



ISSN 2320-3862  
JMPS 2016; 4(6): 204-207  
© 2016 JMPS  
Received: 28-09-2016  
Accepted: 29-10-2016

**Kalantri Manisha**  
Research Scholar,  
MVP College of Pharmacy,  
Nashik, Maharashtra, India

**Aher AN**  
Assistant Professor,  
MVP College of Pharmacy,  
Nashik, Maharashtra, India

## Review on traditional medicinal plant: *Plumeria rubra*

**Kalantri Manisha and Aher AN**

### Abstract

*Plumeria rubra* is an ornamental tree of Apocynaceae family. *Plumeria rubra* is a flowering plant. Flowers are very fragrant, generally red pink or purple center rich with yellow. *Plumeria rubra* reported to have anti-fertility, anti-inflammatory, antioxidant, hepatoprotective and antimicrobial activities. It has been used in the folk medicine systems of civilizations for the treatment however as abortifacient, drastic, purgative, blennorrhagia, used in toothache and for carious teeth. Flowers are aromatic, bechic and used as very popular pectoral syrup.

**Keywords:** *Plumeria rubra*, Hepatoprotective, *purgative*, Antimicrobeal

### Introduction

In general, natural drug substances offer *four* vital and appreciable roles in the modern system of Medicine thereby adequately justifying their legitimate presence in the prevailing therapeutic Arsenal, namely:

- (i) Serve as extremely useful natural drugs.
- (ii) Provide basic compounds affording less toxic and more effective drug molecules.
- (iii) Exploration of biologically active prototypes towards newer and better synthetic drugs.
- (iv) Modification of inactive natural products by suitable biological/chemical means into Potent drugs [1, 7, 8].

*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* 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 cutting, many species and hybrids of *plumeria* are now widely cultivated and distributed in the warmer region of world.

The trees were introduced to Malaysia and at least three main species are commonly found *plumeria obtusa*, *plumeria rubra* and *plumeria acuminata*

*Plumeria rubra* 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 evidently 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 very fragrant, generally red pink or purple center rich with yellow.

Flowers large in terminal 2-3 cymose cymes, bracts many broad, deciduous, calyx small, glandular within, lobes broad, obtuse. corolla salver shaped, throat naked lobes overlapping to the lefty, rarely to right. Stamen near base of tube. seeds oblong or lanceolate [2, 4, 5].

Its broad, usually round-headed canopy is often about as wide as the tree is tall. The species and hybrids vary somewhat in tree size, compactness, and branching character, leaf and flower size and colour, and deciduousness [9].

**Correspondence**  
**Kalantri Manisha**  
Research Scholar,  
MVP College of Pharmacy,  
Nashik, Maharashtra, India

**Plant Profile*****Plumeria rubra***

Common Name	: Frangipani
Vernacular Name	: Mar - Lal champa
English	: Frangipani
Kingdom	: Plantae
Subkingdom	: Tracheobionta
Superdivision	: Spermatophyta
Division	: Magnoliophyta
Class	: Dicotyledons
Subclass	: Asteridae
Order	: Gentiales
Family	: Apocynaceae
Botanical Name	: <i>Plumeria rubra</i>
Plant Type	: shrub
Origin	: India, Sri Lanka

**Traditional uses-**

Fruite is reported to be eaten in West Indies. in India however it has been used as abortifacient.

Root bark- Drastic, Purgative, Blenorrhagia.

Latex – used in toothache and for carious teeth.

Flowers- Aromatic, Bechic and used as very popular pectoral syrup [3, 6].



**Fig 1**

**Pharmacological Activity**

- Anxiolytic effect- Ethanolic 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 butanolic fraction might possess significant anxiolytic potential [10].
- Antibacterial activity-*In vitro* antibacterial activity of ethanol, chloroform and ethyl acetate and aqueous extract of leaves of *Plumeria rubra* were performed using disc diffusion method against *S. epidermis* and *E. coli*. Of bacterial strains. It was observed that etanolic extract of leaves showed partial antibacterial activity against *S. epidermis* at 750 and 1000 µg/ml and at 1500 µg/ml in *E. coli*. 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. 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 [11].
- Antioxidant, cytotoxic and hypolipidemic activity- Methanolic 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* [12].
- 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 [13].
- Antifertility activity- Ethanolic 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. by virtue of an increase in percentage of post implementation embryonic loss [14].
- 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 Ciprofloxacin as a standard. Aqueous extract was active against fungal strains as compared with standard Flucanazole [15].
- Antiviral activity- *plumeria rubra* containing fulvoplumerin act as inhibitors of human immunodeficiency virus type 1 (HIV) reversal transcriptase [16].
- 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 [17].
- 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 [18].
- Anti-oxidative and proteolytic activities Anti-oxidative and proteolytic activities were performed on lattices of *plumeria rubra*. results revealed that *plumeria rubra* posseses relevant enzymatic and proteolytic activities [19].
- Anti-microbial activity and phytochemical constituents of methanol extract of *Plumeria rubra* (flower and leaf) was investigated. 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 [20].
- *P. rubra* flowers revealed the presence of tannins, alkaloids, flavonoids, saponins, gums and terpenoids.

Strong occurrence of tannins in extract has been shown to possess potent anti-inflammatory properties. Analgesic and anti-inflammatory effects have been observed in flavonoids [17]

### Phytochemical Activity

- Flowers contain resin, quercetin, and traces of kaempferol and cyanidin diglycosides. 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 caoutchoue and resin matter, [21].
- Chemical composition of essential oil obtained by hydrodistillation of the leaves were (*Z*)- $\beta$ -farnesene  $\alpha$ -patchoulene, limonene, (*E*)- $\beta$ -farnesene,  $\alpha$ -copaene and phytol. However, the quantitative significant compounds of the flowers oil were (*E*)-non-2-en-1-ol, limonene, phenyl acetaldehyde, *n*-tetradecanal,  $\gamma$ -elemene and (*E,E*)- $\alpha$ -farnesene [22].
- Compounds isolated from ethanol soluble fraction of methanol extract of *Plumeria rubra* are Rubranonoside glucopyranosylnaringenin; a new flavanone glycoside, rubranin, a new sphingolipid rubradoid, a new iridoid galactoside, rubrajaleelol and rubrajaleelic acid. [23].
- In the essential oil, 13 hydrocarbons, 17 alcohols, 13esters, 9 aldehydes and 15 miscellaneous compounds were detected [24].
- Five compounds were isolated from the alcoholic extract of the leaves and were identified as lupeol nanoate, lupeol heptanoate, rubrinol glucoside,  $\beta$ -sitosterol- $\beta$ -D-glucoside, and plumeiride coumarate, on the basis of their physicochemical characters and spectral analyses [25]
- *Plumeia rubra* has resulted in identification of 41 compounds. oil comprised 10 esters (43.3%), 11 hydrocarbon (8.1%), 10 alcohol(29.8%), 4 carboxylic acid (8.5%), 2 ethers (1.0 %), 3 aldehyde (2.5%) benzyl salicylate (20.9%) [26]
- *Plumeria Rubra* is a good source of ursolic acid, is a natural pentacyclic triterpenoid carboxylic acid [27].
- The gas chromatography of *Plumeria rubra* 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 [28].
- The compounds were isolated from the heartwood of *Plumeria rubra*, Plumericin and isoplumericin displayed molluscicidal, cytotoxic and antibacterial activity, hydroxyacetophenone was weakly cytotoxic. [29]
- By bioactivity-directed fractionation of the *P. rubra*, cytotoxic constituents have been reported from the bark of *Plumeria rubra* collected in Indonesia. Three iridoids, fulvoplumerin, allamcin, and allamandin, as well as 2, 5-dimethoxy-p-benzoquinone were found to be active constituents. [30]
- The flower volatile constituents of *Plumeria rubra* L. grown in foothills of north India were analyzed by gas chromatography (GC) and GC-mass spectrometry (GC-MS). 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 (trace, 17.2%), (*E,E*)-

geranyl linalool (9.4%, 0.2%), tricosane (8.3%, 1.1%), linalool (0.1%, 8.0%), nonadecane (7.0%, 3.8%), (*E*)-nerolidol (7.0%, 5.5%), and pentacosane (4.4%, 0.3%) were the major constituents identified in flower oil and hydrodistilled volatile distillate. Results were compared with reported floral compositions of *P. rubra* that revealed considerable qualitative and quantitative variations. Alkanoic acids, neryl phenyl acetate, phenylacetaldehyde,  $\beta$ -phenylethyl alcohol reported earlier were not present in *P. rubra* grown in India [31].

- The two new iridoid Diastereomers were isolated from the flowers of *P. rubra* L. cv. *Acutifolia* and structure was elucidated using spectroscopic methods The compound Plumericin, isoplumericin, 4-hydroxyacetophenone, plumeride, 13,coumaroylplumieride and protoplumericine were isolated from the heartwood of *Plumeria rubra*. Significant amounts of immunoreactive cardiac glycoside were found to be present in the *Plumeria. Rubra* [32].

### Conclusion

The present review describes the phytochemical and pharmacological screening of *plumeria rubra* for medicinal purpose. The compounds isolated from plant parts species with the structures have been studied along with traditional uses and pharmacological activity. 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.

### Acknowledgement

The authors are thankful to the authorities of M.V.P. College of pharmacy Nashik (India) for providing support to the study and other necessary facility like internet surfing, library and other technical support to write an article.

### References

1. Kokate CK, Purohit AP, Gokhale SB, (Eds), Pharmacognosy, 42<sup>nd</sup> edition, Nirali prakashan, Pune. 2008; 8.1(8.5):1.1-1.6.
2. Wealth of India, CSIR New Delhi, 1<sup>st</sup>ed, Shree Saraswati Press Ltd, Calcutta, CSIR. 1959; 5:164-165.
3. Kirtikar, Basu. Indian medicinal plants, 2nd edition, oriental enterprises, 2003, 2157-2160.
4. Nandkarni KM. Indian Materia Medica, Popular Prakashan, Bombay, 1976, 993.
5. Prusti AB, Behera KK. Ethno-medico botanical study of sundargarh district, Orissa, India. Ethnobotanical Leaflets, 2007; 11:148-163.
6. Ramana MV. Ethnomedicinal and ethnoveterinary plants from Boath, Adilabad district, Andhra Pradesh, India. Ethnobotanical Leaflets. 2008; 12:391-400.
7. Ashutosh kar, Pharmacognosy and pharmacobiotechnology, new age international second edition, 5.
8. Trease GE, Evans MC. Text book of Pharmacognosy, 12th edition. Balliere, Tindall, London, 1983, 343-83.
9. Aguoru CU, Abah OP, Olanas JO. Systematic Descriptions and Taxonomic studies on Three (3) Species of Plumeria in North Central Nigeria International Journal of Innovation and Scientific Research. 2015; 2:403-411.
10. Chatterjee M, Verma R, Lakshmi V, Sengupta S, Verma A. Anxiolytic effects of Journal of Psychiatry G Model AJP. 2012; 346:6.
11. Baghel A, Mishra C, Asha R, Sasmal D, Nema A. Antibacterial activity of *Plumeria rubra* var. *acutifolia*

- (Poiret) L. flower extracts in the elevated plus-maze model of anxiety in mice, *Asian Plumeria rubra* Linn. Plant extract, *J. Chem. Pharm. Res.* 2010; 6:435-440.
12. Hafizur R, Reddy v, Ghosh S, Mistry S. Antioxidant, cytotoxic and hypolipidemic activities of *Plumeria alba* L. and *Plumeria rubra* L, *American Journal of Life Sciences.* 2014, 2:11-15.
  13. Dabhadkar D, Zade V, Dawada S, Dhore M, Kodape M. Effect of Alcoholic Pod Extract of *Plumeria rubra* on Biochemical and Haematological Parameters of Female Albino Rats, *Int. J. Pharm. Sci. Rev.* 2013; 15:69-74.
  14. Ramproshad S, Afroz T, Mondal B, Khan R, Ahmed S. Screening of Phytochemical and Pharmacological activities of leaves of medicinal plant *Plumeria rubra*, *International journal of research in pharmacy and chemistry.* 2012; 4:1001-1007.
  15. Surendra K, Kumar N, Sharma. Antimicrobial potential of *Plumeria rubra* syn *Plumeria acutifolia* bark, *Der pharma chemical.* 2012; 4:1591-1593.
  16. Tan G. Evaluation of natural products as inhibitors of human immunodeficiency virus type 1 reverse transcriptase, *journal of natural products.* 1991; 54:143-154.
  17. Kalam S, Yegnambatla R, Periasamy G, Kasarla S, Yasmeen N. Antioxidant and Anti-inflammatory Activities of Flowers of *Plumeria rubra* L. f. *rubra* and *Plumeria rubra* f. *lutea*, A Comparative Study *Research Journal of Pharmaceutical, Biological and Chemical Sciences.* 2013; 4:743-750.
  18. Kumar A, Chand I, Singh AK. Extraction and Evaluation of pharmacological activity of saponin extract of *Plumeria rubra* leaves, *Pharmacologyonline.* 2009; 1:969-974.
  19. Cleverston D, de Freitas I, Diego P, de Souza, Eliane S, Araújo. *et al.* Ramos Anti-oxidative and proteolytic activities and protein profile of laticifer cells of *Cryptostegia grandiflora*, *Plumeria rubra* and *Euphorbia tirucalli* Braz. *J. Plant Physiol.* 2010; 22:11-22.
  20. Egwaikhide P, Okeniyi S, Gimba C. Screening for antimicrobial activity and phytochemical constituents of some Nigerian medicinal plants *Journal of Medicinal Plants Research.* 2009; 3:1088-1091.
  21. Oladipupo A, Lawal I, Opoku Y. Chemical Composition of Essential Oils of *Plumeria rubra* L Grown in Nigeria, *European Journal of Medicinal Plants.* 2015; 6:55-61.
  22. Nasim A, Muhammad S, Naheed R, Shaiq A, Yaqoob A, Hassan F. *et al.* Isolation and characterization of the chemical constituents from *Plumeria rubra*, *Phytochemistry Letters.* 2013; 6:291-298.
  23. Guan Ye, Zhi-Xiong Li, Guang-Xin Xia, Hua Peng, Zhao-Lin Sun, Cheng-Gang Huang. A New Iridoid Alkaloid from the Flowers of *Plumeria rubra* L. cv. *Acutifolia* *Helvetica Chimica Acta.* 2009; 92:2700-2706.
  24. Nosir Tohar, Khalitah Awang, Mustafa Mohd, Ibrahim Jantan. chemical composition of the essential oils of four *plumeria* species grown on peninsula Malaysia. *J. essenta. Oil.* 2006; 18:613-617.
  25. Deshpande R, Chaturvedi A. *Plumeria rubra* (L.) Phytochemical screening and antibacterial potential of natural dye, *Science Research Reporter.* 2014; 4:31-34.
  26. Silva J, Silva A, Alves A, Reis R, Nascimento C, Diré G. *et al.* *Plumeria rubra* (Apocynaceae): A good source of ursolic acid, *Academic Journals of Medicinal Plants Research.* 2013; 7:892-896.
  27. Muruganantham N, Solomon S, Senthamilselvi M. Anti-oxidant and Anti-inflammatory activity of *Plumeria rubra* (Flowers) *Int. J. Pharm. Sci. Rev. Res.* 2015; 30:132-135.
  28. Goswami P, Chauhan A, Verma R, Padalia R. Chemical Constituents of Floral Volatiles of *Plumeria rubra* L. from India *Medicinal & Aromatic Plants.* 2016; (3):2-5.
  29. Hamburger M, Cordell G, Ruangrunsi N. Traditional medicinal plants of Thailand. XVII. Biologically active constituents of *Plumeria rubra*. *J Ethnopharmacol.* 1991; 33: 289-92.
  30. Kardono L, Tsauri S, Padmawinata K, Pezzuto J, Kinghorn A. Cytotoxic constituents of the bark of *Plumeria rubra* collected in Indonesia. *J Nat Prod.* 1990; 53:1447-1455.
  31. Ye G1, Yang YL, Xia GX, Fan MS, Huang CG. Complete NMR spectral assignments of two new iridoid diastereoisomers from the flowers of *Plumeria rubra* L. cv. *acutifolia*. *Magn Reson Chem.* 2008; 46:1195-7.
  32. Radford D, Gillies A, Hinds J, Duffy P. Naturally occurring cardiac glycosides. *Med. J.* 1986; 144:540-544.