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PHARMACOGNOSTIC STUDIES ON THE STEM BARK OF ANNONA RETICULATA Linn.

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ABSTRACT

The macroscopic and microscopic characters of the stem bark of Annona reticulata Linn. are described. Groups of lignified phloem fibres with narrow lumen which separate the phloem parenchyma in blocks, lignified stone cells, large prismatic crystals of calcium oxalate and simple as well as compound starch grains the latter with 2 to 4 components are the chief diagnostic characters.

Annona reticulata Linn. Hindi: , Ramphal; Bengali: Nona; Sanskrit: Krishnabija; Tamil: Ramachita; Telegu: Ramaphalamu is a small tree belonging to the family Annonaceae whose different parts including the stem bark are considered important from the therapeutic point of view and are used in our indigenous system of medicine. The stem bark is used as a powerful astringent and tonic. Chemical investigation confirms that the stem bark contains 0.03%-0.12% of an alkaloid anonaine $C_{17}H_{17}NO_{3}$ m.p. 122-123° besides tannin which is present in large amount. The pharmacognostic studies of the stem bark have been taken up and presented here in order to identify the bark easily and properly.

Botanical origin: Annona reticulata Linn.

Habitat: A small tree of Tropical America but cultivated in India and naturalised in Bengal and South India. In Central and Western India the tree is wild and so abundant as to constitute forests.

Plant: A small deciduous or semi-deciduous tree, young branches tomentose, the older glabrous. Leaves membranous, 10-18 cm. \times 2.5-4.4 cm., oblong-lanceolate, acute or obtuse, cuneate or rounded at the base, the upper surface of the leaf glabrous, the lower with a few scattered hairs. Flowers 2-4 together, on lateral pedicels; pedicels elongating and becomming thick and woody in fruit. Sepals small, 4.5 mm. long broadly ovate, acute or tomentose. Petals—the exterior 31 mm. long $\times 6$ mm. broad, tomentose on both surfaces; the interior minute, shorter than the sepals, narrowoblong. Fruit 10-15 cm. diameter, subglobose or somewhat heart-shaped, roughish outside, yellow or yellowish red when ripe; seeds smooth, blackish.

Parts used: Bark, unripe fruit, seeds and leaves.

Macroscopic characters: The stem bark is about 1.5-4 mm. thick. Outer surface rough, chocolate brown with longitudinal fissures which gives the appearance of lighter coloured small grooves separated by deep greyish coloured wrinkles. The inner surface is deep brown and smooth in comparison to outer surface. Texture hard and fibrous. The bark when dries becomes double quilled.

Microscopic characters: The phellem or cork consists of thin-walled tangentially elongated cells.

In some of the cells the walls are somewhat wavy. The cork is generally 6-15-celled wide. The cork cells



PLATE I. Photograph of the portion of the stem bark of Annona reticulata ×1

contain tannin as confirmed by microchemical test and measure $T = _{38\mu} - 57\mu - 65\mu$; $R = 11\mu - 19\mu - 27\mu$ and $L = 19\mu - 38\mu - 55\mu$ (Plate II, Figs. 2 & 3). The phelloderm or secondary cortex which occupies about thirty per cent of the total thickness of the bark consists of thin-walled parenchymatous cells. The cells are of different size and shape but usually rectangular or polygonal. Starch grains are found distributed throughout the cortex. Both simple and compound starch grains are found but the simple starch grains are greater in numbers than the compound ones. The simple starch grains are usually round or oval and measure $3.8\mu - 11.4\mu$ in diameter. The compound starch grains are generally of two to four components (Plate II Fig. 5). Large prismatic crystals of calcium oxalate are found scattered throughout the cortical region (Plate II, Figs. 2, 3 & 5). The individual stone cells are generally thickwalled and with striations. The stone cells are lignified and measure $T = 19\mu - 38\mu - 58\mu$; $R = 15\mu - 30\mu - 45\mu$ and $L = 27\mu - 38\mu - 57\mu$ (Plate II, Figs. 2, 3 & 5). The phloem which occupies about sixty per cent of the total thickness of the bark consists of phloem parenchyma, phloem fibres, medullary ray cells and stone cells. The phloem parenchyma cells are also

of different size, thin-walled, rectangular or poly-gonal in shape. Like the cortical parenchymatous cells the phloem parenchymatous cells also contain starch grains and prismatic crystals of calcium oxalate. The phloem cells also contain tannin as confirmed by microchemical test. These cells measure $T = 15\mu - 49\mu - 57\mu$; $R = 22\mu - 38\mu - 53\mu$ and $L = 19\mu - 38\mu - 57\mu$ (Plate II, Figs. 2 & 3). The medullary rays are generally 2-8-celled wide, thin-walled and elongated radially towards the phloem region. The medullary ray cells measure $T = 19\mu - 27\mu - 38\mu$; R=65 μ -95 μ -125 μ and L=34 μ -57 μ -76 μ (Plate II, Figs. 2 & 4). The bands of phloem fibres are long and tangentially elongated which separate the phloem parenchyma in groups. The phloem fibres are lingnified as confirmed by microchemical test, with narrow lumen and generally more than 1 mm, long and 11.4µ-22.8µ in breadth. (Plate II, Figs. 2, 3 & 5). Stone cells are also found distributed in the phloem region and they are of the same size as those present in the cortical region. The stone cells are comparatively lesser in number in the phloem region than those in the cortical region. The prismatic crystalsof calcium oxalate measure $7.6\mu - 15.2\mu \times 19.0\mu$ -26.6µ .

Powder: Greyish to chocolate brown in colour, slightly bitter in taste and without any appreciable odour. The powder when examined under the microscope is characterised by the presence of cork cells which are found in small groups, stone cells either scattered or in small groups, phloem parenchymatous cells, phloem fibres either isolated or in groups, simple and compound starch grains and large prismatic crystals of calcium oxalate. (Plate II, Fig. 5). Microchemical test of the bark sections: Treatment of the fresh bark sections with standard chemical test reagents revealed the presence of innumerable starch grains in the cortical and phloem parenchymatous cells, tannin in almost all the cells of the bark sections, lignin in stone cells and phloem fibres and calcium oxalate in large prismatic crystals. The bark sections when treated with iodine and potassium iodide solution turned light chocolate brown which shows the presence of alkaloid.

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PLATE II. Fig. 1. Diagrammetic transverse section of the stem bark of Annona reticulata ×4. Fig. 2. Drawing of the transverse section of the stem bark ×200. Upper portion shows the details of the periderm region and lower portion shows the details of the periderm region and lower portion shows the details of the periderm region. Fig. 3. Drawing of the radial longitudinal section of the stem bark ×200. Upper portion shows the details of the phloem region. Fig. 4. Drawing of the tangential 'longitudinal section ×200. Fig. 5. Drawings of the different diagnostic elements as found in the powdered bark ×350.

Ck.=Cork ; Cor.=Cortex ; Cr.=Crystals ; M. R.=Medullary ray cells ; Ph. P.=Phloem parenchyma cells ; Ph. F.=Phloem fibres ; St. C.=Stone cells ; St. Gr.=Starch grains.

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