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Pharmacognostical evaluation of leaf buds of *Ficus bengalensis* L.

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ABSTRACT

Ficus bengalensis belongs to family Moraceae is a large and extensively growing tree across Indian continent. The aim of present study was to investigate the pharmacognostical characters of important medicinal plant, Ficus bengalensis L. (Moraceae). The pharmacognostic studies were carried out in terms of macroscopical, microscopical characters, physicochemical parameters of F. bengalensis. Samples of different plant parts were fixed with formalin, acetic acid and ethyl alcohol (FAA), sectioned with rotary microtome and studied under microscope. Some of the diagnostic of the leaf buds were presence of uniserrate simple trichomes in sheath on both the surfaces, presence of simple starch grains, rosette calcium oxalate crystals and brown tannin content in the parenchymatous cells and presence of closely arranged thin walled rounded to tangentially elongated brown tannin color parenchymatous cells. Further, ash and extractive values were calculated as per WHO guidelines. The preliminary phytochemical screening showed the presence of sterols/ triterpenes, lactones, saponins, flavonoids, tannins, resins and carbohydrates. Various pharmacognostical characters were observed in study which can help in identification and standardization of F. bengalensis.

Keywords: *Ficus bengalensis*, Microscopy, Phytochemical screening, Pharmacognostic character, Standardization.

INTRODUCTION

Pharmacognosy is the study of the structural, physical, chemical and sensory characters of crude drugs of animals, plants and mineral origin [1]. Last decade mark the uprising of branch as the quest for biologically active compounds from natural source had increased its pace. Higher plants have played a vital role as a source of therapeutic agents. One such plant is *Ficus bengalensis* that is commonly used in Ayurveda as *lepa* in skin diseases. Internal uses of *F. bengalensis* include *raktha shodhaka* (blood purifier), *raktha vikaras* (blood disorders), *raktha pittahara* (correcting coagulation disorders), *garbhashaya dosha hara* (uterine stimulant), *swetha pradara* (white discharge or leucorrhea), *mootra sangrahaniya* (anti-diuretic) in *prameha*. Other traditional uses are in *moorcha* (unconciousness), *jwara* (fever), *shopha* (oedema), *yonidosha* (genetal tract disorders) and *visarpa* (skin disorders of various types) [2]. *Vatankura* has specific curative actions in *masoora* and *vyanga* by its *pralepa*. Aqueous extract of bark and leaves depresses the cardiac and uterine muscles and acts as a cholinergic blocking agent on smooth and skeletal muscles.

Ethnopharmacological information

F. bengalensis has been widely used in Indian folk medicine for the treatment of diabetes, skin disorders, cuts and wounds. This plant is also accredited with antibacterial, antidiabetic and antifungal activity [3, 4].

MATERIALS AND METHODS

Collection and identification of plant material

Fresh samples of leaf buds of *F. bengalensis* were collected from Mysore, Karnataka in the month of July 2010. Leaf buds were cleaned to remove the adhering dust and then dried under shade. Finally, powdered with the help of electronic device. The powdered drug was used for further studies. Microscopical and morphological characters of plant were examined. The plant species was identified by RRI (Ay), Bangalore.

Physicochemical parameters

Physicochemical parameters like foreign matter, ash values, extractive values and loss on drying were calculated as per WHO guidelines. Fluorescence evaluations was done under UV light [5].

Preliminary phytochemical screening

Ethanolic extract of leaf buds of *F. bengalensis* was subjected to qualitative phytochemical screening to establish the nature of chemical composition [6].

Microscopic analysis

Samples of different plant parts were fixed with formalin, acetic acid and ethyl alcohol (FAA), sectioned with rotary microtome and studied under microscope [7,8,9].

RESULTS

Physicochemical parameters

The foreign matter, total ash, acid insoluble ash, water soluble ash, water soluble, alcohol soluble extractive values and loss on drying were found out to be 0.65%, 10.75, 0.75, 1.0, 10.40%, 5.6%, 5.20% respectively. The pH was determined by standard procedure and was found out to be 6.3.

Preliminary phytochemical screening

The ethanolic extract of leaf buds of *F. bengalensis* was found out to contain sterols/ triterpenes, lactones, saponins, flavonoids, tannins, resins and carbohydrates. The presence of sterols/ triterpenes, flavonoids are responsible for valuable pharmacological activities of *Ficus*.

Fluorescence analysis [10, 14]

The observations were made are standard parameters for the crude drugs under UV rays. These studies may help to distinguish the adulterated drugs from the authentic one by observing under similar conditions and examining the color shades. **Table 1** presents the Fluorescence analysis of *F. bengalensis*.

Table 1 Fluorescence analysis of *F. bengalensis*

S. No.	Sample	*Ficus bengalensis*		
		Visible rays	UV rays	
		White light	Long wave 365nm	Short wave 254nm
1	Drug	Grey	Grey	Grey
2	Drug + Ethyl alcohol	Black	No Fluorescence	Dark black
3	Drug + ethanolic NaOH	Black	No Fluorescence	Black
4	Drug + dil.HCl	Grey	No Fluorescence	Dark black

Table 2 Physical characters of extract of *F. bengalensis*

S. No.	Extract	Color	Odor	Nature
1	Petroleum ether	Whitish green	Characteristic	Powder
2	Benzene	Whitish green	Characteristic	Sticky
3	Chloroform	Pale green	None	Faintly sticky
4	Ethyl alcohol	Dark brown	Aromatic	Hard mass
5	Aqueous	Brown	None	Waxy

Physical characteristics of different extracts of *F. bengalensis* was examined by extracting it with various solvents, successively. Table 2 shows the physical characters of various extracts.

Macroscopic characters

The leaf buds were short, and measures 1.5 cm to 2 cm in length and 0.5 to 1 cm in diameter. Outer surface is smooth and hairy (pubescent). Leaf base (sheath) apperars to be thick, leathery, green to dark brown in color. It has no aroma and posses bitter taste.

Microscopic Characters

The transverse section of single leaf sheath shows upper and lower epidermal layers made up of rectangular cells and both the epidermal cells shows simple unicellular trichomes (tufts of trichomes). Epidermal cells were followed by many layered, rounded to polygonal, brown parenchymatous cells, compactly. These cells were filled with simple starch grains and rosette type of calcium oxalate crystals. In between the parenchymatous cells rounded to polygonal calcium oxalate crystals were present. Walls of the stone cells were highly lignified and lumen was broad and with pitted thickenings.

The leaf is uniform thick with smooth and even surfaces and fairly prominent midrib. The midrib region shows the upper and lower epidermis followed by two to three layers of collenchymatous cells and parenchymatous cells. Vascular bundles are feebly developed with xylem and phloem and contains small vascular bundles. Laminar region is also feebly developed with spongy and palisade parenchymatous tissue.

The diagnostic characters were the presence of tufts of uniserrate simple trichomes in sheath on both the surfaces. It also showed the presence of closely arranged thin walled rounded to tangentially elongated brown tannin color parenchymatous cells and round to polygonal stone cells heavily lignified wall with pitted thickenings were also present. The parenchymatous cell contains simple starch grains, rosette calcium oxalate crystals and brown tannin content.

Maceration of the whole leaf bud shows parenchymatous cells (rectangular) with tannin, helical to spiral vessel round to polygonal stone cells with heavily lignified cell walls with pitted thickenings unicellular simple trichomes.
Measurement of different tissues in microns (µ)

1. Epidermis: 15-20-25 × 10-12-20 µ
2. Parenchyma: 25-38-45 × 15-20-35 µ
3. Stone cells: 20-25-35 × 15-20-30 µ
4. Trichomes: 10-15-20 × 5-10-15 µ
5. Phloem: 5-10-15 × 3-5-10 µ

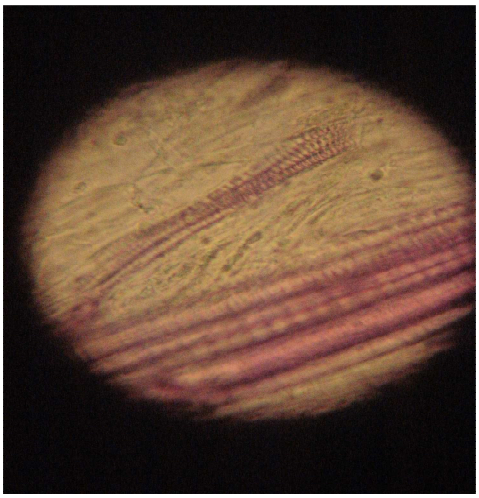

Fig 1. Spiral vessels of *F. bengalensis*

Fig 2. Stomata of *F. bengalensis*

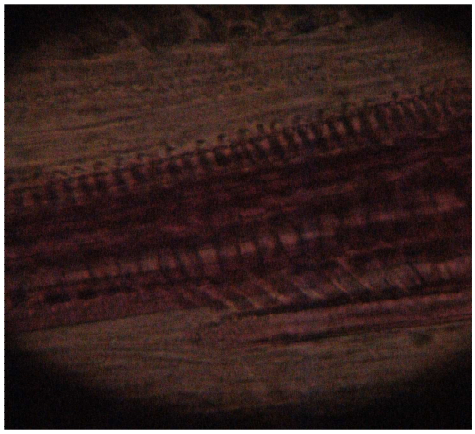

Fig 3. Unicellular trichomes of *F. bengalensis*

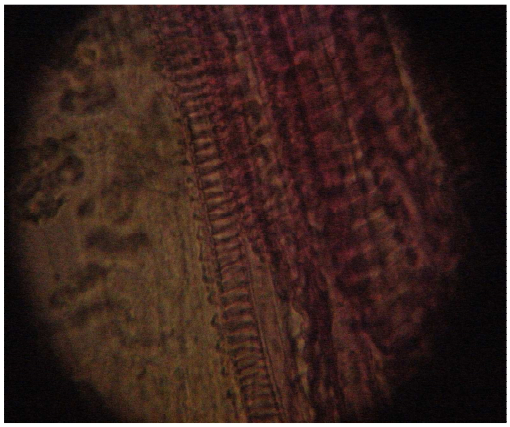

Fig 4. Parenchymatous cells of *F. bengalensis* containing brown tannin content

Histochemical tests [11] showed the presence of starch, tannin, lignin and oil globules were found to be absent. Table 3 presents the result analysis of histochemical tests.

Table 3 Histochemical tests of *F. bengalensis*

S. No.	Test for	Reagents	Result	Color
1	Starch	Iodine solution	Positive	Blue
2	Tannin	Aqueous ferric chloride solution	Positive	Black
3	Lignin	Dil HCl and pinch of phloroglucinol	Positive	Effervescence resction and magenta color
4	Oil globules	Sudan III	Negative	No change

DISCUSSION

Standardization is an important for herbal drugs in order to establish their identity, purity, safety and quality. In order to standardize a drug, various microscopic, macroscopic analysis are done [12]. Microscopic method is one of the cheapest and best method to start with establishing the correct identification of the source of material [13]. Pharmacognostical studies of *F. bengalensis* was carried out in order to identify the correct species and also to differentiate the closely related other species of *Ficus*. The parameters observed may be useful for future identification of the plant. Morphological and microscopic studies of leaf buds act a reliable source for detecting adulteration [14]. Ash values are useful in indicating extraneous matter (eg. soil and sand) adhering to plant material and extractive values whether the drug purchased is fresh one and not the exhausted one. Extractive value is employed for material for which no suitable chemical or biological assay exists. Preliminary phytochemical screening also indicates the quality of drug.

CONCLUSION

In the present study various parameters were evaluated to explore the anatomical features of leaf buds of *F. bengalensis* which could be useful in identifying the species in routine quality control process. In conclusion, parameters reported above are sufficient enough to identify and authenticate the plant material. The microscopic and physicochemical standards laid down can be used to distinguish the genuine drug from adulterated drug. The plant, *F. bengalensis* entire plant is worth for further chemical isolation and pharmacological investigation[15].

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