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Research Article

STEM BARK OF *NYAGRODHA* (*FICUS BENGALENSIS* LINN): A PHARMACOGNOSTICAL AND PHYSICO-CHEMICAL APPROACH

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ABSTRACT

Ficus bengalensis Linn, called *'Nyagrodha'* in Ayurveda is a medicinal tree with wide range of uses in Ayurveda. The tree is having many useful parts such as bark, flower, latex, aerial roots etc. Among these, the stem bark which belongs to *Panchavalkala* in Ayurveda is having high demand in current scenario. *Panchavalkala* is the group of stem bark of five medicinal species in Ayurvedic system of medicine, which is an ingredient of many formulations. Other than this stem bark of *Ficus bengalensis* Linn is having many ethno medicinal uses. The drug is used for treating skin disorders, bleeding diseases, various metabolic disorders such as diabetes, dyslipidemia etc. Owing to the high demand of the drug, the adulteration of stem bark of *Ficus bengalensis* is common. The adulteration mostly happens with stem bark of other Ficus species as well as with the wood portion of the same instead of the bark. Thus here is an attempt to establish the genuineness of stem bark of *Ficus bengalensis* Linn by method of pharmacognosy and physico-chemical evaluation. The pharmacognostic evaluation includes macroscopic, microscopic evaluation of stem bark as well as the powder macroscopy and microscopy of the same by referring the standards. The physico-chemical evaluation is done by assessing various physico-chemical parameters such as foreign matter, ash values, extractive values, tannin content, sugar content, phenol content etc. Both the pharmacognostical and physico-chemical evaluation has proved the genuineness of the drug.

KEYWORDS: Stem bark of *Ficus bengalensis* Linn, Macroscopic and Microscopic evaluation, Physico-chemical evaluation.

INTRODUCTION

Ficus bengalensis Linn, called *Vata/ Nyagrodha* in Ayurveda is a large evergreen tree lactiferous tree that grows up to 25 meters tall with spreading branches and many aerial roots. The tree belongs to family Moraceae and is included under category of *'Panchaksheerivrksha'* in Ayurveda. The stem bark of the same is included under category of *'Panchavalkala'*, which has wide range of uses in Ayurveda. The stem bark *Nyagrodha* is an ingredient of many Ayurvedic formulations such as, *Panchavalkala Kasaya, Chandanasavam, Useerasava, Arimedadi Taila, Nalpamaradi Kera* etc. Thus the pharmacognostical and physico-chemical evaluation of stem bark of the same is essential for the establishment of genuineness of the drug as follows.

Outer portion of stem bark

Inner portion of stem bark

Macroscopic Evaluation

The macroscopic features of stem bark of *Ficus bengalensis* Linn is tabulated below.[1]

Table 1: Macroscopic features of stem bark of *Ficus bengalensis* Linn

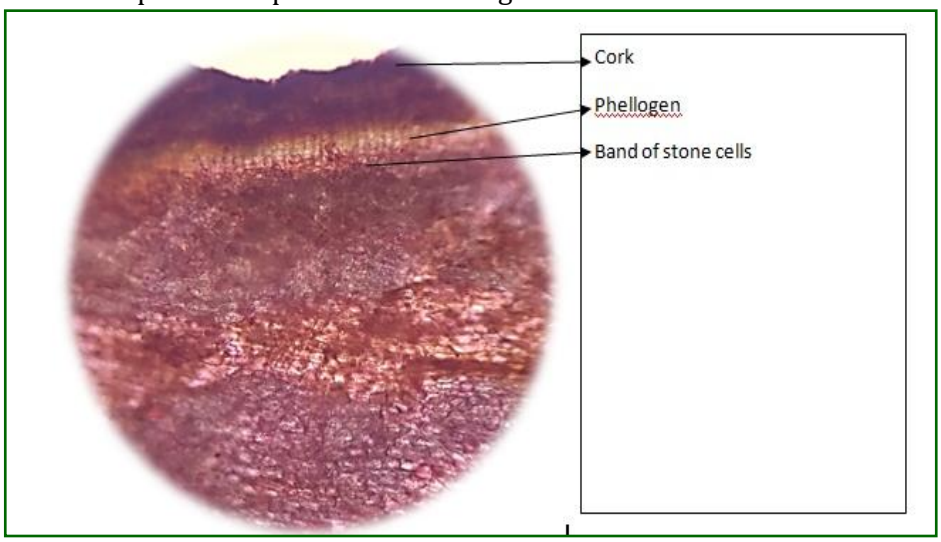
Dimension	Up to 50cm in length
Shape	Flat
Thickness	12-13mm
External color	Dark slate gray
Internal color	Light color/Whitish
External characters	Dark slate grey in color with presence of numerous lenticels
Internal characters	Outer two by third- Deep pink and has granular appearance Inner one by third-Lighter and whitish and fibrous
Fracture	Outer– Clean short fracture, Inner-Fibrous
Taste	Astringent
Odour	Characteristic

Microscopic Evaluation

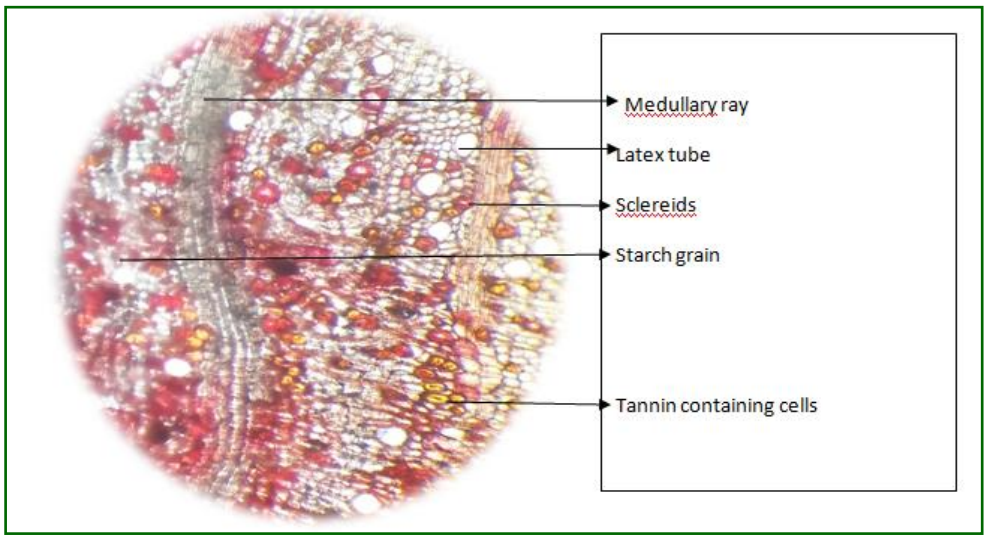
The mature stem bark is divided in to four distinct regions i.e., cork portion, cortex region, phloem region and wood portion.[2] The cork consists of rectangular, thick walled cells and posses brownish content. The cortex portion consists of mostly thick walled cells and stone cells. The secondary cortex is wide and constitutes more than half of the bark. This region shows group of stone cells which varies in shape, thin walled parenchymatous cells which are cubical or oval in shape, prismatic crystals of calcium, starch grains and tannin containing cells.

The phloem region composed of sieve elements parenchyma, fibres, stone cells, and latex tube alternating with medullary rays. The sieve elements are compressed in outer region and intact in inner region. Between the patches of phloem fibres and stone cells thick walled phloem parenchyma is seen. Some phloem fibres contain prismatic crystals of calcium and forms crystal fibres. The medullary rays are 3-5 serrated composed of thick walled cells which are circular to oval in shape. Some cells have pitted wall and contains plenty of starch grains. The starch grains are rounded, oval or semi lunar in shape. The cambium composed of few layers of small, rectangular, thin walled cells.

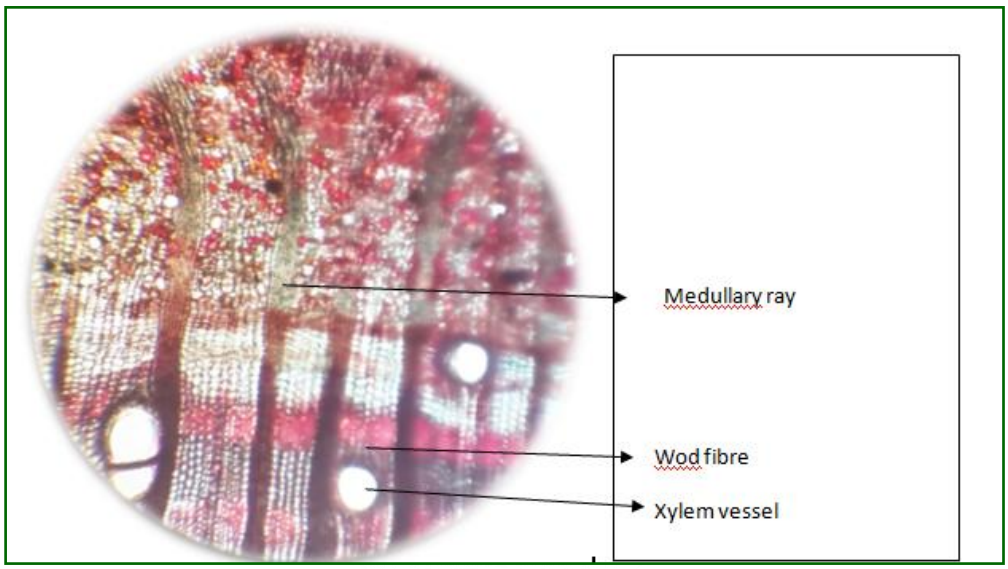
The wood consists of xylem vessels, wood fibres, wood parenchyma and medullary rays. The medullary ray cells have pitted walls. Wood fibres and wood parenchyma are arranged in alternating bands. Vessels occur either singly or in groups of two or three. The medullary ray cells and wood parenchyma are also thickly packed with starch grains.



T.S of cork region (10 X)



T.S of phloem region (10 X)



T.S of wood portion (10 X)

Powder Macroscopy: Macroscopic features of powder of stem bark of *Nyagrodha* (*Ficus bengalensis* Linn) is as follows

Characters	*Nyagrodha twak choorna*
Color	Dark brown
Texture	Fibrous
Odour	Characteristic
Taste	Astringent

Stem bark powder of *Ficus bengalensis*

Powder Microscopy: The powder microscopy of *Ficus bengalensis* Linn has showed the following structures like prismatic crystals of calcium, stone cells, starch grains, rhytidima (fragments of cork), fibres, phloem fibre with lactiferous duct, pitted vessels and tannin containing cells.[3]

Stone cells

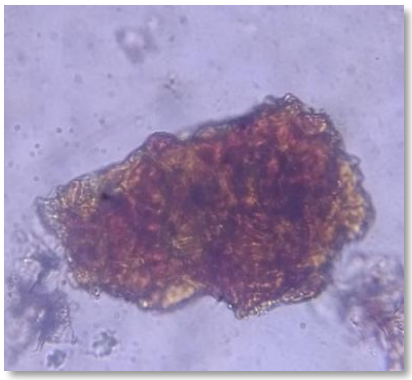
Prismatic crystals of calcium

Starch grains

Sclerids

Phloem fibre & Lactiferous duct

Pitted vessel



Cells containing tannin

Fibre

Rhytidima

Physico-Chemical Analysis: The physico-chemical analysis of stem bark of *Ficus bengalensis* has showed following results.

Table 2: Results of physico-chemical parameters

Sl no	Experiments	*Nyagrodha*
1	Foreign matter	Nil
2	Total ash	6.75%
3	Acid Insoluble Ash	2.84%
4	Water Insoluble Ash	3.45%
5	Cold Alcohol soluble extractive	8.9%
6	Hot Alcohol soluble extractive	10.89%
7	Cold water soluble extractive	13.22%
8	Hot water soluble extractive	12%
9	Moisture Content	8%
10	Volatile oil	Nil

11	Fibre	39.22
12	Tannin Content	34%
13	Total sugar	2.25%
14	Reducing sugar	1.64%
15	Phenol	40.53 μg/g
16	pH	5.18

DISCUSSION

The findings coincides with the description of stem bark of *Ficus bengalensis* Linn available in the Ayurvedic Pharmacopoeia of India as well as the schematic representations available in the various text book of Pharmacognosy. The cell constituents identified under the powder microscopy also reveals the genuineness of the drug. The characteristic features such as calcium crystals, starch grains, phloem fibres, lactiferous ducts, tannin containing cells are evident from the study. The physico-chemical values obtained are also within limits and reveal the genuineness of the drug as it is in parlance with authentic text books.

CONCLUSION

The findings drawn from the macroscopic and microscopic evaluation of stem bark and its powder as well as from physico-chemical parameters substantiates the genuineness of the drug *Nyagrodha* (Stem bark of *Ficus bengalensis* Linn) as it coincides with the authentic descriptions available so far.

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