plumieride. The latex coagulum from branches gave caoutchove and resin matter[5]. The essential oil[6] obtained by hydrodistillation of the leaves contains (Z)-β-farnesene αpatchoulene, limonene, (E)-β-farnesene, α-copaene and phytol. However, the quantitative significant compounds of the flowers oil were (E)-non-2-en-1-ol, limonene, phenyl acetaldehyde, n-tetradecanal, γ-elemene and (E,E)- α-farnesene. Five compounds were isolated from the alcoholic extract of the leaves and were identified as lupeol nanoate, lupeol heptanoate, rubrinol glucoside, β-sitosterol-β-Dglucoside, and plumeiride coumarate, on the basis of their physicochemical characters and spectral analyses[7].

Ethanolic extract of *Plumeria rubra* was 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 because of the increase in percentage of post implementation embryonic loss[8]. Leaves are useful in inflammation[9], rheumatism, antibacterial, antifungal, bronchitis and antipyretic. The prevention of oxidative damage to tissue could therefore be one of the mechanisms responsible for the anti-inflammatory effect[10] shown by this plant. Confirmation of the anti-inflammatory activity in animal model further justifies the traditional use of this plant for inflammatory disorders. The ethno medical use of *Plumeria rubra* as a useful remedy in inflammatory and arthritic disorders could possibly be because of its excellent anti-inflammatory and antioxidant potential. Various extract of *Plumeria rubra* leaves were studied for their antimicrobial[11] activities against eleven human pathogenic bacteria. Chloroform and ethyl acetate extract showed moderate to good

antimicrobial activity against all the tested pathogens. The ethyl acetate extracts showed the largest zone of inhibition (25mm in diameter with 2000mg/disc extract) against *E. coli* and with fungal radial mycelial growth (62.00% with 100mg extract /ml medium) in A. ustus ethyl acetate extract.

Flowers

Ethanolic extract of flower of *Plumeria rubra* and its fraction was evaluated for anxiolytic effect[12] using elevated plus model of anxiety. It was observed that the flower extract of *Plumeria rubra* and its insoluble butanolic fraction might possess significant anxiolytic potential. Methanolic extract of flower[13] of *Plumeria rubra* was 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. Methanolic extract of flowers[14] of *Plumeria rubra* showed significant antioxidant and anti-inflammatory activity and phytochemical analysis indicate that *Plumeria rubra* was rich in flavonoid and phenol contents.

Anti-microbial activity and phytochemical constituents of methanol extract of *Plumeria rubra* (flower and leaf)) was investigated[15]. Phytochemical screening of the crude extract revealed the presence of tannins, phlobatannins, saponins, flavonoids, steroids, terpenoids, cardiac glycosides and reducing sugar. Phlobatanins were found to be absent in the methanol extract of *Plumeria rubra* (flower). All the crude extract displayed higher inhibitory effects at the tested concentration (20 mg/ml) except on Corynebacterium pyogenes and Bacillus anthracis of *Plumeria rubra* leaf. Flowers[16] contain resin, quercetin, and traces of kaemferol and cyanidin diglycosides, fresh leaves and bark contain plumeride, resinic acid; bark also contain fulvoplumerinThe latex coagulum from branches gave caoutchove and resin matter.

The flower[17] volatile constituents of *Plumeria rubra* L. grown in foothills of north India were analyzed by 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. The Pink colour of flowers[18] of *Plumeria rubra* is due to phenolic compound and is found to be a good source of natural dye for cloth. The flowers[19] contain essential oil, 1-diethoxyethane, benzaldehyde, geraniol, citral, methylbenzoate, methyl salicylate and linalool.

Bark

By bioactivity-directed fractionation of the *Plumeria rubra*, cytotoxic[20] constituents have been reported from the bark of *Plumeria rubra*. Three iridoids, fulvoplumierin, allamcin, and allamandin, as well as 2, 5- dimethoxy-p-benzoquinonewere found to be active constituents. Anthelmintic[21] activity of stem bark of *Plumeria rubra* was carried out using P. posthuma, with methanolic extract. Piperazine citrate 15 mg/ml was used as a standard drug. Five concentrations 2, 5, 10, 25, and 50 mg of methanolic extracts were tested. The anthelmintic effect was carried out in dose dependent manner. Iridoids[22] isolated from the bark of *Plumeria rubra* were cytotoxic. The bark of the plant contain plumieride coumarylplumieride, protoplumericine. The ethanolic extract[23] of the stem bark of *Plumeria acutifolia* was tested for antimicrobial activity against both gram positive and gram negative bacteria and fungi by disc diffusion method[24]. Results have shown that the extract have very strong antimicrobial activity against *E. faecalis, B. subtilis, S. aureus, P. aeruginosa, S. typhimurium, A. niger*and *C. albicans*.

Roots

The roots[25] of *Plumeria rubra* contains plumericine, βdihydroplumericin, isoplumericin, β-dihydroplumericinic acid, fulvoplumerin and plumeride. Rubrinol; an antibacterial tritripenoid. together with teraxasteryl acetate, lupeol, stigmasterol, oleanolic acid had isolated from Bark.

Conclusion: The present review describes the phytochemical constituents and uses found in different parts of *plumeria rubra* for medicinal purpose. The evaluation needs to be carried out on *Plumeria rubra* in order to use the plant in formulation for their practical and clinical applications, used for the welfare of the mankind.

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