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Pharmacognostical and Physicochemical Standardization of Leaves of *Spathodea Campanulata* P. Beauv

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Spathodea campanulata belongs to the family *Bignoneaceae*, commonly known as the Fountain tree, African tulip tree, Flame-of-the forest. The leaves possess analgesic and anti-inflammatory activities. The ethanolic extract of leaf and flower shows antimicrobial properties. The roots peel contains iridoid glucoside and phenolic derivatives p-hydroxy-benzoic acid and methyl p-hydroxy-benzoate. They were evaluated for anti fungal activity. Macroscopically, the *Spathodea campanulata* is compound leaf, oblong shape, entire margin, hairy surface, normal base, short solid petiole. The microscopic study showed the presence of collenchyma, vascular bundles, spongy parenchyma, palisade cells, diacytic stomata, trichomes. Physicochemical studies revealed moisture content, foreign matter, total ash, acid insoluble ash, water soluble ash, sulphated ash. The leaves were extracted by cold maceration process using solvents like chloroform, acetone, methanol and water. The preliminary phytochemical screening revealed the presence of steroids, cardiac glycosides, alkaloids, tannins and phenolic compounds were observed. The present study might be useful to supplement information in regard to its identification parameters.

Keyword: *Spathodea campanulata*, Physico-Chemical Analysis, Phytochemical Study

1. Introduction

Spathodea is a monotypic genus in the flowering plant family *Bignoniaceae* (Figure:1). It contains a single species, *Spathodea campanulata*. It is commonly known as the Fountain Tree, African Tulip tree, Pichkari or Nandi Flame^[1]. It is a tree that grows between 7–25 m (23–82 ft) tall and is native to tropical dry forests of Africa. The generic name derived from the Greek word 'spathe' (blade), from the shape of the corolla^[2]. The specific name means pertaining to a Campanula, a name coined in 1542 by Fuchs for the type of corolla with a broad rounded base and a gradually expanded tube corresponding to the sound bow of a church bell.

This tree is planted extensively as an ornamental tree throughout the tropics and is much appreciated for its very showy reddish-orange or crimson (rarely yellow), campanulate flowers.



Fig 1: *Spathodea campanulata* P. Beauv

It has become an invasive species in many tropical areas. The leaflets are oblong-elliptic, about 1 cm long and 0.5 cm broad, entire, broadly acuminate, unequal at the base, dark green on top and light green on the underside. There are glandular swellings at the base of the lamina. The midrib and nerves are yellow, raised and very

slightly pubescent; the venation is reticulate. The petiole is short, thick about 0.7 cm long; there are conspicuous lenticels on the rachis; rachis base is swollen. Flowers are large, red, hermaphrodite, orange with calyx green, about 1 cm long and split on the posterior side, ribbed and tomentellous; petals 5, each about 1.5 cm long; stamens 4 with orange filaments; style extruding with a 2-lipped stigma. Flower buds curved and contain a red sap. A yellow-flowered variety has been reported. Fruit upstanding, dark brown, cigar-shaped, woody pod, 15-25 cm long and split on the ground into 2 boat-shaped valves, releasing many flat-winged seeds; 1-4 pods usually develop from 1 flower cluster; seeds thin, flat and surrounded by a filmy wing. Seed is about 2.5 centimeters wide, with a broad, silvery white, transparent wing.

Spathodea campanulata is used for various purposes in herbal medicine. It is evaluated for its analgesic and anti-inflammatory properties^[3]. Antimicrobial activity of ethanol extract of leaf and flower of *Spathodea campanulata* P. Beauv., was evaluated and it was reported that flower extract exhibited good activity compared to the leaf^[4]. Study of methanolic extract of flower of *Spathodea campanulata* L. as an anti-solar was proved for its effective usage in sunscreen preparations^[5]. The ethanol leaves extract was reported for anticonvulsant activity^[6]. The quinazoline derivatives of *S. campanulata* possess anti-oxidant property^[7]. Establishment of the pharmacognostic profile of leaves of *Spathodea campanulata* will assist in standardization which can guarantee quality, purity and identification of sample.

2. Materials and Methods:

The fresh leaves of *Spathodea campanulata* were collected in and around Guntur, Andhra Pradesh, India. The plant was identified and authenticated by Dr. M. Raghu Ram, Department of Botany & Microbiology, Acharya Nagarjuna University, Guntur, Andhra Pradesh. The healthy leaves were shade dried and powdered to a get coarse powder. Pharmacognostical evaluation includes macroscopical and microscopical characters. Quantitative leaf microscopy to determine

stomatal number, stomatal index and physico-chemical parameters of the powdered drug such as ash value, extractive value and loss on drying were performed. Examination of starch grains, calcium oxalate crystals were carried out as per standard procedure^[8-10]. The preliminary phytochemical screening for various secondary metabolites such as alkaloids, flavonoids, glycoside, phenolic compounds, saponin, sterols, tannins was carried using standard methods^[11].

3. Result

3.1 Morphological and Microscopical characters of leaves

Spathodea campanulata, is an ornamental plant found throughout in India. Morphologically leaves are the opposite imparipinnate and are exstipulate. Each leaf consists of 5-7 pairs of opposite leaflets and a terminal one (Figure:2). The leaflets are oblong-elliptic, about 1 cm long and 0.5 cm broad, entire, broadly acuminate, unequal at the base, dark green on top and light green on the underside. There are glandular swellings at the base of the lamina (usually a pair); the midrib and nerves are yellow, raised and very slightly pubescent; the venation is reticulate. The petiole is short, thick about 0.7 cm long; there are conspicuous lenticels on the rachis; rachis base is swollen. The results were reported in table-1.

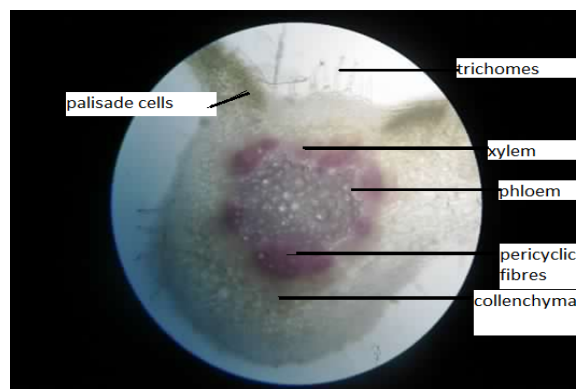


Fig 2: Pinnae of *Spathodea campanulata*

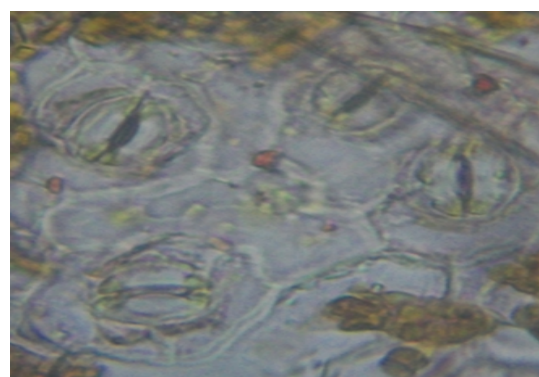
Table 1: Morphology of *Spathodea campanulata* leaves

Morphological Parameters	Observation
Size	
Length:	17.3cms
Width:	9.7cms
Shape	Oblong
Apex	Acute
Margin	Entire
Base	Normal
Petiole	Short solid petiole
Surface	Hairy
Colour	
Inner:	Light green
Outer:	Dark green
Odour	Characteristic
Taste	Bitter taste

Microscopically transverse section of leaf consists of lamina and midrib region. Lamina exhibits upper and lower epidermis. Epidermis covered with cuticle. Diacytic stomata and glandular trichomes were found on epidermis, mesophyll comprises of palisade and spongy parenchyma. Palisade cells are columnar one layered. Midrib exhibits arc shaped vascular bundle enclosed by pericyclic fibre. Vascular bundle consists of xylem and phloem (Figure-3).

**Fig 3:** Transverse Section of leaf of *Spathodea campanulata*

3.2 Quantitative Leaf Microscopy: Fragment of lamina showing stomata and venation. Stomatal index was found for upper and lower epidermis is 45. Stomatal number for upper epidermis is 20 and lower epidermis is 23 (Figure-4).

**Fig 4:** Stomata of *Spathodea campanulata* leaf

3.3 Physico-chemical Study: Physicochemical studies revealed moisture content, foreign matter, total ash, acid insoluble ash, water soluble ash, sulphated ash (table-2).

Table 2: Physicochemical constants of leaves of *Spathodea campanulata*

Parameter	Physico-chemical Constant (%w/w)
Moisture content	0%
Foreign matter	0.007%
Total ash	87%
Acid insoluble ash	5%
Water soluble ash	2%
Sulphated ash	1.8%

3.4 Preliminary Phytochemical Screening:

The preliminary phytochemical screening revealed the presence of various

phytoconstituents. Carbohydrates are present in chloroform extract. All the extracts possess mucilage. Steroids and cardiac glycosides are present in aqueous extract. Alkaloids are present

in chloroform and acetone extracts. Tannins and phenolic compounds are present in acetone, methanol and aqueous extracts. The results were reported in table-3.

Table 3: Preliminary Phytochemical Screening of leaves of *Spathodea campanulata*

Tests	Chloroform Extract	Acetone Extract	Methanol Extract	Aqueous Extract
Carbohydrates	+	—	—	—
Gums	—	—	—	—
Mucilage	+	+	+	+
Proteins	—	—	—	—
Aminoacids	—	—	—	—
Fats & Oils	+	—	—	—
Steroids	—	—	—	+
Cardiac glycosides	—	—	—	+
Flavonoids	—	—	—	—
Alkaloids	+	+	—	—
Tannins & phenolic compounds	—	+	+	+
Vitamins	—	—	—	—

4. Conclusion

The present study on pharmacognostical characters of leaves of *Spathodea campanulata* may be useful to supplement information with regard to its identification and will be helpful in establishing standardization criteria. The preliminary phytochemical screening revealed the presence of steroids, cardiac glycosides, alkaloids, tannins and phenolic compounds.

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