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Research Article

COMPARATIVE PHARMACOGNOSTIC AND POWDER MICROSCOPIC STUDIES OF THE BARK OF FOUR FICUS SPECIES (*NALPAMARAM*)

Anusha UJ[1], Meera Mohan K[2], Ayana Elma Shaji[2], Bijeshmon PP[3]*
[1]PG Scholar, Dept. of Botany, ST. Joseph's College, Irinjalakuda, Thrissur, Kerala.
[2]Botanist, *[3]Manager, Quality Control Division, Sitaram Ayurveda Pvt. Ltd., PO Nedupuzha, Thrissur, Kerala, India.

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ABSTRACT

Nalpamaram is widely used in traditional Ayurvedic system for the treatment of several ailments. It is very effective for the treatment of skin diseases like pigmentation, wrinkles and dark circles. This has a brown texture and a unique aroma. *Nalpamaram* is a mixture of four plant species of the family Moraceae - *Ficus religiosa* (*Asvattha*), *Ficus benghalensis* (*Nyagrodha*), *Ficus racemosa* (*Udumbara*) and *Ficus microcarpa* (*Plaksah*). The barks of the species are usually interchanged or adulterated with other species of *Ficus* because of the limited knowledge in identification and differentiation. Therefore, a detailed comparative pharmacognostic evaluation of the four species has been carried out with the aim to establish the diagnostic keys of these important drugs based on the pharmacognostic and powder macroscopic profiles. Pharmacognostic study of all these shows differences in values. Total ash is low in *F. racemosa* and high in *F. benghalensis* Acid insoluble ash is low in *F. benghalensis* and high in *F. racemosa*. Water soluble extractive is low in *F. benghalensis* and high in *F. racemosa*. Alcohol soluble extractive is low in *F. benghalensis* and high in *F. racemosa.* Unique identification features like stone cells and prismatic crystals of calcium oxalate were found in the powder of all four species. The information from the present study provide data which is useful for the development of suitable monograph, determining the quality and purity of a crude drug and laying down Pharmacopoeia standards for *Nalpamaram*.

INTRODUCTION

Pharmacognosy is the branch of knowledge concerned with medicinal drugs produced from plants, animals and microbes of their natural sources. It is generally the study of medicines or crude drugs of plant and animal origin also includes the analysis of physical, biological and chemical properties. Pharmacognosy is closely related to botany and plant chemistry and, indeed, both originated from the earlier scientific studies on medicinal plants. Initial periods of the 20th century, the subject had developed from the botanical side, considering with the explanation and identification of drugs, both in the entire form, parts and its powder forms, and with their history, collection, preparation and storage[1]. It is estimated that roughly 1500 plant species in Ayurveda, 1200 plant species in Siddha have been used for drug preparation[2]. For to identify the purity of herbal raw materials and to detect adulteration among them, an authentic pharmacognostic study is very urgent and crucial for each herbal raw drug. Usually, the drugs are collected by traditional practitioners who have inherited Ayurvedic or other herbal practices. The identification of herbal drug is commonly based on its morphological features or its conventional characteristics. In such conditions, there is a chance of selecting adulterants or false herbal raw materials. Therefore, an extensive anatomical and phytochemical screening is needed for each raw drug used in the formulation to avoid any ambiguity and such a study will serve also as a reference for further studies [3].

In the traditional Indian system of medicine, Ayurveda, mixtures of plants are used rather than one species. *Nalpamaram* is in an important group of trees in Ayurveda which constitutes four milky latex

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secreting trees namely; *Ficus benghalensis, Ficus religiosa, Ficus racemosa* and *Ficus microcarpa* of the Family Moraceae. The barks of these species are used for various diseases like ulcers, inflammation, dysentery, diarrhea, diabetes skin diseases etc [4]. The barks of these species form an important ingredient in many Ayurvedic formulations, such as *Nalpamaraditailam, Chandanasavam, Saribadyasavam* etc [5]. The stem barks are used for to cure various ailments: used for skin diseases, inflammations, ulcers, very effective for skin related problems in children, helps to brightening skin, remove dark coloured spots and helps to the smoothening and soften the skin. These have very effective antioxidant properties and help to repair pigmentation. Studies revels that these contains organic acids, amino acids, fatty acids, flavonoids, phenolic compounds, phytosterols, volatile compounds etc [6,7,8,9,10,11].

The barks are almost 1-2cm thick, light brown to brown in colour. These are very useful for preparation of many drugs [12]. In the present study, an attempt was made to study the comparative pharmacognostic features and powder microscopic studies of the barks of the four Ficus species used in *Nalpamaram*, an important Ayurvedic drug.

MATERIALS AND METHODS

Plant Material

The fresh stem barks of *Ficus bengalensis, Ficus religiosa, Ficus racemosa* and *Ficus microcarpa* were collected from Thrissur district of Kerala. (Fig. 2) All the barks were identified and authenticated by Dr. Ashima Sasidharan (RM Purchase officer, Sitaram Ayurveda, Thrissur and the control samples were kept in QC Department of Sitaram Ayurveda, Thrissur, Kerala. For analysis all the barks were shade dried separately and kept in air tight containers (Fig. 3).

Fig: 1. Ficus Species

Fig.2: Fresh Bark of Ficus species

Fig.3: Powdered bark of Ficus species

Physicochemical Parameters

Physicochemical analysis of sample was carried out. The determination of physicochemical parameter is important in determination of adulterants and improper handling of drugs. Ash values are important quantitative standards and criterion to analyze the identity and purity of crude drugs especially in the powder form. Quantitative analysis of total ash, acid insoluble ash, water soluble extractive and alcohol soluble extractives were checked according to the standard methods in Ayurvedic Pharmacopeia of India [13].

Determination of Total Ash

Accurately weighed 3gm of the ground drug in a silica crucible which is previously dried and weighed. Incinerate at a temperature not exceeding 600°C until free from carbon, cool in a desiccator for 30 minutes and weigh without delay, collect the residue on an ashless filter paper, incinerate the residue and filter paper, add the filtrate, evaporate to dryness, and ignite

at a temperature not exceeding 600°C. Calculated the percentage of ash with respect to the air-dried sample.

Determination of Acid Insoluble Ash

Boil the ash obtained in above for 5 minutes with 25ml of dil. HCl, collected the insoluble matter in a gooch crucible on an ash less filter paper, washed with hot water and ignite to constant weight. The percentage of acid insoluble ash with reference to the air-dried drug is calculated.

Determination of Alcohol Soluble Extractives

Macerate 5 gm of the coarsely powdered drug with 100 ml of alcohol of the specified strength in a stoppered flask for 24 hrs, shaking frequently during 6 hrs and allow to stand for 18 hrs. Filter precautions to be taken to prevent the loss of solvent. Evaporate 25 ml of the filtrate to dryness in tarred flat bottomed shallow dish and dry at 105°C to constant weight and weigh. Calculate the percentage of alcohol soluble extractive with reference to the dried drug.

Determination of Water Soluble Extractives

Macerate 5gm of the coarsely powdered drug with 100ml of chloroform water in a stoppered flask for 24 hours shaking frequently during 6 hours and allow to stand for 18 hrs. Filter rapidly, taking precautions against loss of solvent. Evaporate 25ml of the filtrate to dryness in tarred flat bottomed shallow dish and dry at 105°C to constant weight and weigh. Calculate the percentage of water soluble extractive with reference to the dried drug.

Powder Microscopy

Powder microscopic studies were done by standard procedures[14]. Slides were prepared with chloral hydrate, glycerine, phloroglucinol and iodine-in-potassium iodide solution, the characters were observed under Magnus Trinocular Microscope and the images were captured with Sony Digital camera.

RESULTS AND DISCUSSION

Physicochemical parameters of powder are shown in the Table 1. The percentage of total ash, acid insoluble-ash and water-soluble extractives, alcohol soluble extractives were obtained by employing standard methods of analysis.

Table-1: Physio chemical Parameters of four Ficus species

Parameters tested	*F. religiosa*	*F. benghalensis*	*F. racemosa*	*F. microcarpa*
Total Ash	9.162	17.064	9.290	11.779
Acid insol. ash	1.036	0.879	1.980	1.672
Water sol. extractives	4.172	2.054	10.479	3.732
Alcohol sol. extractives	6.487	2.634	10.302	4.097

Powder Microscopy

***Ficus religiosa* L.**

The stem bark powder is dark brown coloured with a pleasant smell. When treated with chloral hydrae, safranin and potassium iodide shows cork cells, Crystals of calcium oxalate, stone cells and sclerids (Fig. 4).

***Ficus benghalensis* L.**

The stem bark powder is dark brown coloured with a pleasant smell. When treated with chloral hydrae, safranin and potassium iodide shows prismatic crystals of calcium oxalate in various sizes, stone cells and sclerids (Fig. 5).

***Ficus racemosa* L.**

The stem bark powder is dark brown coloured with a pleasant smell. When treated with chloral hydrae, safranin and potassium iodide shows prismatic crystals of calcium oxalate in various sizes, fragments of cork cells, trichrome with narrow lumen and stone cells (Fig. 6).

***Ficus microcarpa* L.**

The stem bark powder is dark brown coloured with a pleasant smell. When treated with chloral hydrae, safranin and potassium iodide shows prismatic crystals of calcium oxalate in various sizes, parenchymatous cells with stone cells, xylem and phloem fibers (Fig. 7).

Figure-4: Powder microscopy of Ficus religiosa

A- Calcium oxalate crystals, B- Stone Cells, C- Cork Cells, D-Sclerids

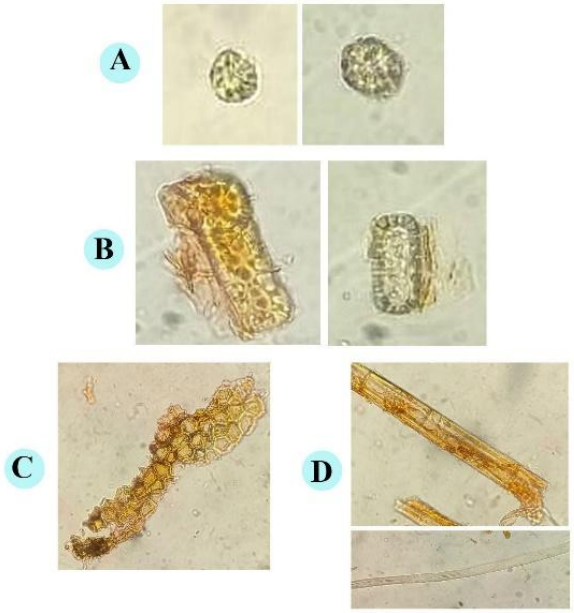


Figure-5: Powder microscopy of *Ficus benghalensis*

A-Prismatic crystals of calcium oxalate, B- Stone Cells, C- Sclerids

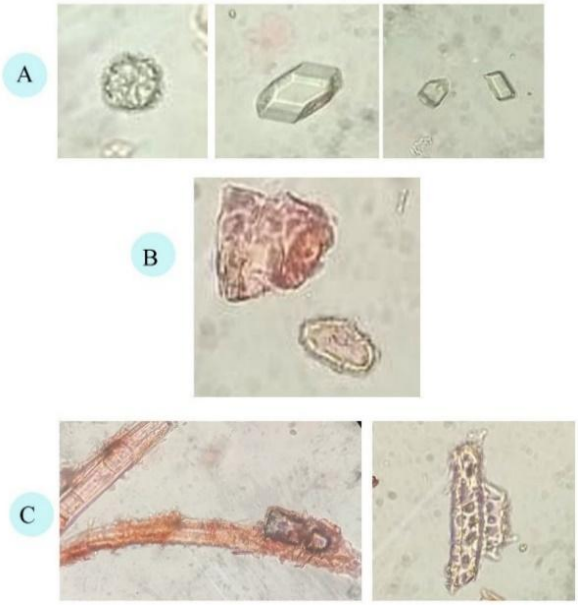


Figure-6: Powder microscopy of *Ficus microcarpa*

A- Prismatic crystals of Calcium Oxalate, B- Cork Cells, C- Trichomes, D- Stone Cells, E- Round shaped Starch grains

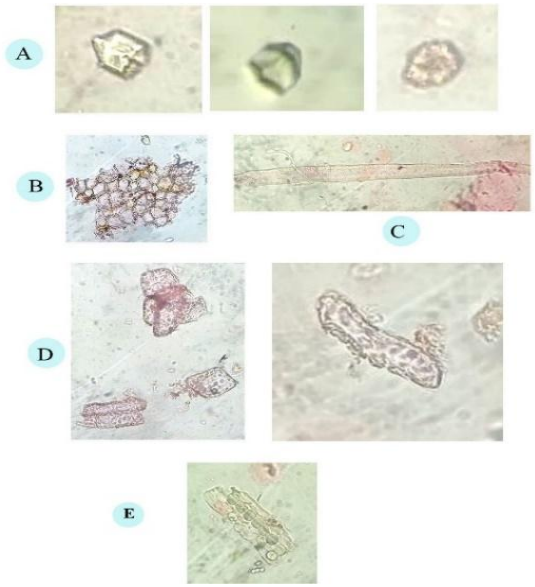
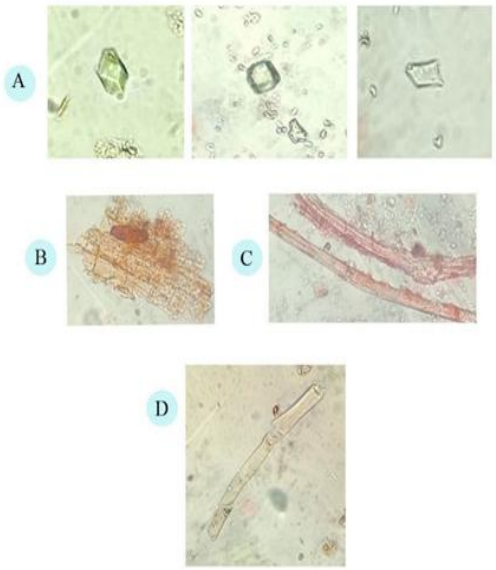


Figure-7: Powder microscopy of *Ficus microcarpa*

A- Prismatic Crystals of Calcium Oxalate, B- Parenchymatous cells with stone cells, C- Xylem, D- Phloem fibers



CONCLUSION

Genuineness and authenticity of any herbal crude drug needs to be standardized using approved parameters to avoid adulterations in the process of medicine preparations. The majority of the information on the identity, purity and quality of the plant material can be obtained from its physio–chemical parameters, TLC analysis, anatomical and powder microscopic studies. The powder microscopic analysis is an important area of the present study and this is one of the unique identification tools for the genuine identification of raw material if it is in powder forms. In all these four species prismatic crystals of calcium oxalate is seen. In *Ficus microcarpa* unique round shaped starch cells are found. Nowadays most of the supplier's especially for organic raw materials they are preferring raw material as powder form. So, it

is not easy to identify by physical observations. The microscopic features and the quantitative standards would be useful for laying down pharmacopeia standards of *Nalpamaram*. The information from the present study will provide data which is helpful in the correct identification and authentication of these medicinal plants and may help in preventing its adulteration. This work can be utilized for identification and authenticity of the drug required for the standardization of these plant species.

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***Address for correspondence**
Mr. Bijeshmon PP
Manager
Quality Control Division,
Sitaram Ayurveda Pvt. Ltd.,
PO Nedupuzha, Thrissur,
Kerala, India- 680007
Email:
bijeshplanthadam@gmail.com