PLUMERIA RUBRA LINN. : AN INDIAN MEDICINAL PLANT

*Zahid Zaheer, Konale A.G., Patel K.A., Subur Khan W, M.N.Farooqui1

Y. B. Chavan College of Pharmacy, Dr. Rafiq Zakaria Campus, Maulana Azad Educational Trust, Rauza Bagh, Aurangabad (MS) India-431001.

1Maulana Azad Post Graduate and Research Centre, Dr. Rafiq Zakaria Campus, Aurangabad.

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. Plumeria rubra is one such plant that has been frequently used as medicine which belongs to Plumeria genus. The decoction of the bark and roots of P.rubra used to treat asthma, ease constipation, promote menstruation, venerial disease, reduces fever and latex used to soothe irritation. The plant contains various phytoconstituents like the cytotoxic iridoi ds, fulvoplumerin, oleanane type triterpene etc. This present review summarizes the physiochemical constituent and also pharmacological reports that have been shown promising results.

Keywords: Plumeria rubra, Chemical constituents, pharmacology, Apocynaceae.

INTRODUCTION
Plumeria rubra (Hindi name: Lal champa; English: True Frangipani) belonging to Family Apocynaceae. They have laticiferous trees and shrubs; native of tropical America. Plumeria plants are famous for their attractiveness and fragrant flowers. Plumeria rubra is a small beautiful, flowering tree, with a wide variety of flower colors. It is the most commonly seen in Florida. The waxy, long-lasting flowers are sweetly perfumed, making the species a natural for many warm-climate gardens around the world. Some ornamental species are grown in the warmer regions of the world. About eight species are reported from India, but owing to the overlapping of characters in some species; it become difficult to fix their identity. Plumeria acuminata and Plumeria rubra are commonly grown for their ornamental flowers.

* Corresponding Author
Zahid Zaheer
Email: zaheerzahid@gmail.com
large in terminal, 2-3 chotomous cymes, bracts many, broad, deciduous. Calyx small, 5-fid, eglandular within; lobes broad, obtuse. Corolla salver shaped, throat necked. Stamens near the base of the tube, anthers obtuse, cell rounded at the base. Disk 0 or lining the calyx tube. Carpels 2, distinct; Style short; Stigma, 2 lobed; Ovules many seriate in each cell. Flowers of most cultivars are highly fragrant and bloom from March to October. The hybrids differ in their profusion of blooms; with some producing more than 200 flowers per cluster and other only 50-60 flowers. Follicles are linear oblong or ellipsoid. Seeds are oblong or lanceolate, plano convex, winged, albumen fleshy, thin; cotyledons oblong or ovate-cordate (Anonymous 1).

**General and Medicinal Uses**

Various scientific evaluations have been conducted to verify the traditional uses of this plant in the folk medicine. The fruit is reported to be eaten in West Indies. In India, however, it has been used as an abortifacient. Medicinal properties of *P. rubra* are more or less similar to those of *P. acuminata* (Watt JM and Breyer-Brandwijk MG, 1962). According to some authorities, *P. acuminata* is considered as a variety or a form of *P. rubra* linn. The flowers are aromatic and bechic and widely used in pectoral syrups. The essential oils from the flowers used for perfumery and aromatherapy purposes. The flowers decoction of *P. rubra* was reported to be used in Mexico for control of diabetes mellitus. The Leaves of *P. rubra* are used in ulcers, leprosy, inflammations and rubefacient (Bobbarala V et al., 2000).

A decoction of the bark has been used for the treatment of venereal disease and also used in the indigenous system of medicine for the treatment of rheumatism, diarrhoea, blennorrhoea and leprosy. The decoction of the bark and roots of *P. rubra* is traditionally used to treat asthma, ease constipation, promote menstruation and reduce fever. The root bark is a drastic purgative used mostly for blennorrhagia in Guiana. For instance, the extract obtained from the bark of *P. acuminata* was found having antimutagenic properties (Guevara AP et al., 1966). The leaves extract of *P. rubra* exhibited antibacterial activity (Hamburger MO et al., 1991). While the barks extract showed cytotoxic effects against a number of in vitro human cancer cell lines (breast, colon, lung, fibrosarcoma and melanoma) (Kardono LB et al., 1990). The flowers and the latex of *Plumeria rubra* can be used for stopping vaginal bloodloss, and tooth headache, and the latex of the plant is used against earache. Infusions are used as an eye-cleaning liquid (Ruiu F et al., 2008). The root bark is bitter, pungent, acid, heating, carminative, laxative: useful in leprosy; itching, ulcers, pains, ascites -In general the therapeutic properties are the same as those of Michelia champaca (Ayurveda). The root bark is purgative; useful in gleet, urinary discharges, venereal sores; cures tumours and rheumatic pains (Yunani).

**Toxicology**

The barks extract of *P. rubra* showed cytotoxic effects against a number of in vitro human cancer cell lines (breast, colon, lung, fibrosarcoma and melanoma).

**Phytochemistry of *P. Rubra***

The flowers contain resin, quercetin, traces of kamempferol and a cyanidin diglycoside. It contains seven volatile constituents like 2-methylbutan-1-ol, β-phenylethyl alcohol, nanodencane, heneicosane, benzyl salicylate, tetradecanoic acid and phenylacetaldehyde. Among them 2-methylbutan-1-ol could be considered as the chemical marker in characterizing its essential oil. The occurrence of this constituent together with β-phenylethyl alcohol, phenylacetaldehyde, nanodencane and heneicosane in malaysian varieties of *P. rubra* agree with the finding of on the essential oil of irma bryan cultivar of *P. rubra* from Hawaii (Omata A et al., 1992). The essential oil of *Plumeria rubra* form acutifolia (Poir.) Woodson cv. Common Yellow* growing in Hawaii was extracted by simultaneous distillation and extraction (SDE) and analysed with GC and GC-MS, and a total of 74 compounds were identified. Linalol, phenylacetaldehyde, trans;trans-farnesol, β-phenylethyl alcohol, geraniol, α-terpineol, neral and geranial were found to make a major contribution to the floral scent of this flower. They investigated the Phytochemical Screening of Methanol extract of *P. rubra* flower and leaf and found Tannins, Flavonoids, Terpenoids, Reducing sugar and Alkaloids in flower and leaf and other Phlobatannins, Saponins, Steroids, Carbonyl in only leaf and extract displayed antimicrobial activity (20 mg/ml) using agar well technique (Omata A et al., 2007).

The fresh leaves and bark contain respectively: plumeride, 0.83, 0.53 and resinic acid, 1.26, 0.4%. A recent examination of the fulvoplumierin, a mixture of terpenoids and sterols and large quantities of plumeride. The latex coagulum from the young branches on analysis gave: caoutchouc, 25.5; resinous matter, 21.9; and moisture, 15.7%. The bark contains the cytotoxic iridoids, fulvoplumierin, allamcin, allamandin, 2, 5-dimethoxy-p-benzoquinone, plumericin and the lignin liroidendrin. Five additional iridoids, 15-demethylplumeride, plumeride, α-allamcin, β-allamcin, and 13-O-trans-p-coumaroylplumeride were obtained as inactive constituents. A flavan-3-ol-glycoside, plumerubroside (C_{27}H_{30}O_{12}, m p 210-11°C) and a bicyclic lupin alkaido. plumenernine is also reported from the stem-bark of *P.rubra* (Akhtar et al., 1994). Recently, Comins...
and Coworkers devised a stereocontrolled total synthesis of (+/-) plumerine and showed that its NMR data differ from natural plumerinine. The plant contains the oleanane type triterpenes, 6α-hydroxy-epi-oleanolic acid (C_{30}H_{48}O_{4}, mp 235-37°C) and 3α, 27-dihydroxy-olean-12-ene (C_{30}H_{50}O_{2}, m p 183-84°C) (Akhtar N et al., 1994). The two new iridoid Diastereomers were isolated from the flowers of P. rubra L. cv. Acutifolia and structure was elucidated using spectroscopic methods (Ye G et al., 2008). The compound Plumericin, isoplerumericin, 4-hydroxyacetophenone, plumeride, 13-O-coumaroylplumeride and protoplumericine A were isolated from the heartwood of Plumeria rubra. Significants amounts of immunoactive cardiac glycoside were found to be present in the Plumeria. rubra (Radford DJ et al., 1986).

The plant contains the triterpene, rubrinol (3β, 30-dihydroxy-12-ursene, C_{30}H_{50}O_{2}, m p 244°C). It also contains taraxateryl acetate, lupeol, stigmasterol, oleanolic acid and cycloart-22-ene-3α,25-diol.

**Pharmacological Properties of Plumeria rubra**

The plant is reputed to possess purgative, diuretic, abortifacient and antituberculotic properties and is also used as a remedy for rheumatism, diarrhoea, blennorrhrea, gonorrhea, syphilis, venerial sores and leprosy (Comins DL et al., 2002). The leaves extract of P. rubra exhibited antibacterial activity (Hamburger et al. 1991). While the barks extract showed cytotoxic effects against a number of in vitro human cancer cell lines (breast, colon, lung, fibrosarcoma and melanoma). The antimicrobial properties of the essential oils (2 µl per disk) were determined in vitro using agar diffusion method. Fulvoplumierin, an iridoid obtained as a constituent of P. rubra L., has been shown to inhibit HIV-1 [IC_{50}=98 µg/ml (400 µM)] and HIV-2 [IC_{50}=87 µg/ml (357µM)] Reverse transcriptases to similar extents (Tan GT et al., 1992). The medicinal plant P. rubra is Reported source of Cardiac glycoside which have positive ionotropic effect and used in Congestive cardiac failure (Nick. H et al., 1998).

Rubrinol showed antibacterial activity against two gram positive (Bacillus anthracis, Corynebacterium pseudodipthericum) and two gram negative (Pseudomonas aeruginosa and P. pseudomallei) organisms. P.aeruginosa is a causative agent responsible for infecting burns, wounds, and urinary tract; it also causes infection in cystic fibrosis patients; P.pseudomallei causes meliodosis or pseudoglobinosis.

**CONCLUSION**

Pharmacological researches conducted over the past few decade show that the natural products are potential source of novel molecules for drug development (Farnsworth NR et al., 1990). As we concluded that the medicinal plant Plumeria rubra was used in treatment of venereal disease, rheumatism, diarrhea, blennorrhrea, asthma, leprosy and reduce fever and have phytoconstituents like cytotoxic iridoids, Tannins, Flavonoid, terpenoid, reducing sugar, phlobatannins, saponins, steroids and carbonyl.

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