

PHARMACOGNOSTICAL STUDIES ON THE ROOT OF “*FICUS NATALENSIS*”

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ABSTRACT

Ficus natalensis, a member of the Moraceae family, is widely recognized in African ethnomedicine for its therapeutic value. This study investigates the root of *Ficus natalensis*, focusing on its ethnobotanical uses, macroscopical and microscopical characteristics, physicochemical properties, and extractive values. Traditionally, the root is employed in the treatment of a range of ailments including respiratory infections, gastrointestinal disorders, reproductive health issues, and for wound healing. Macroscopical analysis revealed that the roots are cylindrical, brown externally, with a woody, fibrous interior. Microscopical examination showed key diagnostic features such as multilayered cork cells, parenchymatous cortex, lignified xylem vessels, and the presence of starch grains and calcium oxalate crystals. Physicochemical evaluations were carried out to determine parameters such as moisture content, total ash, acid-insoluble ash, and water- and alcohol-soluble extractive values. These values fall within acceptable pharmacopoeial limits, indicating good quality and purity of the plant material. The extractive values suggest the presence of a significant quantity of water- and ethanol-soluble phytoconstituents, which correlate with its traditional medicinal uses. Overall, the study provides essential pharmacognostic and quality control data that support the traditional use and standardization of *Ficus natalensis* root in herbal formulations, this research provides valuable insights that will benefit researcher in their endeavors.

KEYWORDS: *Ficus natalensis*, Macroscopy, Microscopy, Physicochemical parameter.

INTRODUCTION

The term ‘pharmacognosy’ was derived by the merger of two Greek words (e.g., pharmakon—drug and gnosis—knowledge of to mean the knowledge of drugs. It was introduced and used for the first time by J.A. Schmidt (1811) and C.A. Seydler (1815), respectively, to define the branch of medicine or commodity which deals with crude drugs. Studies on physical, chemical, biochemical, and biological properties of drugs, drug substances, or potential drugs or drug substances of natural origin as well as the search for new drugs from natural sources are now included in pharmacognosy.^[1]

The term pharmacognosy as a constituent scientific discipline of pharmacy has been in use for nearly 200 years, and it refers to studies on natural product drugs. During the last half of the 20th century, pharmacognosy

evolved from being a descriptive botanical subject to one having a more chemical and biological focus. At the beginning of the 21st century, pharmacognosy teaching in academic pharmacy institutions has been given new relevance, as a result of the explosive growth in the use of herbal remedies.^[2]

There are roughly 850 species in the genus *Ficus*, which belongs to the Moraceae family. There are roughly 200 different types of *ficus* found in tropical and subtropical woods as woody trees, shrubs, and vines. There are over 500 *ficus* species in Asia and Australia, and they are high in nutritious elements. In traditional medicine, *ficus* species are well-known for their abundance of flavonoids and phenolic acid, which help them protect against oxidative stress disorders. Plant extracts from these species have been shown to be useful in treating

diabetes, stomachaches, piles, dysentery, inflammation, oxidative stress, and cancer. The anti-cancer, anti-inflammatory, and anti-diabetic properties of ficus plants have also been used to promote their ethno-medical usage.^[3]

The evergreen or soon-deciduous tree or shrub *Ficus natalensis* can reach a height of 10 to 30 meters and has a

crown that spreads widely. It frequently begins as an epiphyte in a tree branch before sending down aerial roots that, once they reach the ground, supply additional nutrients that support the plant's faster growth. When combined with the more vigorous top growth, these aerial roots have the ability to completely wrap the host tree's trunk.^[4]



Fig. 1: Ficus Natalensis Root.

PLANT PROFILE

FICUS NATALENSIS

Scientific name: *Ficus natalensis*

TAXONOMY

Kingdom	=	Plantae
Division	=	Angiosperms
Class	=	Eudicots
Order	=	Rosales
Family	=	Moraceae
Genus	=	<i>Ficus</i>
Species	=	<i>F. natalensis</i>
Synonyms	=	<i>Natal fig</i>
Common name	=	<i>Ficus natalensis</i> ^[5]

CHEMICAL CONSTITUENTS

Ficus natalensis root contain flavonoids, tannins, glycosides, sterols, saponins, and triterpenes, and have strong antioxidant properties. Three triterpenoid saponins were isolated and identified, with the leaves showing significant free radical scavenging activity, suggesting potential health benefits.^[6]

ETHNOPHARMACOLOGICAL USES

Ethno pharmacological, therapeutic and commercial importance and have been used in traditional medicines as a cure against malaria, diabetes, cancer, diarrhea, pyretic, ulcer, as well as gastrointestinal and urinary tract infections.^[7]

MATERIALS AND METHODS

Collection of Plant Material: The plant material was

collected from K.M. doddi, Mandya district, Karnataka, India in the month of January 2024. The plant was identified and authenticated by Dr. V. Rama Rao, Research officer (Botany), Central Ayurveda Research Institute, Bengaluru. An herbarium voucher specimen was preserved in the department of Pharmacognosy, Bharathi College of Pharmacy, Bharathinagar for further reference.

Drying and size Reduction of Root: The Root of *Ficus natalensis* were subjected to shade drying and further crushed to powder, and then the powder is passed through the sieve no. 80, and stored in air tight container for further use.^[8]

EXPERIMENTAL PROCEDURE

Macroscopical Studies: Leaves of *Ficus natalensis* was studied macroscopically for examining its colour, odour, taste, size, shape, fracture and texture. Macroscopic examination of crude drug was carried out by naked eye by placing the individual raw materials on a white paper surface.^[9]

Microscopical Studies: Microscopical study has been carried out by taking free-hand sections of fresh stem bark. Thin sections were cleared with chloral hydrate solution followed by water and stained with safranin and observed under the microscope. As well as the dried bark powder was evaluated by treated with chloral hydrate solution followed by water and stained with safranin and observed under the microscope. Microphotographs have taken by using CatCam microscope camera fixed with

the microscope (Model: OLYMPUS CX31).^[10]

Physicochemical Constants: Physicochemical constants such as the percentage of moisture content, total ash, acid insoluble ash, water soluble ash, sulphated ash, water and alcohol soluble extractives, loss of weight on drying, were calculated based upon standard procedures

prescribed in Indian Pharmacopoeia.^[11]

Preliminary Phytochemical Studies: Preliminary phytochemical test for stem bark of *Ficus natalensis* were performed and chemical constituents were determined by using standard procedures described by Kokate C.K., Purohit A.P., and Gokhale S.B.^[12]

RESULT AND DISCUSSION

Macroscopical studies



FIG. 2: A – *Ficus natalensis* Root, B – Root powder.

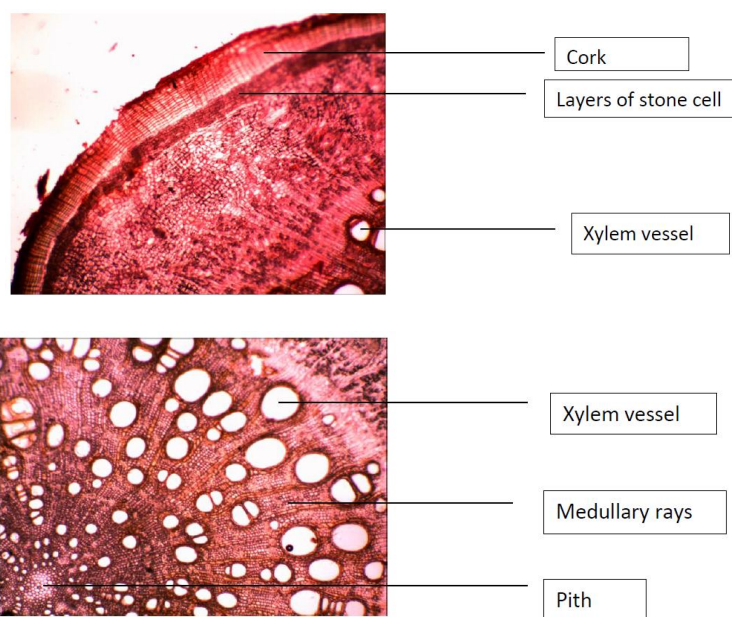
Table 1: Macroscopical Character of Root of *Ficus Natalensis* Includes.

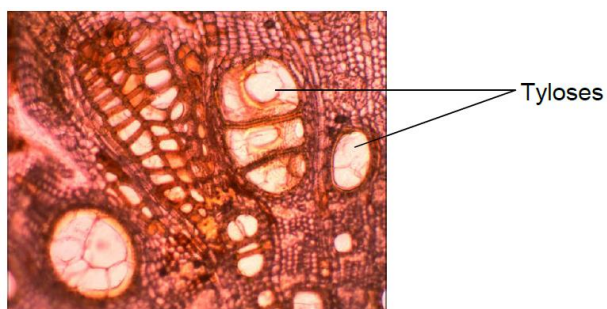
Colour	Brown
Odour	Characteristics
Taste	Distinct
Length	5-10cm length, 15-30mm diameter (varies)
Shape	Long irregular

Microscopical Character

Transverse Section of Root: The transverse section preparation of the root was studied under the microscope and the following inclusions were recorded.- The

transverse section of the root is circular in outline, with an outer brownish cork, followed by 5-6 layers of phellogen. The phelloderm layer is narrow with 1-2 layers of cells. Prismatic and styloid crystals are present in the phellogen layer. Below the phellogen, a band of stone cells are present, similar to the stem. Cortex region is wider with parenchymatous cells, embedded with fibres. Phloem tissue present beneath the cortex is embedded with irregularly running uni, bi and multiseriate medullary rays, xylem vessels, parenchyma cells with starch grains, gelatinous fibres and tyloses in vessels.

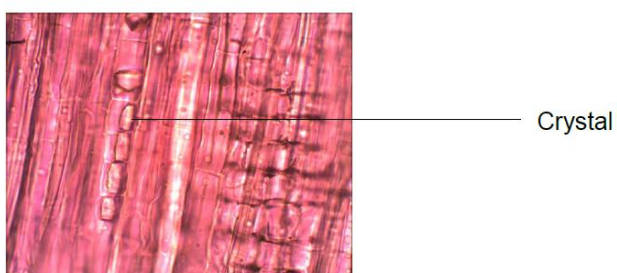
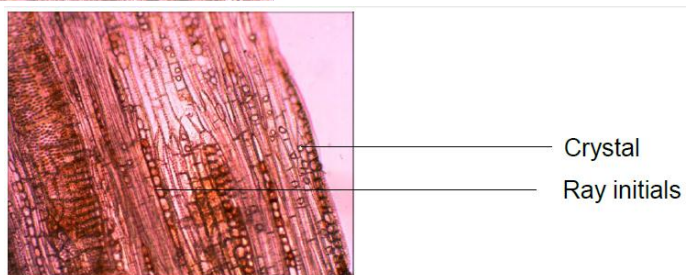
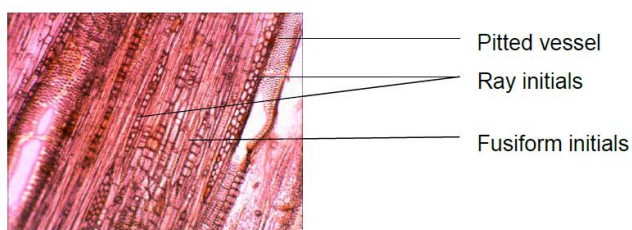


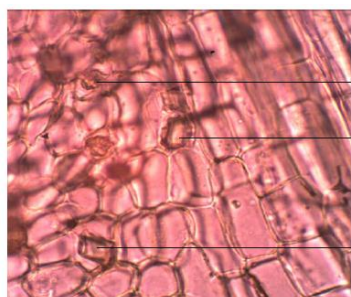


Longitudinal Section of Root

Longitudinal section of the root shows the presence of uniseriate, biseriate and few multiseriate ray initials,

fusiform initials, border pitted vessels with alternate pitting, presence of prismatic, styloid and druse crystals.





Druse Crystal

Styloid Crystal

Prismatic Crystal

POWDER MICROSCOPY OF ROOTS

Root powder is creamish brown in colour. Powder microscopy of the root showed the presence of Fragments of tissues; Pitted vessel (alternate pitting); Vessel element; Stone cells with pits; Cork cells; Xylem fibre; Starch grains; Prismatic crystals.

Powder microscopy of Root: A- Fragments of tissues. B,C, -Pitted vessel. D- Vessel element, E,F- Stone cell with pits, G- Xylem fibre H,I- Prismatic crystals.

Table 2: Showing Results For Quantitative Evaluation of The Root of *Ficus Natalensis*.

Evaluation parameters (% W/W)	Root (% W/W)
Moisture content	62.32
Total ash value	3.1
Acid insoluble ash value	1.6
Water soluble ash value	2.4
Sulphated ash value	3.7

Table 3: Extractive Values of Root of *Ficus Natalensis*.

Evaluation parameters (% W/V)	Root (% W/V)
Alcohol soluble extractive value	8.0
Water soluble extractive value	9.4

CONCLUSION

The study of *Ficus natalensis* Root has provided valuable insights into their morphological, and microscopical characteristics.

The transverse section (T.S.), and longitudinal section of the root showed a well-organized structure with a clear differentiation of tissues including the cork, layers of stones cell, xylem vessel, medullary rays, pith, gelatinous fiber, fusiform initials, crystals, vessels. These type of charecters helpful for the growth and development of tree.

In summary, *Ficus natalensis* root possess significant structural and chemical features that support their traditional medicinal use. These findings contribute to the scientific understanding of the species and suggest potential for further pharmacological and botanical research.

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CONFLICTS OF INTEREST: No conflicts of interest.

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