

## REVIEW ON *PLUMERIA ACUMINATA*

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### ABSTRACT

*Plumeria acuminata* is commonly known as 'perungalli' in Tamil and belonging to the family Apocynaceae. This plant is widely distributed all over the world among tropical region especially in southern part of India. In the traditional medicine system different parts of the plant have been useful in the treatment of a variety of diseases such as decoction of bark is used as purgative and febrifuge, the latex is used for itching with coconut oil, the flower is used as contraceptive etc. This plant is also used as ornamental purpose. In this review article various established facts related to the plant *Plumeria acuminata* have been compiled so that it may be a source of potential drugs in the days to come.

**Keywords:** *Plumeria acuminata*, Antiinflammatory, Antimicrobial, Free radical.

### 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. 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 tumours 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.

### Botanical Description<sup>1,2,3</sup>

**Morphology-** It is small tree, 3 to 7 m high, stem smooth and shinning succulent with abundant white latex easily breaks.

**Leaves-** The leaves crowed at the terminal end of the branch, commonly oblong in shape, reaching a length of 40cm and a width of 7cm.It is simple, opposite, rarely whorled or alternate, stipules absent or rarely present.



Fig: *Plumeria acuminata*

**Inflorescence-** The inflorescence is cymose, terminal or axillary, with bracteoles. The stamens are inserted on the inside of the corolla tube.

**Flowers-** The flowers are bisexual, fragrant, the upper portion whitish, while the inner lower portion yellow, 5-6cm long.

**Fruits-** The fruits are linear oblong or ellipsoid follicles. These are brownish black in colour, seeds are oblong.

**Distribution-** This plant is considered to be a native to Mexico. It is reported to have been introduced from the Philippines and has become naturalised in India.

#### Vernacular names in India

English	: Frangipani
Hindi	: Golainchi
Bangali	: Gorur champa, Dalan phul
Sanskrit	: kshira champa
Malayalam	: Velachampakan
Marathi	: Sonachampa
Gujarati	: Rhada champa
Oriya	: Kat champa

#### Phytochemical constituents of *Plumeria acuminata*<sup>4,5</sup>

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 Fulvoplummerin, Plumericin along with three new compounds- isoplumericin,  $\beta$ -dihydroplumericin and  $\beta$ -dihydroplumericin acid from roots of *Plumeria acuminata* (Helv.Chim.Acta 1961). The steam distillate of *Plumeria 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 %). These oils have acid value (20.2) and saponification value (123).

#### Medicinal uses of *Plumeria acuminata*<sup>4,5</sup>

The leaves, bark, flower and oil of *Plumeria acuminata* are used in many countries. (Nadkarni 1976; Hua and Geng-Tao 1992; Formica and Regelson 1995; Wagnor et al 1996;Aruoma and Cuppett 1997). The following uses have been reported,

- Decoction of bark is used as purgative and febrifuge.
- The material may be taken as cooling tea for prevention for heart stroke.
- 12 to 24 gm of dried material is used as decoction for controlling dysentery & diarrhoea during summer season.

- The latex is mixed with coconut oil warmed and applied to affected area to treat arthritis, rheumatism, pruritic skin lesion.
- Decoction of the bark is used as counter irritant on the gum for tooth ache.
- The juice is rubefecient in rheumatic pain.
- Decoction of leaves are applied for cracks and eruptions of the soles of the feet
- Infusion or extract from leaves is used to control asthma.

#### Review of phytochemistry<sup>5</sup>

Preliminary phytochemical screening of the powdered leaf revealed the following compounds- Alkaloids, Cynogenic glycosides, Phenolic compounds, Flavonoids, Terpenoids, Tannins and Saponins.

#### Experimental trial on animal models, conducted by different laboratories and authors

##### Anti-inflammatory evaluation of leaves of *Plumeria acuminata*<sup>6</sup>

The methanolic extract of *Plumeria acuminata* exhibited significant anti-inflammatory activity on the tested experimental animal models. The extract (500 mg/kg-1 b.w) exhibited maximum anti-inflammatory effect. Carrageenan-induced oedema has been commonly used as an experimental animal model for acute inflammation and is believed to be biphasic. The early phase (1 – 2 h) of the carrageenan model is mainly mediated by histamine, serotonin and increased synthesis of prostaglandins in the damaged tissue surroundings. 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 *Plumeria acuminata* possess potent anti-inflammatory activity in both acute and chronic models.

##### Antipyretic and antinociceptive activities of *Plumeria acuminata* leaves<sup>7</sup>

A single oral administration of methanolic extract of *Plumeria acuminata* (MEPA) at different doses (100, 250 and 500 mg/kg) showed significant reduction in brewer's yeast induced hyperthermia in rats. MEPA also showed inhibitory effect on acetic acid induced writhing response, hot plate, tail flick, tail immersion responses in mice in the antinociceptive activity. MEPA showed significant decreases in rectal temperature similar to that of paracetamol (100mg/kg). These results suggested that the plant has some influence on prostaglandin biosynthesis

because prostaglandin is believed to be regulator of body temperature. The antinociceptive effect of the extract may be due to its anti-inflammatory action in case with salicylates which are particularly effective in relieving the type of pain associated with inflammation. The extract possesses potent antipyretic and antinociceptive properties which are mediated via peripheral and central inhibitory mechanism.

#### Antioxidant and free Radical scavenging activities of leaves of *Plumeria acuminata* Leaves<sup>8</sup>

The disease caused by free radical reaction are atherosclerosis, aging, ischemic heart disease, inflammation, diabetes, immunosuppression and neurodegenerative diseases. The laboratory experimental study on animal models exhibited that the antioxidant activity of methanolic extract of *Plumeria acuminata* (MEPA) increases in a dose dependent manner 50, 100, 200, 300, 400, and 500 µg. 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 µg/ml. The methanol extracts of leaves of *Plumeria acuminata* possesses potent antioxidant and free radical scavenging properties.

#### Antimicrobial activity of methanol extracts of leaves of *Plumeria acuminata* Ait<sup>9</sup>

Methanol extracts of leaves of *Plumeria acuminata* Ait. (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 µg/ml and 1000 µg/ml showed inhibitory activity against all tested bacteria except *S.typhimurium* which was not inhibited at 250 µg/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.

#### Antimutagens from *Plumeria acuminata*<sup>10</sup>

The ethanolic extract of the green leaves of *Plumeria acuminata* showed ant mutagenic

activity. Four isolates A<sub>1</sub>, C<sub>1</sub>, D<sub>3</sub>, and F<sub>2</sub> from the bioactive hexane and carbon tetrachloride fraction of the ethanolic extract of leaves of *Plumeria acuminata*. The structure elucidation studies indicated that C<sub>1</sub> is stigmast-7-enol, D<sub>3</sub> is lupeol carboxylic acid and F<sub>2</sub> is ursolic acid. The structure of A<sub>1</sub> not fully elucidated but MS data suggested that it contained a long hydrocarbon chain. These fractions were proved to possess ant mutagenic effect.

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