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Research Article

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Phytochemical screening of leaves of *Plumeria alba* and *Plumeria acuminata*

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ABSTRACT

Plumeriaalba and Plumeria acuminate is small laticiferous tree or shrub is a native of tropical America, commonly known as White Champa Leaf and stem were evaluated for its phytoconstituents, which is used in several traditional medicines to cure various diseases. P. accuminata, P. alba, P. rubra, P. lancifolea, P. drastic and P. phagidenica are some of the species with medicinal utility. This shrub has been known to possess analgesic, antitumor, antihelmintic, antioxidant, hepatoprotective, antidiarrhoeal, anticonvulsant, antimicrobial, oestrogenic and antimalarial activity. The leaves and dry stem were extracted with organic solvents and concentrated to obtain residue. Phytochemical screening reveals the presence of alkaloids, cardiac glycosides, flavonoids, steroids, tannins, triterpenoids, carbohydrates and saponins in the leaf extract of the Plumeria alba and Plumeria acuminate.

Key words: *Plumeria alba* and *Plumeria acuminate*, organic solvents and chemical analysis.

INTRODUCTION

Plumeria alba Linn. belong to family Apocynaceae, commonly known as White Champa, a small laticiferous tree or shrub is a native of tropical America. It is 4.5m high, occasionally grown in the gardens. The plant is mainly grown for its ornamental and fragrant flowers, are also known for their medicinal importance[1]. Leaves arrangement is lanceolate to oblanceolate with white flowers, fragrant in corymbose fascicles[2] and fruit is edible.Their medicinal properties are often due to their latex which is frequently drastic and corrosive. Latex is applied to ulcers, herpes and scabies. Seeds possess haemostatic properties. Moreover its bark is bruised and applied as plaster over hard tumours[1,3]. Whereas the others finds use as purgative, cardiotonic, diuretic and hypotensive [4,5].Few important spesiesare *P. accuminata, P. alba, P. rubra, P. lancifolea, P. drastic and P. phagidenica* known for its medicinal utility.The essential oils from the flowers are used for perfumery and aromatherapy purposes being possessed good fragrance[6].Methanolic extract showed antimicrobial activity against *Bacillus anthracis*, *Pseudomonas aeruginosa*[7]. The plant is reported to contain amyrinacetate, mixture of amyrins, ß-sitosterol, scopotetin, the iriddoids isoplumericin, plumieride, plumieride coumerate and plumieride coumerate glucoside[8,9]. According to the World Health Organization, 2003 about 80 % of the population of developing countries being unable to afford pharmaceutical drugs based on traditional medicines, mainly plant based, to sustain their primary health care needs [10]. Herbal medicines are in great demand in the developed as well as developing countries for primary healthcare because of their wide biological and medicinal activities, higher safety margins and lesser costs[11].

Plumeria acuminate is mainly used as medicinal plant. It is a native of Mexico, It is spreaded throughout the tropics. Its common name in India is "Temple tree" or "Champa". It is small tree, 3 to 7 m high stem with smooth and shinning succulent with abundant white latex easily breaks. At the terminal end of the branch, the leaves are crowed, commonly oblong in shape, reaching a length of40cm and a width of 7cm. Leaves are simple, opposite, rarely whorled or alternate, stipules absent or rarely present.

The inflorescence is showing to be cymose, terminal or axillary, with bracteoles. The stamens are inserted on the inside of the corolla tube. The flowers are bisexual, fragrant, the upper portion whitish, while the inner lower portion yellow, 5-6cm long. The fruits are linear oblong or ellipsoid follicles, are brownish black in colour where as seeds are oblong [12,13].

Plumeria obtuse can grow as either a small shrub or tree ranging in height from 0.9-6.1 meters with widely spaced thick succulent branches that are often covered with "knobby" protuberances. The leaves are found in clusters near the tips of the branches. They are large (6-21 cm long and 2-8 cm wide) and have a characteristic oblong shape and the tip of the leaf is obtuse (rounded)rather than pointed as it is in other species. The leaves are dark and leathery and tend to be shiny on the upper surface with conspicuous parallel secondary veins that run from the mid vein to the margins of the leaves. The flowers of this species are borne in inflorescences (clusters) that form at the ends of the branches. Each inflorescence contains many white flowers with a small yellow center creating as plashes of color throughout the tree. The well known characteristic of Plumeria flowers is they contain five petals that are fused at the base in a short funnel-shaped tube which gradually widens as the lobes of the petals are spread out. The fruit of this species is a dry follicle which splits along one side to release the winged seeds[14].

The plants of *Plumeria* species are used traditionally as purgatives, in rheumatism, asthma, piles, gonorrhea, blood disorders and tumors[3].India is sitting on a gold mine of well-recorded and traditionally well-practiced knowledge of herbal medicines, therefore, any scientific data on such plant derivatives could be of clinical importance. The major importance of herbal medicines seem to be their efficacy, low chances of side effects and low cost [15].

They are recognized as excellent ornamental plants and often seen in the grave yards[16]. Plumeria plants are famous for their attractiveness and fragrant flowers.

Phytochemical constituents

Various species of Plumeria contains different phyoconstituents. The stigmast-7-enol, lupeol carboxylic acid, lupeol acetate and ursolic acid had been isolated from *P.acuminate* leaves. It have successfully isolated Fulvoplummierin, Plumericin along with other new compounds isoplumericin, β-dihydroplumericin and β- dihydroplumericinic acid from roots of *P.acuminata*. The steam distillate of *P. acuminate* yields an essential oil which mainly consist of primary alcohols, geraniol, citronellol, farnesol and phenylethyl alcohol with little amount of aldehyde and ketones. These oils have acid value (20.2) and saponification value (123) [17, 18]. *P. rubr*a containing β-sitosterol-β-D-glucoside, lupeolnanoate, irroides viz. fulvoplumierin, allamcin and allamandin, as well as 2,5-dimethoxy-p-benzoquinone, (2R,3s)-3,4'dihdroxy-7,3',5'-trimethoxyflavan-5-O-β-*D*-glucopyranoside as Flavan3-ol Glycoside[19]. The root contains plumericine, β-dihydroplumericin, β-dihydroplumericinic acid and plumeride. Rubrinol; an antibacterial tritripenoid. together with teraxasteryl acetate, lupeol, stigmasterol, oleanolic acid had isolated from Bark[20]. The flower of *P.rubra* consist, 1-diethoxyethane, citral, methylbenzoate, nerolidols, linalool, banzylbenzoate and methyl salicylate[21-23]. The bark *of P.alba* containing alkaloids, carbohydrates, flavonoids, phenolic compounds and tannins[24]. The plant is reported as medicinally important being having amyrin acetate, mixture of amyrins, ß-sitosterol, scopotetin, the iriddoidsiso plumericin, plumieride, plumieride, coumerate and plumieridecoumerate glucoside[25]. The flower oil mainly consists of primary alcohol, such as geraniol, citronellol, farnesol and phenyl ethyl alcohol and some linalool. The flowers contain quercetin and kaempferol[26]. The oil of *P. obtuse* was found to be rich in benzyl salicylate (45.4%) and benzyl benzoate (17.2%), but also minute concentrations of aliphatic acids [27].

Some recent pharmacological activities

Different species of *Plumeria* are used for the cure of rheumatism, diarrhoea, blennorhea, venereal disease, leprosy, psychosis and diuresis etc. *Plumeria* species have also been investigated for isolation of irridoids and triterpenoids, which exhibited algicidal, antibacterial and cytotoxic activities.

1. Anti-inflammatory activity

The methanolic extract of *Plumeria acuminata* exhibited significant anti-inflammatory activity on carrageenan-induced edema in both acute and chronic experimental animal model. This was further confirmed by Sameer Rastogi *et al*)[28]. In another study saponin extract of *P. rubra* exhibited a significant reduction in rat's paw inflammation[29].

The anti-inflammatory activity of a lupine alkaloid Plumerianine isolated from the root bark of *P.acutifolia* was investigated against the carrageenan-induced edema and cotton pellet granuloma in albino rats [30].

2. Antibacterial activity
Methanolic extract of leaves of *P. acuminate* was investigated for their *in vitro* anti-microbial activities. The extract inhibited both gram positive *(Bacillus subtilis, Staphylococcus aureus* and *micrococcus luteus*) and gram negative *(Escherichia coli, Pseudomonas aeruginos* and *salmonella typhimurium*) microorganisms [31].

In another study n-hexane fraction of crude methanolic extract of *P. rubra*stem bark showed growth inhibition against *S.aureus, E. cloacae, P. aeruginosa* and *S. marcescens*[32,33].

3. Antioxidant properties
Alloxan induced diabetic model in rats was used for evaluation of antioxidant and hypolipidemic activity of the flavone glycoside isolated from *P.rubra* L. The treatment showed a significant reduction in serum triglycerides level, while serum cholesterol and glucose were unaltered. Antioxidant activity of the drug was also confirmed through in vitro studies[34]. In another study the antioxidant activity of methanolic extract of *P. acuminate* was evaluated.

4. Antipyretic Activity
Antipyretic effect of ethanolic extract of the leaf of *P.rubra* was investigated in an animal study. Subsiquent dose of ethanolic extract of the leaf of *P.rubra* significantly reduced the elevated body temperature of rabbit. The results were comparable to the standard anti-pyretic drug Aspirin [35].

5. Antitumor activity
Anti tumar property of *Plumeria*was known after the isolation of anti-tumor agents namely plumeric acid and methyl plumerate, from the leaves of *P. accutifolia*. In 2009 it was reported that an endophytic fungus *Colletotrichum gloeosporioides* isolated from *P.acutifolia* possess antitumor properties [36].

6.Gastroprotective activity
The methanolic extract of *Plumeria obtuse* from the stem barkwas evaluated for gastroprotective activity. The extract showed activity due to reduction of gastric acid secretion, gastric cytoprotection and proton pump inhibition mechanism [37]. Antiulcerogenic property of hydroalcoholic extract and fractions obtained from the leaves of *Plumeria alba* L.[38].

7.Antiarthritic activity
The anti-arthritic potential of ethyl acetae and n-butanol fractions (100 and 200mg/kg, p.o.), respectively of hydroalcoholic extract from leaves of *P.alba* were evaluated *in vivo* models of rodents[39].

8. Miscellaneous
Ursolic acid from the leaves, plumeric acid from the latex and leaves and Fulvoplumericin from the bark of *P. rubra* possess local anesthetic, cardiotonic and becteriostatic activities respectively[40]. Methonlic extract of *P.alba* showed hepatoprotective action against paracetamol induced hepatic damage[41]. The iridoid, plumieride[42], isolated from *P. bicolor*, has been recently reported for its antifertility activity[43].

EXPERIMENTAL SECTION

Plant material and chemicals. The fresh plant materials of were collected from Campus during the month of Decenber2015. The botanical identity of the plant was confirmed by the faculty of Botany department, Suraj College. A voucher specimen has been deposited at the of the Department of Botany. All the reagent and chemicals used were procured from laboratory and of analytical grade.

Extraction and isolation
The fresh leaves (100g) of plant *P. alba and P. acuminata w*ere continuously macerated extracted with Petroleum ether (60-80°c), toluene, chloroform, ethyl acetate and then with methanol (35 hrs, 70°c) and five extracts were proceed separately. Petroleum ether extract , toluene extract chloroform extract and ethyl acetate extract. Solvent was evaporated to give a thick material, which was waxy semi solid in nature.

Preliminary phytochemical screening
Preliminary Phytochemical screening of *P. alba and P. acuminate* was carried out by using standard procedures [44,45] is tabulated in table no.1 and 2

Table 1: Test for Phytoconstituents for different extract of *Plumeria alba*

S.No	Test for Phytoconstituents	Pet. ether	Toluene	Chloroform	Ethyle Acetate	Methanol
1	Test for alkaloids	--	--	--	--	--
2	Test for steroids and terpenoids	+	+	+	--	--
3	Test for flavanoids:	--	--	--	+	--
4	Test for saponins	--	--	+	--	--
5	Test for tannins	--	--	--	--	+
6	Test for carbo-hydrates:	--	--	--	--	--
7	Test for glycosides:	--	+	--	--	--
8	Test for sugars (Bromine water test)	--	--	--	--	+
9	Test for oils and fats	+	+	--	--	--

Table 2: Test for Phytoconstituents for different extract of *Plumeria acuminata*

S.No	Test for Phytoconstituents	Pet. ether	Toluene	Chloroform	Ethyle Acetate	Methanol
1	Test for alkaloids	--	--	--	--	--
2	Test for steroids and terpenoids	--	+	+	--	--
3	Test for flavanoids:	--	--	--	--	+
4	Test for saponins	--	--	+	+	--
5	Test for tannins	--	--	+	--	+
6	Test for carbo-hydrates:	--	--	--	+	--
7	Test for glycosides:	--	--	--	--	+
8	Test for sugars (Bromine water test)	--	--	--	+	+
9	Test for oils and fats	+	+	--	--	--

RESULTS AND DISCUSSION

The preliminary phytochemical test was performed with the extracts of leaves of *P.alba* and *P. acuminate.* They show the presence of steroid, alkaloid, flavonoid, glycoside, tannin and carbohydrates in extracts of leaves.

CONCLUSION

The preliminary phytochemical screening revealed the presence of steroid, oil, flavonoid and terpenoid in extracts of leaves of *P.alba* and Tannin, Carbohydrates, Glycosides, Steroid and Flavonoid in extracts of leaves of *P.acuminata.* Due to the presence of active phytochemical, plants can be used medicinally in future.

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