

PHARMACOGNOSTICAL STANDARDISATION OF *PLUMERIA ACUTIFOLIA* (POIR) BARKSURENDRA KR. SHARMA<sup>1\*</sup> AND NARESH KUMAR<sup>1</sup><sup>1</sup>Department of Pharmacognosy, Faculty of Pharmacy, Guru Jambheshwar University of Science and Technology, Hisar-125001, Haryana, India. Email: prof.sharmask@gmail.com

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## ABSTRACT

*Plumeria acutifolia* (Poir) syn *Plumeria rubra* (Linn) is a herbal plant belonging to genus *Plumeria* of Apocynaceae family. The *Plumeria acutifolia* Poir syn *Plumeria rubra* L is a native of Mexico. It is also known as Frangipani, Temple tree, Jasmine tree, Pogoda tree. It is a medicinal and ornamental plant widely used in perfumery. The root bark is bitter, pungent, carminative, laxative, ulcers and useful in leprosy. In Mumbai (India), it is used as an intermittent, like cinchona. In Ayurveda system of medicine it is used in malaria, fever, antiseptic and stimulant. The microscopy shows bark composed of cork cells and small size sclerenchymatous cells. The cortex is wide and parenchymatous, numbers of sclereids are widely distributed in cortex region. The cortex also shows the presence of calcium oxalate crystals. The water soluble, chloroform soluble, alcohol soluble and petroleum ether soluble extractive values were determined. The total ash, water soluble ash, acid insoluble and sulphated ash were observed. The preliminary phytochemical screening revealed the presence of carbohydrate, alkaloids, glycosides, tannins, iridoids and saponins in various bark extract of plant. The pharmacognostical studies of plant have been carried out. This study will help curb substitution and adulteration of the plant material.

**Keywords:** *Plumeria acutifolia*, *Plumeria rubra*, Apocynaceae, Pharmacognostical, Physico-chemical

## INTRODUCTION

The plant *Plumeria acutifolia* Poir syn *Plumeria rubra* L. is a native of Mexico and cultivated in gardens throughout India as an ornamental tree. Its leaves fall during the month of March and new foliage is produced in April. The different parts of the plant are used traditionally as a medicine. The root bark is bitter, pungent, heating, carminative, laxative, ulcers and useful in leprosy.

In Indonesia a decoction of *Plumeria rubra* bark is used to treat gonorrhoea, while in the Philippines bark extracts are employed for their purgative, emmanagogue and febrifuge effects and in Mumbai (India), it is used as an intermittent, like cinchona. In Ayurveda system of medicine it is used in malaria, fever, antiseptic and stimulant<sup>1</sup>.

## MATERIALS AND METHODS

The bark of *Plumeria acutifolia* Poir Syn *Plumeria rubra* L. was collected in University campus in June 2010 and authenticated by Dr. H.B. Singh, Head Raw Material Herbarium & Museum, New Delhi vide Ref. NISCAIR/RHMD/Consult-2010-11/11/1413/11. A voucher specimen has been retained in Department of Pharmaceutical Science, Guru Jambheshwar University of Science & Technology, Hisar. The plant material (1kg) was air-dried at room temperature (30-40°C) and then powdered to pass through a sieve of 1mm and further subjected to various studies like macroscopy, microscopy, histochemical test, were performed on bark of the plant. The physico-chemical constants and preliminary phytochemical screening were studies as standard guidelines.

## Macroscopic Characters

Macroscopical characters relating to colour, odour, taste, shape, size and texture were studied.

Microscopy of bark<sup>2</sup>

Thin transverse sections of the bark were cut using microtome (WES WOX Model, MT-1090 A), stained with phloroglucinol and hydrochloric acid and observed under compound microscope.

## Histochemical colour reaction tests

The histochemical colour reactions on the transverse section of the bark of *Plumeria acutifolia* Poir were performed according to standard procedures reported<sup>3, 4, 5</sup>. The colour tests were performed for the identification of the major cell components.

## Physico- chemical Constants

Extractive values of *Plumeria acutifolia* Poir bark powder were determined according to standard procedures<sup>6,7</sup> using petroleum ether

(60-80°C), chloroform, methanol and water. Loss on drying and ash values such as total ash, water soluble ash, sulphated ash and acid insoluble ash values were studied according to standard procedures.

## Fluorescence Characteristics

The fluorescence nature of *Plumeria acutifolia* Poir bark powder was observed under ultraviolet and visible radiations after treatment with various chemical reagents<sup>8</sup>.

## Behaviour of Bark Powder with Different Chemical Reagents

The behaviour of *Plumeria acutifolia* Poir bark powder with different chemical reagents was studied to detect the presence phytoconstituents along with colour changes under ordinary light on a glass slide<sup>9</sup>.

Preliminary Phytochemical Investigation<sup>10, 11, 12</sup>

The Petroleum ether, chloroform, methanol and aqueous extracts of *Plumeria acutifolia* Poir were investigated for various phytoconstituents present, like alkaloids, carbohydrates, glycosides, terpenoids, sterols, tannins, phenolic compounds, saponins, iridoids, protein and amino acid.

## Quantitative Studies

The Quantitative studies of the powdered *Plumeria acutifolia* Poir bark like foaming index, swelling index and pH of the extract were also investigated<sup>13</sup>.

## RESULTS

## Macroscopic Characters

The bark of *Plumeria acutifolia* Poir is grey-brown in colour with characteristic odour, slightly scaly and curved in shaped. The average bark size is 4-6 cm, bitter in taste. Outer surface is rough and inner surface is smooth. The inner bark exude a white viscid milky juice.

## Microscopy of bark

The bark is composed of cork cells on the outer side which is 6-8 cells thick and composed of small size sclerenchymatous cells. The cortex is wide and has parenchymatous cells. Numbers of sclereids are widely distributed in the cortex region. Cortex also shows the presence of calcium oxalate crystals.

## Histochemical colour reaction tests

Transverse section of the bark has been treated with various chemicals and reagents for the tests of cell components as shown in Table 1.

### Physico-chemical Constants

The Physico-chemical investigation of powdered *Plumeria acutifolia* Poir bark drug such as extractive value, total ash, acid insoluble ash, water soluble ash, sulphated ash and loss on drying of the plant drug were determined and results presented in Tables 2 and 3.

### Fluorescence Characteristics

It is the quick method for the resolution study of crude drug of suspicious specimen, when physical and chemical methods produce inadequate results. The plant material may be identified from their adulterants on the basis of fluorescence nature. Results are described in Table 4.

### Behaviour of Bark Powder with Different Chemical Reagents

The behaviours of bark powdered with different chemical reagent were studied to detect the presence phytoconstituents along with colour changes under ordinary light. Table 5

### Preliminary Phytochemical Investigation

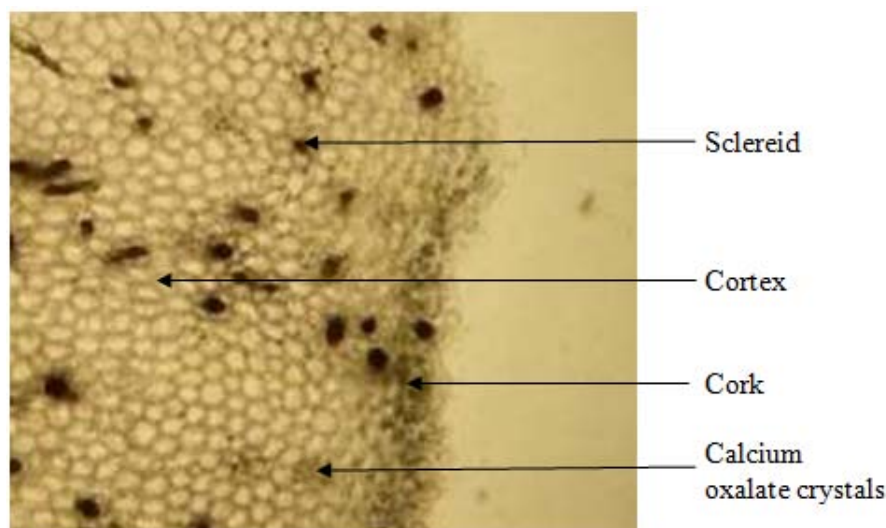
The successive extracts obtained were subjected to investigation for various phytoconstituents present, like alkaloids, carbohydrates, glycosides, terpenoids, sterols, tannins, phenolic compounds, saponins, iridoids, protein and amino acid. Table 6

### Quantitative Studies

The foaming index, swelling index and pH of the extract are tabulated in Table 7.



Dried Bark of *Plumeria acutifolia* (Poir)



Transverse Section of *Plumeria acutifolia* bark

Table 1: Histochemical zone by chemical reagents

Reagent	Test for	Nature of colour change	Chemical constituents
Iodine solution	Starch	Brownish black	++
Aqueous FeCl <sub>3</sub>	Tannins	Yellowish	-
Libermann Burchard	Terpenes	Yellowish black	++
Dragendroff' Reagent	Alkaloids	Yellowish brown	++
H <sub>2</sub> SO <sub>4</sub>	Sterol	Yellowish black	+
Trim-Hill Test	Iridoids	Blackish brown	++
NH <sub>3</sub>	Glycoside	Brownish black	+

++ : more present, + : less present, —: not present

Table 2: Ash values and loss on drying

Parameter	% w/w
Total ash	4.5%
Acid insoluble ash	1.53%
Water soluble ash	2.0%
Sulphated ash	5.6 %
Loss on drying	4.16%

Table 3: Extractive values of different solvents, Percentage yield and Colour of extract

Solvents used	Percentage yield	Colour of extract		
		Visible	254 nm	365 nm
Petroleum ether	2.1	Grey sticky mass	Greenish	Greenish
Chloroform	3.7	Yellowish	Brownish	Yellowish black
Methanol	17.5	Brownish	Brownish Black	Black
Water	18.2	Brownish	Brownish Black	Black

Table 4: Fluorescence Characteristics of Drug with Different Chemicals under UV Light

Powder and Reagent	Colour observed under ordinary light	UV Light	
		254 nm	365 nm
Powder as such	Brown	Brown	Yellowish
Powder + Picric acid	Brown	Brownish	Brownish black
Powder + NaOH	Blackish	Brownish black	Black
Powder + GAA	Yellowish	Yellowish	Yellowish black
Powder + HCL	Brownish	Blackish brown	Black
Powder + HNO <sub>3</sub>	Yellowish brown	Reddish brown	Brownish black
Powder + Iodine	Brownish	Blackish brown	Blackish
Powder + FeCl <sub>3</sub>	Yellowish brown	Yellowish	Brownish black
Powder + H <sub>2</sub> SO <sub>4</sub>	Brownish black	Blackish	Black
Powder + Methanol	Blackish	Black	Black

Table 5: Behaviour of Bark powder with different chemical reagents

Reagent	Colour / Precipitate	Constituents
Powder as such	Brown	-
Powder + Conc. H <sub>2</sub> SO <sub>4</sub>	Brownish black	Steroids
Powder + Aqueous FeCl <sub>3</sub>	Yellowish brown	Tannins absent
Powder + Iodine	Blackish	Carbohydrate
Powder + Picric acid	Yellowish brown	Alkaloid
Powder + Ammonia solution	Brownish black	Glycoside
Powder + Magnesium + HCl	Blackish pink	Flavanoids
Powder + Aqueous KOH	Reddish black	Glycoside

Table 6: Preliminary Phytochemical Investigation of various extracts

Test	Petroleum ether	Chloroform	Methanol	Water
Carbohydrate	—	—	+	++
Alkaloid	—	—	++	++
Glycoside	—	—	+	+
Phenolic and Tannin	—	—	—	—
Flavonoid	—	-	+	+
Saponin	—	—	—	—
Protein and Amino acid	—	++	++	—
Iridoids	—	—	—	—

++ : more present, + : less present, —: not present

Table 7: Quantitative studies of *Plumeria acutifolia* bark

S. No.	Estimation	Observations
1	Foaming index	> 100
2	Swelling index	> 1
3	pH value	5.8
	(1) 1%	4.9
	(2) 10%	

**DISCUSSION AND CONCLUSION**

The scientists from past few decades are keen and sincere to evaluate many ethno medicinally used plants, due to their specific healing properties, desirable action, easy availability and less toxicity. The bark of *Plumeria acutifolia* Poir is still used in treatment of various disorders by populations. The pharmacognostical studies on this plant give idea about identification, standardization and monograph of the plant. It is also important in long term study of plant to evaluate the medicinal and therapeutic action of this plant

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