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THE HERBACEOUS DICOTYLEDONOUS AXIS FROM THE DECCAN INTERTRAPPEAN BEDS OF MOHGAONKALAN

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ABSTRACT
The present axis appears pentangular, herbaceous, dicotyledonous showing secondary growth of diffuse porous type. It consist of bark, cork, secondary cortex, secondary phloem, secondary xylem, primary xylem and pith. cortex parenchymatous, secondary xylem consists of vessels, rays, parenchyma, and fibres. Vessel mostly solitary, rays uniseriate and homogenous paratracheal vesicentric parenchyma, primary xylem endarch. Pith large with mucilage cells.

INTRODUCTION

The mega fossil flora of angiosperms are very well known from the Deccan Intertrappean beds as impression, petrifaction and fossilised fragments forms. The detailed anatomical description of a dicotyledonous axis showing growth of diffuse porous type from the Deccan Intertrappean beds of Mohgaonkalan, M.P., India. A number of dicotyledonous woods have been described from the Deccan Intertrappean Beds of Mohgaonkalan. Paradkar (1972) described dicotyledonous axis *Aerocaulon decanii*. Shallom (1963) described dicotyledonous axis *Sonneratioxylon duabangoides* with aerenchymatous cortex belonging to family Sonneratiaceae. Chawhan (1987) described *Guttiferites ramanujamii*. This axis is an additional report of a dicotyledonous axis with secondary growth from the Deccan Intertrappean beds of Mohgaonkalan.

The present work was therefore an additional report of a pentangular dicotyledonous axis with marked ridges and furrows, showing diffuse porous growth.

MATERIALS AND METHODS

The material was collected from the Mohgaonkalan, a well known fossiliferous locality in Chhindwara district, Madhya Pradesh. The fossils were petrified and preserved in the silicified cherts. Two axis showing same anatomy were exposed on same cherts after itching with hydrofluoric acid. Both axis were of approximately same size. Serial peel sections of both axes were taken by usual peel method. The peel were mounted in Canada balsam and studied.

Observations

Both the axes were cut in T.S. and were almost pentangular in shape. One axis appears exactly pentangular in shape with deep ridges and furrows and measures 1.56mm. The other one appears not so pentangular with less ridges and furrows and measures 1.43mm (Plate 1, Figs. 1 and 2; Text Figs.1 and 3).

The axis shows early secondary growth. The axis consist of layers like Bark, Cork, Cortex, Secondary phloem, Secondary xylem, Primary xylem, Pith.

Bark

It is the outermost layer of the axis. It measures 22μ in thickness and consist of 2 to 3 layers of cells. It is made up of thick walled suberized compactly arranged parenchymatous cells with dark brown depositions (Plate1 Figs. 3 to 4; Text Fig. 5). Individual cell measures 4μ in size.

Cork

After bark there is a well preserved zone of cork. It consists of 8 to 9 layers of cells in the ridge region and 5 to 6 layers of cells in the furrows region. It measures 77μ in thickness at the ridge region and 55μ in thickness at the furrows region (Plate 1, Figs 3 and 4; Text Figs. 3 and 4). It is arranged in radial row of narrow thin walled rectangular cells. Each individual cells measures 11μ to 15μ in size.

Cortex

After the cork, there is a zone of ill preserved cortex. The cells are crushed during preservation. However some parenchymatous cells are preserved which are either rounded to rectangular in shape (Text Figs. 3 and 4).

Secondary phloem

Below the cortex there is an ill preserved layer of phloem.

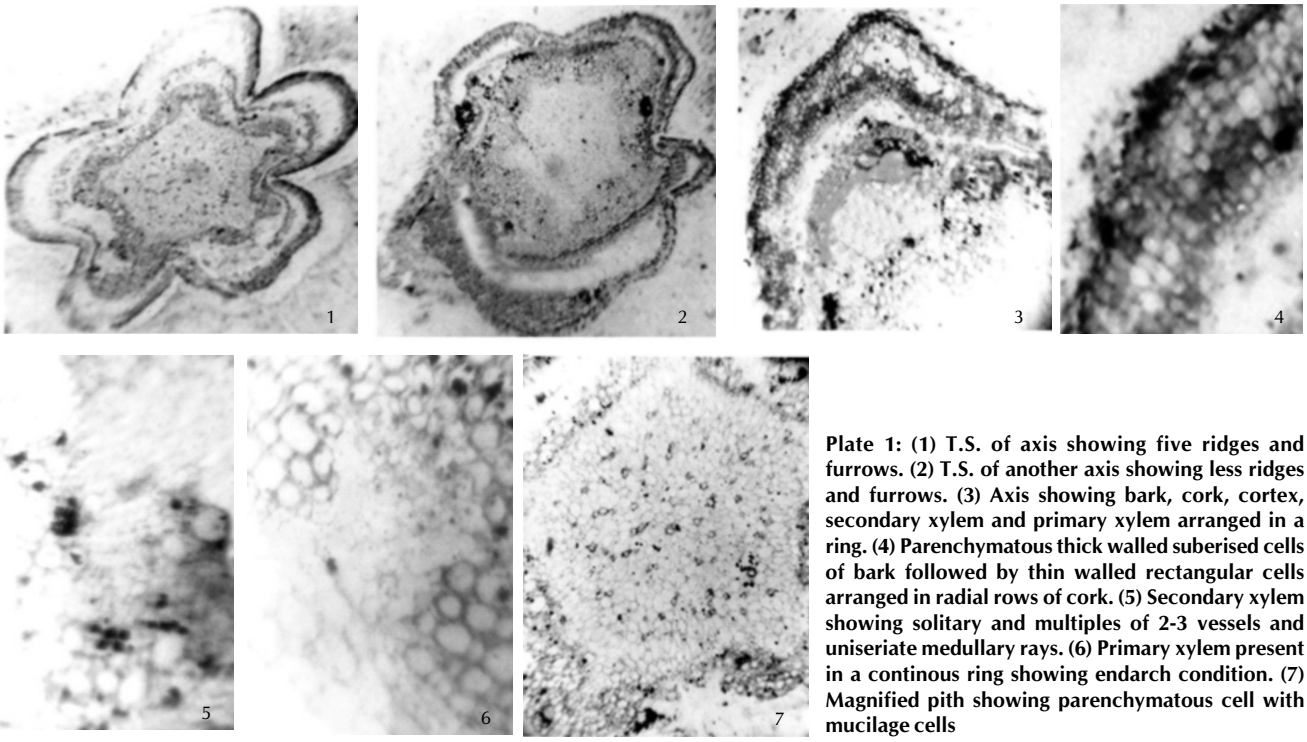


Plate 1: (1) T.S. of axis showing five ridges and furrows. (2) T.S. of another axis showing less ridges and furrows. (3) Axis showing bark, cork, cortex, secondary xylem and primary xylem arranged in a ring. (4) Parenchymatous thick walled suberised cells of bark followed by thin walled rectangular cells arranged in radial rows of cork. (5) Secondary xylem showing solitary and multiples of 2-3 vessels and uniseriate medullary rays. (6) Primary xylem present in a continous ring showing endarch condition. (7) Magnified pith showing parenchymatous cell with mucilage cells

Some thin walled cells are preserved at some places.

Secondary xylem

Secondary xylem is 183μ in thickness and diffuse porous in nature. Secondary xylem shows marked distinct zone (Plate 1, Fig. 5; Text Figs. 3 and 4). It consist of vessels, fibres, parenchyma and medullary rays (Plate 1, Fig. 5; Text Figs. 3 and 4). Vessels are mostly solitary, few are in multiple of two (Plate 1, Fig. 5; Text Figs. 3 and 4). Secondary xylem vessels are mostly oval to circular in shape and measures 22μ to 27μ in t.s. (Plate 1, Fig. 5; Text Figs 3 and 4). Vessels are not tylosed. The frequency of vessels in 3 to 4 per mm^2. Medullary rays are uniseriate and homogenous consisting of isodiametric cells only. Some rays are contiguous with vessels. Xylem parenchyma is paratracheal vesicentric, one layer around each vessel (Text Fig. 6). The cells are rounded in shape in transverse section and measures 7μ to 8μ in size.

Xylem fibres occupy the major portion of the axis. It is uniform in shape and size and consisting of elongated cells only (Plate 1, Fig. 5; Text Fig. 6). The cells of xylem fibres measures 19μ in size.

Primary xylem

Primary xylem is seen against the ridges and furrows of the pith forming a continous ring (Plate 1, Fig. 6; Text Fig. 7). Primary xylem shows endarch condition with metaxylem facing towards periphery and protoxylem facing towards the centre (Plate 1, Fig. 6; Text Fig. 7). Metaxylem measures 19μ x 23μ and protoxylem measures 7μ x 11μ. In between the xylem elements one or two layers of connective is present (Text Fig. 7).

Pith

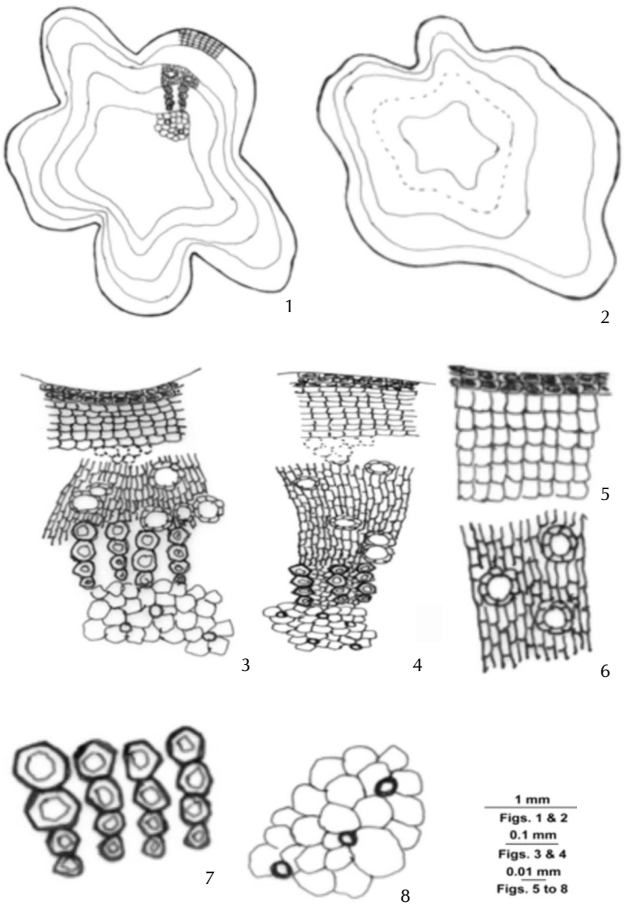
Pith is large and five angled (Plate1, Figs.1, 2 and 7; Text Figs.1and 2). It consists of five ridges and five furrows. The centre of the pith is occupied by thin walled parenchymatous cells mixed with mucilage cells (Plate 1, Fig. 7; Text Fig. 8). Mucilage cells are solitary and in groups of two to three. As compared to the cells of the pith the mucilage cells are dark brown in colour. Mucilage cells measures 16μ in diameter.

RESULTS AND DISCUSSION

The verifying characters of the axis under report are diffuse porous, presence of bark, cork, cortex, secondary phloem, and vessels mostly solitary, few are in multiple of two, parenchyma paratracheal vesicentric about one layer around vessel, medullary rays uniseriate and homogenous. Primary xylem endarch. Pith is angular, large and parenchymatous mixed with mucilage cells. For identification of the present fossil axis keys given by Metcalfe and Chalk (1950), Shallom (1963), Esau (1965) and SoLereder (1908) are used. For identification of the present petrified dicot axis, comparison is made with the recorded fossil petrified dicot axis such as- *Aerocaulon decanii* (Paradkar, 1970) resembles in having pith, vascular zone and cortex but differ in having aerenchymatous cortex which is not seen in the present axis under consideration.

Sonneratioxylon duabangoides (Shallom, 1963) resembles in having pith, vascular zone, primary and secondary xylem, but differ in primary cortex consists of hypodermis and spongy parenchyma with stone cells.

Guttiferites ramanujamii (Chawhan, 1987) resembles in having vascular bundles and pith but differ in nature of xylem vessels. Vessels are arranged in radial rows in multiples of 6 to 7 which are not present in fossil axis. The present dicot axis is also compared with the axis of modern families Rubiaceae, Ericaceae, Connaraceae, Apocynaceae, Celastraceae



Text Figure 1: (1 and 2) T.S. of axis showing five ridges and furrows, Bark, Cork, Cortex, Secondary phloem, Secondary xylem, Primary xylem and Pith. (3and4) Enlarged view of ridges and furrows showing two layered bark, cork, cortex, secondary xylem, primary xylem and pith. (5) Parenchymatous suberised bark followed by radial rows of cork. (6) Secondary xylem showing solitary vessels and fibres. (7) Primary xylem showing endarch condition. (8). Parenchymatous cells of pith with mucilage cells in the center.

(Metcalfe and Chalk, 1950; Shallom, 1963; Esau, 1965; SoLereder, 1908).

The fossil axes resembles Ericaceae in nature of vessels, xylem parenchyma, but differ in nature of medullary rays.

The family Connaraceae shows resembles with the fossil axis in having primary xylem but differ in having presence of large vessels.

The family Apocynaceae shows resembles with the fossil axis in having vessels, cork arrangement of xylem but differ in nature of rays and presence of sclerosed element in the pith.

The family Celastraceae shows resembles with the fossil axis in having mostly solitary vessels, presence of parenchyma, cork but differ in nature of medullary rays and nature of pith.

The family Rubiaceae shows close resemblance with the fossil axis in having polygonal axis with ridges and furrows, small sized vessels. Presence of mostly solitary vessels. Presence of cork. Presence of uniseriate medullary rays. Xylem forming continous cylinder and including poorely differentiated vessels presence of pith.

So the fossil axis kept under the form genus *Rubiates*, after the family Rubiaceae and under species *inertrappea*, after the Deccan Intertrappean beds as *Rubiates intertrappea* gen.et sp. nov.

Holotype: 6PD/Ang Department of Botany, Institute of Science, Nagpur.

Horizon: Deccan Intertrappean Beds.

Locality: Mohgaonkalan, Dist- Chhindwara, M.P., India.

Age: ? Uppermost Cretaceous.

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