

TERMINALIOXYLON CHOWDHURII SP. NOV.: A NEW FOSSIL DICOTYLEDONOUS WOOD FROM THE TERTIARY ROCKS OF ASSAM

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ABSTRACT

This paper deals with the anatomical studies of a new species of *Terminalioxylon* (*T. chowdhurii*) from the Tertiary rocks of Assam. So far there is no record of the occurrence of a fossil wood of *Terminalia* from Assam.

INTRODUCTION

THE material on which the present investigation is based was collected by Vigyan Mandir Officer, Arunachal, Assam (MR. G. K. D. ROY), and sent to Birbal Sahni Institute of Palaeobotany for identification in the year 1959. The material consisted of small pieces of highly variegated fossil woods. The fossil specimen was collected in Barail reserve, Cachar hills of Assam. The age is believed to be Middle Tertiary (WADIA, 1953; KRISHNAN, 1949 and CHOWDHURY, 1952). The preservation of the material is poor but the anatomical details can be made out on good rock sections which give clue to the identification.

DESCRIPTION

The fossil specimen is a diffuse porous wood (PL. 1, FIG. 1).

Growth rings are absent. The terminal parenchyma appears as if growth marks (PL. 1, FIG. 1).

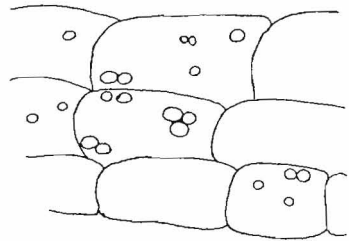
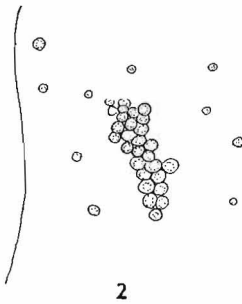
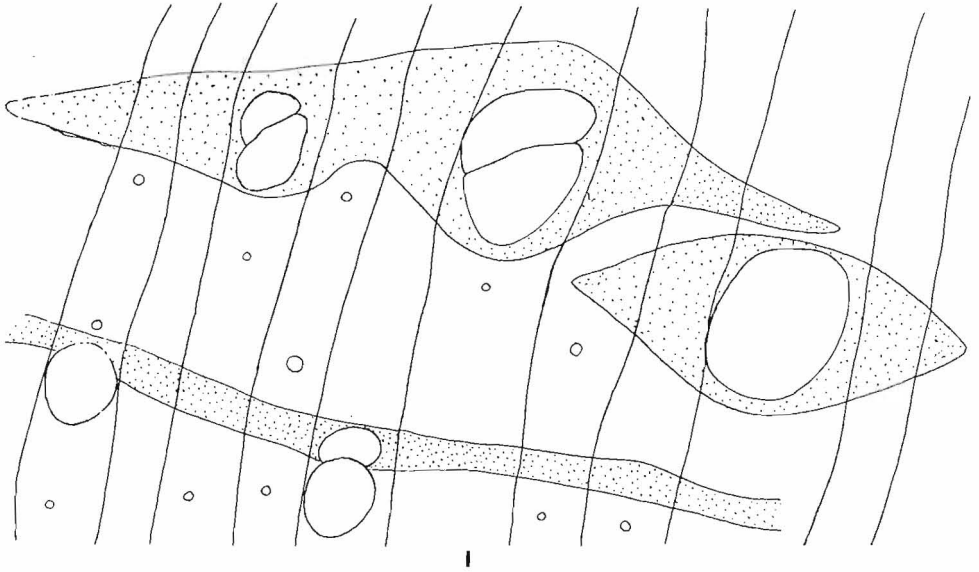
Vessels are diffused and easily visible to the naked eye. They are solitary as well as in multiples of two or more (PL. 1, FIG. 1; TEXT-FIG. 1). Vessels are usually enclosed by parenchyma and have uniform distribution (PL. 1, FIG. 1; TEXT-FIG. 1). Often tyloses are seen in the vessels (PL. 1, FIG. 1). Vessels are thick-walled, round to elliptic in shape (PL. 1, FIG. 1; TEXT-FIG. 1). They are usually medium sized to large, but rarely small (PL. 1, FIG. 2; TEXT-FIG. 1). The perforations appear to be simple. They are

not well preserved. Vessel segments are short, truncate or tailed at one end. Intervessel pits are small, alternate, distinct and vested (PL. 1, FIG. 3; TEXT-FIG. 2). Vessel-ray pits are small, circular, many per cell (TEXT-FIG. 3). Vessel-parenchyma pits are minute, numerous and alternate.

Parenchyma is both paratracheal and apotracheal. The paratracheal parenchyma is mostly vasicentric to aliform, sometimes confluent (PL. 1, FIG. 1; TEXT-FIG. 1). The vasicentric parenchyma forms complete sheath around the pores forming 2-4 layers of cells (PL. 1, FIG. 2; TEXT-FIG. 1). The bands of the confluent parenchyma are usually thick and run for a short distance (PL. 1, FIG. 1; TEXT-FIG. 1). Occasionally, adjacent vessels are joined by sheaths of parenchyma cells (TEXT-FIG. 1). The apotracheal parenchyma occurs as diffused cells, scattered in the ground mass of the wood (PL. 1, FIG. 1; TEXT-FIG. 1). Terminal parenchyma is in bands of 1-4 rows of cells which often connects the vessels (PL. 1, FIG. 1; TEXT-FIG. 1). Cells of the parenchyma are small, circular and contain crystals.

Rays are uniform and frequent in distribution (PL. 1, FIG. 4; TEXT-FIG. 4). They are often contiguous with vessels (PL. 1, FIG. 1; TEXT-FIG. 1). Rays are homogeneous (PL. 1, FIG. 5), mostly uniseriate, sometimes bicelled in some parts of the ray (PL. 1, FIG. 4; TEXT-FIG. 5). They are 2-18 cells high (PL. 1, FIG. 4; TEXT-FIG. 5). Ray cells are squarish in shape (PL. 1, FIG. 4; TEXT-FIG. 5) and contain a single crystal in each cell (PL. 1, FIG. 4). Sometimes rays show end to end fusion.

Fibres are arranged in regular radial rows. They are medium in height, thin to thick-walled and septate (PL. 1, FIG. 4). Fibre cells are round and squarish in cross-section (PL. 1, FIG. 2). Inter-fibre pits are small, minute and many per cell.



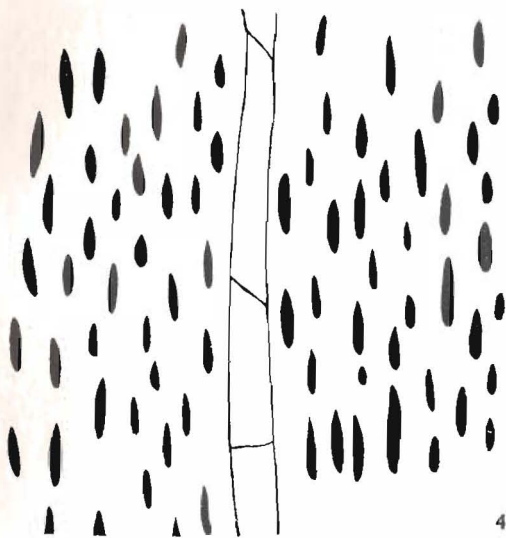
TEXT-FIGS. 1-3—1, cross-section of the fossil wood to show the distribution of vessels, rays and parenchyma. $\times ca. 170$. 2, tangential section showing the vestured pits. $\times ca. 1000$. 3, radial section showing vessel-ray pits. $\times ca. 750$.

AFFINITIES AND DISCUSSION

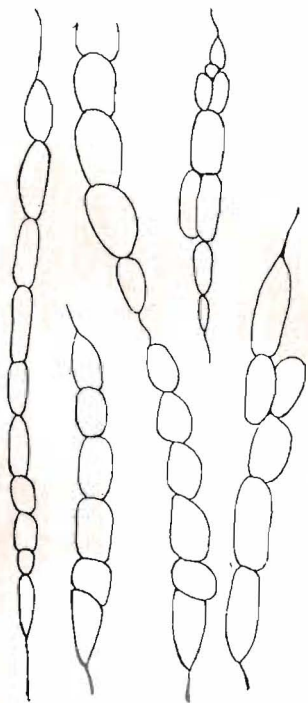
The above combination of characters indicate that the fossil specimen might belong to any one of the families of Leguminosae, Anacardiaceae, Burseraceae, Rutaceae, Sapindaceae and Combretaceae (CHOWDHURY, 1932; GAMBLE, 1902; HENDERSON, 1953; MOLL & JANSSONIUS, 1908; KANEHIRA, 1924; METCALFE & CHALK, 1950 and PEARSON & BROWN, 1932).

Taking into consideration one by one, the woods of Leguminosae although show some general similarities in the overall features with the fossil, yet they differ distinctly in having abundant parenchyma and broad rays. Similarly woods of Anacardiaceae and Burseraceae also differ in having gum canals in the rays and multi-seriate rays. Woods of Rutaceae can be differentiated as they lack vestured pits and possess intervacular canals and small

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TEXT-FIGS. 4-5 — 4, tangential section showing the distribution of rays. \times ca. 170. 5, ray cells and their nature. \times ca. 420.

pores unlike the fossil. Few genera of Sapindaceae resemble the fossil in the nature of vessels, rays and fibres but the scanty nature of parenchyma and absence of ves-

tured pits in the woods of Sapindaceae are important characters to distinguish them from the fossil. It is only in the genus *Terminalia* of Combretaceae that we find similar combination of characters as seen in the fossil wood. The woods of *Terminalia* possess medium to large sized vessels having ves-tured pits, vasicentric, aliform to confluent parenchyma along with diffuse and terminal parenchyma, uniseriate homogeneous rays and septate fibres. These features are well seen in the fossil specimen. Many thin sections of the modern wood of *Terminalia* species taken during the investigation show that the present fossil specimen resembles the wood of *Terminalia*.

Terminalioxylon speciosum, *T. felixii* (RAMANUJAM, 1956), *T. mortandrense* and *T. sahnii* (NAVALE, 1955) are four fossil woods of *Terminalia* described from South India. Comparing with these, the present fossil specimen shows many specific differences although one or few characters might agree. *T. sahnii* differs in having broad paratracheal bands of parenchyma and high rays apart from the size variations in the vessels and parenchyma cells. Similarly *T. mortandrense* does not agree with the present fossil as it lacks the diffuse parenchyma and possesses solitary vessels and aseptate fibres. Comparing with *T. felixii*, the present fossil wood can be well differentiated as the fossil wood of *T. felixii* generally have high rays, broad parenchyma bands and no diffuse parenchyma. *T. speciosum* somewhat agrees with the present specimen in the nature of vessels and parenchyma but a closer comparison shows distinct differences. Fibres in *T. speciosum* are septate, vessels are usually solitary and large and the parenchyma is limited.

Few fossil woods of *Terminalia* have also been recorded from outside India. They are *Terminalioxylon naranjo* and *T. porosum* (SCHÖNFELD, 1947) and *T. annamense* (BOUREAU, 1950). The present fossil specimen differs from all of them in most of the anatomical characters. *T. annamense* differs in having secretory cells in parenchyma, large vessels and heterogeneous rays. Similarly, *T. porosum* does not agree as it possesses large vessels, high rays and lacks the diffuse parenchyma. *T. naranjo* shows some similarities with the present fossil in the nature of vessels and rays but the nature and distribution of parenchyma differs.

The above detailed anatomical studies and comparisons clearly indicate the affinities of the fossil wood with the genus *Terminalia*. The present fossil wood has been referred to a new species of *Terminalioxylon* as it differs from the hitherto known species of this genus.

The few fossil dicotyledonous woods already known from Assam are *Glutoxylon assamicum* (CHOWDHURY, 1936), *Dipterocarpoxyylon garoense* and *Dryoxylon* sp. (CHOWDHURY, 1938), *Cynometroxylon indicum* (CHOWDHURY & GHOSH, 1946), *Kayeoxylon assamicum* (CHOWDHURY & TANDON, 1949), *Dipterocarpoxyylon chowdhurii* (GHOSH, 1956) and *Ebenoxylon indicum* (GHOSH & KAZMI, 1958). The present investigation shows the occurrence of a new species of fossil *Terminalia* wood from the Tertiary rocks of Assam. The only other record of fossil woods resembling the genus *Terminalia* from India is from Pondicherry (NAVALE, 1955 & RAMANUJAM, 1956).

Terminalioxylon chowdhurii sp. nov.

Diagnosis

A diffuse porous wood.

Growth marks not present; terminal parenchyma often simulate growth marks.

Vessels diffused, 171 μ in tangential diameter, 247 μ in radial diameter when solitary, 242 μ in radial diameter when in groups of two or more, 4-6 per sq. mm., uniformly distributed, solitary as well as in multiples of two or more, round to elliptic in shape, thick-walled, often with tyloses;

vessel-segments short, 247-475 μ , truncate, tailed; intervessel pits small, alternate, vested; vessel-ray pits small, circular, 4-5 per cell, 5 μ in size; vessel-parenchyma pits minute.

Parenchyma both paratracheal and apotracheal; paratracheal parenchyma mostly vasicentric to aliform, sometimes confluent, forming 2-4-layered sheaths round the pores; apotracheal parenchyma diffused, solitary, cells 19 μ in size; terminal parenchyma banded, 1-4 rows, cells 14 μ in size.

Rays uniform in distribution, 5-8 per sq. mm., mostly uniseriate, sometimes locally bicelled, homogeneous; ray cells squarish in shape, 38 μ in diameter; rays 2-18 cells high with single crystal in each cell.

Fibres arranged in regular rows, 970 μ in height, thin to thick-walled, septate; fibre cells round to squarish in cross-section, 10-12 μ in diameter; interfibre pits minute, and many per cell.

Holotype—No 32776 Birbal Sahni Institute of Palaeobotany.

Locality—Barail reserve hills of Assam.

Horizon—Tertiary.

ACKNOWLEDGEMENTS

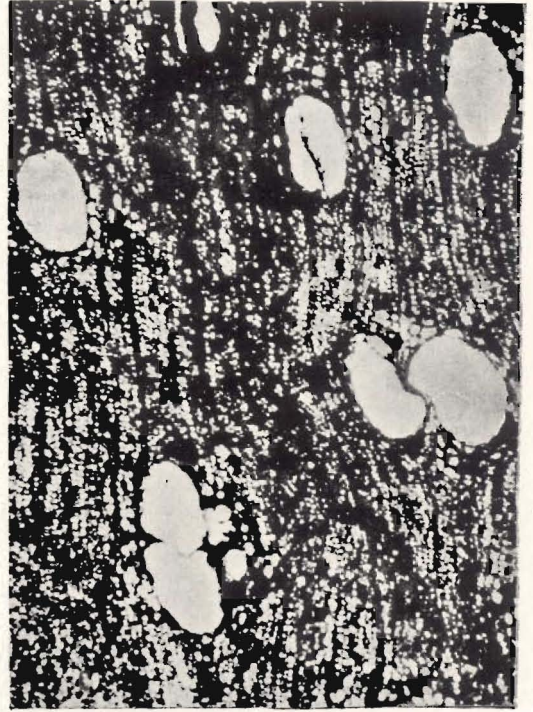
We are thankful to Mr. G. K. D. Roy, Vigyan Mandir Officer, for sending the material to Birbal Sahni Institute of Palaeobotany for identification. Thanks are also due to Drs. R. N. Lakhanpal and D. C. Bharadwaj for giving all the encouragement and facilities during the progress of the present work, and to Prof. R. Karäusel for critically going through the manuscript.

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EXPLANATION OF PLATE 1

1. Cross-section of the fossil wood showing the nature and arrangement of vessels, parenchyma and rays. $\times 35$.
2. Another cross-section enlarged to show the structure and distribution of vessels and parenchyma. $\times 50$.
3. Tangential section showing the vested pits. $\times 400$.
4. Another tangential section showing the distribution and the nature of rays. $\times 35$.
5. Radial section of the wood showing the homogeneous nature of rays. $\times 35$.