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Pharmacognostic studies on stem bark of *Tamarindus indica* L.

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ABSTRACT

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Tamarindus indica L. (family Caesalpiniaceae) is medicinally useful in Ayurveda for diarrhoea, asthma, aphthous sores and amenorrhoea. The present study provides macro and microscopic details of the stem bark of *Tamarindus indica* L. In addition, powder microscopic and organoleptical characters are also presented. The study is expected to be helpful in the identification and authentication of crude drug. Diagnostic characters of stem bark are multilayered cork, grouped stone cells, rhombic crystals, uniseriate medullary rays and tannins.

Key-words: Pharmacognosy, *Tamarindus indica*, stem bark, stone cells, rhombic crystals.

INTRODUCTION

Tamarindus indica (Tamarind) is large, evergreen tree belonging to family Caesalpiniaceae. It is commonly called as '*imli*' in Hindi and '*Chincha*' in Ayurveda. It is cultivated or found naturalized almost throughout the Sub-Himalayan tracts and plains of India, particularly in the south. In Ayurveda, the stem bark is astringent, used in constipation, colic, cough, dyspepsia, fever, flatulence, gastro-intestinal diseases and urinary infections (Sivarajan & Balachandran 1994). The bark is astringent tonic and heals ulcers (Joshi 2000). A decoction of the bark is given in asthma and amenorrhoea. In Guinea and Cambodia, it is used as astringent in diarrhoea and gingivitis (Kirtikar & Basu 1989). A gargle of ash and water is used in sore-throat and to heal aphthous sores (Nadkarni & Nadkarni 1976). Classical names: Chincha, Chinchika, Amla, Amli, Tintidi, Vernacular names: English: Tamarind tree. Methanolic extracts of stem bark is used in inhibition of *Clostridium chauvoei* neraminidase activity (Useh et al. 2004). Pharmacognostic studies on stem bark appear scanty (Singh et al. 2005). Hence, the present investigation is taken up to establish pharmacognostic profile which is expected to help in identification of crude drug and establish standards.

MATERIAL AND METHOD

Fresh stem bark material was collected from Osmania University campus, Hyderabad. The material was preserved in glycerin and alcohol mixture (1:1) for softening. Sections of fresh barks were cut in transverse and longitudinal planes, stained with crystal violet and basic fuchsin and mounted in Canada balsam (Johansen 1940). A portion of fresh bark was macerated and examined for dissociated elements. A small amount of powder was boiled in water, stained in safranin

and mounted in glycerin and was observed for microscopic characters. The photomicrographs were taken with Olympus CH-2 microscope. The herbarium specimens of the plant were deposited in Herbarium Hyderbadense, Department of Botany, Osmania University, Hyderabad.

RESULTS

Macroscopic characters: A large evergreen tree; leaves 4-12 cm long; leaflets 10-20 pairs, oblong, 8-20.5 mm long, 8 mm wide, petioles very short; flowers yellow, in few flowered lax racemes at the ends of branchlets. Pods oblong, 3-15 cm long, 2 cm wide, brown, with brittle epicarp and pulpy, brown mesocarp. Seeds 1-10, ovate-quadrate, dark brown shining. Stem bark pieces of variable size, measuring 1-4 cm in length, up to 2 cm wide and 0.5-4 cm thick; flat, squarish to rectangular and slightly curved; outer surface distinctly fissured longitudinally or irregularly wrinkled to scaly; thicker are deeply fissured; inner surface faintly longitudinally striated to smooth; texture woody or rough; fracture short to granular externally and slightly fibrous internally; outer surface colour blackish to grayish brown (Plate 1).

Microscopic characters: In transverse section, stem bark shows outermost cork multilayered, stratified, compactly arranged, rectangular to squarish cells, measuring 21-38.5 (24.5) µm long and 10.5-28 (21) µm wide; walls thin, contents dense with tannins. The cork is distinctly stratified and divided tangentially into 4-6 strata. An individual stratum is separated by means of narrowed and obliterated cells, appearing like cork cambium; cells measuring 24.5-52.5 (35) µm long and 7-10.5 (7) µm wide. Phelloderm is few layered, cells small, round to polygonal in shape, measuring 19-25 µm in diameter, walls slightly thick, contents dense with prismatic crystals of calcium oxalate, granular matter and tannins. Isolated or groups of stone cells are present throughout the phelloderm region, cells rounded, oval to oblong, measuring 10.5-49 (31.5) µm in diameter; thick-walled, small lumen, lignified with pit canals and distinct striations. Secondary phloem wide, comprising of phloem parenchyma, sieve tubes, phloem fibres and medullary rays. Phloem parenchyma cells isodiametric, measuring 10.5-21 (17.5) µm in diameter; walls thin, contents dense with simple rounded starch grains, prismatic crystals of calcium oxalate, granular matter and tannins. Phloem fibres in groups of 4-15; cells measuring 7-17.5 (10.5) µm in diameter; walls thick in more or less horizontal disrupted bands throughout the phloem. Medullary rays are uniseriate and wavy; cells rectangular, radially long, measuring 3.5-35 (17.5) µm long and 14-21 (17.5) µm wide; walls slightly thin, contents dense with tannins (Plate 2).

Powdered microscopy: Polygonal cork cells in surface view; groups of tannin cells; prismatic crystals of calcium oxalate, many isolated or groups of lignified sclereids, rectangular or oval cells; medullary rays; septate thick walled phloem fibres; fragments of lignified crystal fibres; and starch grains (Plate 2).

Organoleptic characters: Colour: Greyish-brown; Touch: Coarse; Odour: Unpleasant; Taste: Slightly astringent.

DISCUSSION

Tamarindus indica is a potential drug used for various ailments. Outer surface is longitudinally fissured with few scars and the inner surface faintly striated as also reported earlier (Singh et al. 2005). Outer-most cork is many layered, stratified and is composed of compactly arranged squarish

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Plate 1

1-6. *Tamarindus indica* L. Stem bark. 1. Outer surface. 2. Inner surface. 3. T.S. of stem bark showing cork and phelloderm. 4. T.L.S. of stem bark. 5. T.S. of stem bark, showing inner phloem region. 6. T.S. of stem bark, showing ceratenchyma and medullary rays enlarged.


1


2


3
Stone cells
Cork


4
Phloem parenchyma
Medullary rays
Phloem fibres


5
Stone cells
Phelloderm
Medullary ray
Pholem fibres


6
Ceratenchyma
Medullary rays
Secondary pholem parenchyma

Plate 1

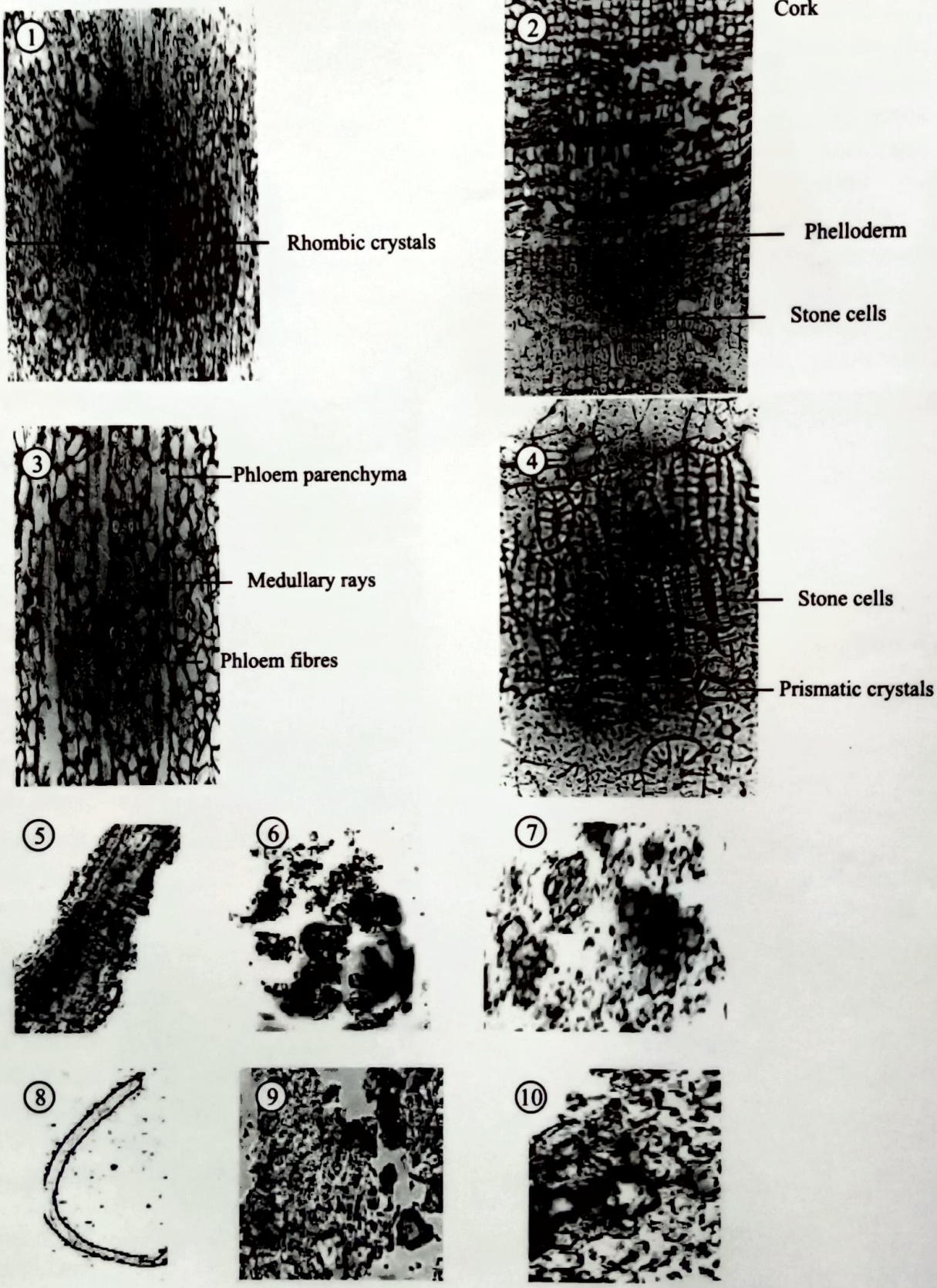

Plate 2

1-4. *Tamarindus indica* L. Stem bark 1. T.S. of stem bark showing rhombic crystals enlarged. 2. T.S. of stem bark showing cork enlarged. 3. T.S. of stem bark showing medullary rays enlarged. 4. T.S. of stem bark showing stone cells enlarged. 5-10. Powdered elements 5. Medullary rays. 6. Prismatic crystals. 7. Cork. 8. Fibre. 9. Starch. 10. Parenchyma.

or rectangular cells. Phelloderm is few celled, often containing prismatic crystals of calcium oxalate and tanniniferous matter. Phelloderm is characterized by the presence of stone cells as also reported by Singh et al. (2005).

Secondary phloem is extensive, occupying more than half the entire thickness of bark. Phloem parenchyma occurs in narrow patches separated by medullary rays. The phloem parenchyma cells contain prismatic crystals of calcium oxalate, starch grains and tannins. Medullary rays are uniseriate with rectangular cells often filled with tannins as also reported earlier by Singh et al. (2005). Phloem fibres occur in horizontal disrupted bands. The powder microscopic features and organoleptic characters (loc. cit.) are of diagnostic importance and confirms earlier studies.

CONCLUSION

Macroscopic and microscopic features recorded are of diagnostic importance and help in identification and standardization of the drug and in distinguishing it from substitutes and adulterants

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