

*MESUOXYLON ARCOTENSE* GEN. ET SP. NOV.,  
A FOSSIL DICOTYLEDONOUS WOOD FROM THE  
TERTIARY OF SOUTH ARCOT DISTRICT, MADRAS, INDIA

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**ABSTRACT**

A new fossil wood has been described from the Tertiary rocks of Mortandra (Murattandichavadi) in the South Arcot district, Madras. The fossil shows close resemblance with the wood of the modern genus *Mesua* of the Guttiferae.

**INTRODUCTION**

**I**N the Cuddalore Sandstones of South Arcot District, Madras, there are a number of localities where petrified woods are found in great abundance. Two of them, *Mesembrioxylon schmidianum* and *Palmoxylon pondicherriense*, were described by Prof. Sahni (1931a, 1931b). Later, extensive studies on these woods were made by Ramanujam (1953a, 1953b, 1953c, 1954a, 1954b, 1955, 1956a, 1956b, 1956c, 1958, 1959 and 1960) and Navale (1955, 1956, 1958, 1960, 1962a, 1962b, 1962c, 1962d and 1963) who have described a large number of angiospermic and gymnospermic woods from this area.

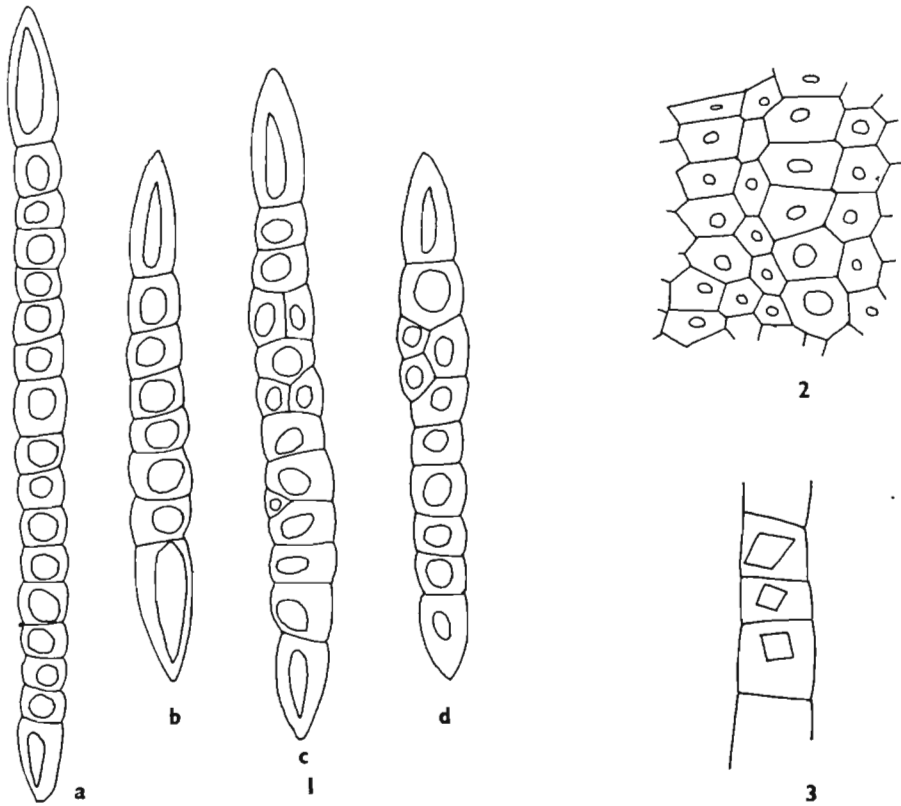
Recently, in order to make fresh collections of the petrified woods of South Arcot, an excursion was undertaken by us in early 1962. Extensive collections were made from different localities, i.e. Mortandra (Murattandichavadi), Tiruchhitambalam, Tiruvakkarai, Singamedu and Suttukeni. Out of the specimens collected, a large number were investigated after preparing their thin sections. Quite a few seem to be new for the area. One of them shows striking resemblance with the wood structure of the modern *Mesua* and is described here in detail.

**DESCRIPTION**

The fossil described here is a piece of well preserved secondary wood which before cutting measured about 10 cm. in length and 5 cm. in diameter. The colour of the cut surface varies from dirty white to light brown.

**TOPOGRAPHY** — *Wood* diffuse-porous (PL. 1, FIG. 1). *Growth rings* absent. *Vessels* in cross-section appearing as small crowded dots to the naked eye, clearly visible under the microscope (PL. 1, FIG. 1), medium to large (mostly medium) in size, exclusively solitary (PL. 1, FIGS. 1 & 5), arranged characteristically in oblique radial lines in cross-section (PL. 1, FIGS. 1 & 5), mostly 2-12 vessels per group; tyloses present, thick-walled (probably sclerotic). *Tracheids* paratracheal, visible under the microscope as dark masses around the vessels (PL. 1, FIG. 5), more abundant between the adjacent vessels in a group, forming 1- several (mostly 2-3) cells wide sheath around the vessels. *Parenchyma* visible to the naked eye as fine, concentric tangential bands (PL. 1, FIGS. 1 & 5), apotracheal, bands slightly wavy, ending abruptly, interrupted by the xylem rays, 4-5 bands per mm., each band 2-5 (mostly 2-4) cells wide. *Xylem rays* visible neither to the naked eye nor with the help of hand lens, fine to very fine (PL. 1, FIG. 3; TEXT-FIG. 1), close (PL. 1, FIG. 1), mostly uniseriate (PL. 1, FIG. 3; TEXT-FIG. 1 a & b), rarely biseriate at some places due to paired cells (TEXT-FIG. 1 c & d), 10-15 per mm., separated by 2-12 rows of fibres in cross-section, heterogeneous (PL. 1, FIGS. 3 & 7; TEXT-FIG. 1), 3-25 (sometimes upto 35) cells in height. *Fibres* aligned in radial rows in cross-section (TEXT-FIG. 2), interrupted by parenchyma bands.

**ELEMENTS** — *Vessels* thick-walled, wall thickness 8-12  $\mu$ , circular to oval in cross-section, tangential diameter 100-180  $\mu$ , radial diameter 120-210  $\mu$ , filled with dark contents; vessel-members medium to large; perforations simple; pits leading to contiguous tracheids not clearly observed. *Tracheids* as long as fibres, cells oval to polygonal in cross-section, measuring about 15  $\times$  25  $\mu$ , infiltration dark; pits small, arranged in vertical strips (PL. 1, FIG. 6), bordered, circular to oval with lenticular,



TEXT-FIGS. 1-3 — *Mesuoxylon arcotense* gen. et sp. nov. 1. Xylem rays as seen in the tangential longitudinal section; a & b, uniseriate; c & d, biseriata.  $\times 350$ . 2. Thick-walled fibres in cross-section.  $\times 480$ . 3. A crystalliferous parenchyma strand showing crystals as seen in the tangential section.  $\times 350$ .

horizontal to oblique orifices. *Parenchyma cells* mostly thick-walled, round to oval in cross-section, about  $48-140 \mu$  in length;  $10-25 \mu$  in diameter, infiltration dark crystalliferous cells present containing solitary crystal in each cell (TEXT-FIG. 3). *Ray cells* thick-walled, tangential length of procumbent cells  $8-16 \mu$ , radial length  $32-100 \mu$ , upright cells  $32-64 \mu$  in tangential length,  $20-48 \mu$  in radial length, infiltration dark. *Fibres* non-septate, non-gelatinous, highly thick-walled, angular or polygonal, somewhat tangentially flattened (TEXT-FIG. 2), length  $375-1125 \mu$ , tangential diameter  $16-24 \mu$ , radial diameter  $16-20 \mu$ , wall thickness  $4-8 \mu$ , interfibre pits not seen.

#### DISCUSSION

**AFFINITIES**—The most important anatomical features exhibited by the fossil

wood are (1) vessels exclusively solitary and characteristically arranged in oblique radial lines, (2) paratracheal tracheids, (3) apotracheal, tangential parenchyma bands, (4) fine, mostly uniseriate heterogeneous rays and (5) thick-walled fibres. All these structural features considered collectively indicate its affinities with the wood of *Mesua* and *Calophyllum* of the family Guttiferae (BRAZIER & FRANKLIN, 1961; CHOWDHURY & GHOSH, 1958; KRIBS, 1959; METCALFE & CHALK, 1950; PEARSON & BROWN, 1932).

Detailed comparison was made with the thin sections of the following 18 species of *Calophyllum* and 3 species of *Mesua*:

1. *Calophyllum amoenum* Wall.
2. *C. blancoi* Pl. & Tr.
3. *C. brasiliense* Camb.
4. *C. costatum* F. M. Bailey
5. *C. inophyllum* L.

6. *C. kunstleri* King
7. *C. polyanthum* Wall.
8. *C. pulcherrimum* Wall.
9. *C. obliquinervium* Merr.
10. *C. spectabile* Willd.
11. *C. tomentosum* Wight
12. *C. venustum* King
13. *C. wallichianum* Pl. & Tr.
14. *C. wightianum* Wall.
15. *Calophyllum* sp. (Java)
16. *Calophyllum* sp. (Kuala-Lumpur)
17. *Calophyllum* sp. (Sandakan)
18. *Calophyllum* sp. (Singapore)

1. *Mesua ferrea* L.
2. *M. lepidota* T. Anders.
3. *M. thwaitesii* Pl. & Tr.

The sections of 16 species of *Calophyllum* and of *Mesua ferrea* were examined at the Wood Anatomy Branch of the Forest Research Institute, Dehra Dun. Sections of *Calophyllum brasiliense*, *C. obliquinervium*, *Mesua lepidota* and *M. thwaitesii* were prepared and examined in our own laboratory.

After the detailed comparison it was found that the wood of *Mesua* showed better affinities than that of *Calophyllum*. The fossil resembles *Calophyllum* in (1) the type and arrangement of vessels, (2) paratracheal tracheids, (3) apotracheal parenchyma bands and (4) fine, 1-2 seriate, heterogeneous rays. However, it differs from *Calophyllum* in having highly thick-walled fibres, the fibres being so thick-walled that the lumen is hardly visible even under high magnification. Moreover, the parenchyma bands are much more closely placed as compared to *Calophyllum*.

Among the species of *Mesua*, there is a very close agreement in all structural features with *M. ferrea* than with other species. *M. lepidota* differs from the fossil in having mostly biseriate rays while in *M. thwaitesii* the parenchyma bands are too close as compared with the fossil.

COMPARISON WITH THE FOSSIL SPECIES — So far, only two species of fossil wood belonging to the family Guttiferae are known from India; *Kayeoxylon assamicum* (CHOWDHURY & TANDAN, 1949) from the Tertiary of Assam and *Guttiferoxylon indicum* (RAMANUJAM, 1960) from the same locality as of the present fossil wood. However, the anatomical features of these two woods are quite different from those of the present fossil. One of them has been assigned to

the modern genus *Kayea* and the other belongs to *Garcinia* type.

From outside India, a number of fossil woods belonging to the family Guttiferae are known from the Cretaceous onwards; *Symphonioxylon stefaninii* and *S. scegurensis* (CHIARUGI, 1933) from the Cretaceous of Somalia, South Africa; *Guttiferoxylon fareghense* and *G. symphonioides* (KRAUSEL, 1939) from the Tertiary of Egypt; *G. platonioides* and *G. compactum* (SCHÖNFELD, 1947) from the Tertiary of Colombia, South America; *G. saharianum* (BOUREAU, 1952) from the Algerian Tertiary; *G. garcinioides* (HOFMANN, 1944) and *G. prambachense* (HOFMANN, 1952) discovered from the Tertiary of Austria. Most of these fossil woods show resemblance with the wood structure of either *Symphonia* or *Garcinia*. The present fossil being closely allied to *Mesua*, differs widely from the woods of these genera.

As far as we are aware there is no record of a fossil wood resembling that of *Mesua*. However, fossil leaves resembling those of *Mesua ferrea* have been described by Lakhnupal and Bose (1951) from the Fuller's earth bed (Eocene) at Kapurdi near Barmer in Rajasthan.

Since the present fossil wood shows closest resemblance with the wood structure of *Mesua*, it has been designated as *Mesuoxyton* gen. nov. Its specific name *M. arcotense* sp. nov., is after the name of the Arcot district from where the fossil wood was collected.

#### PRESENT DISTRIBUTION OF *MESUA*

*Mesua*, with which our fossil shows close resemblance, is a small genus consisting of only 3 species of moderate to large-sized trees occurring in tropical Asia, widely distributed in the forests of India, East Pakistan, Burma, Ceylon, Java, the Andamans and the Malayan and Cambodian Peninsulas (PEARSON & BROWN, 1932) *M. ferrea* is found in some hilly regions of India, Burma, Eastern and Western Peninsulas and Andaman Islands. In India it occurs in eastern and southern parts of the country. In east India it is common in almost all evergreen forests in the Western Duars, upper Assam and Khasi hills. In Assam it occurs at various altitudes ranging from the level of the plains up to nearly 1000 metres. In South India it is

found limited in evergreen forests of Western Ghats, South of North Kanara in Coorg, South Coimbatore, Ootacamund, South Kanara, South Malabar and Tinnevely. It is also reported from Purnea, Mayurbhanj and Orissa.

#### DIAGNOSES

##### *Mesuoxyton* gen. nov.

Wood diffuse-porous. *Growth rings* not visible. *Vessels* medium to large, exclusively solitary in cross-section, arranged characteristically in oblique radial lines, circular to oval, tylosed; perforations simple. *Tracheids* paratracheal; pits small, bordered. *Parenchyma* apotracheal, concentric, tangential bands, 2-8 bands per mm., each band 2-8 cells wide, chambered crystalliferous cells usually present. *Xylem rays* fine to very fine, 1-2 seriate, heterogeneous. *Fibres* non-septate, highly thick-walled.

Genotype — *Mesuoxyton arcotense* sp. nov.

##### *Mesuoxyton*<sup>*arcotense*</sup> sp. nov.

Wood diffuse-porous. *Growth rings* absent. *Vessels* medium to large, exclusively solitary, arranged characteristically in oblique radial lines in cross-section, circular to oval, thick-walled; tyloses abundant, thick-walled; perforations simple; vessel-members medium to large. *Tracheids* paratracheal, more abundant between the adjacent vessels in a group, mostly 2-3

cells wide sheath around the vessels; pits small, arranged in vertical strips, bordered, circular to oval with lenticular, horizontal to oblique orifices. *Parenchyma* apotracheal, concentric, tangential bands, slightly wavy, ending abruptly, 2-5 bands per mm., each band 2-5 (mostly 2-4) cells wide; chambered crystalliferous strands abundant. *Xylem rays* fine to very fine, mostly uniseriate, rarely biseriate at some places due to pairing of procumbent cells; heterogeneous, 3-25 cells high. *Fibres* aligned in radial rows, angular to polygonal (mostly hexagonal), somewhat tangentially flattened, non-septate, highly thick-walled, wall thickness 4-8  $\mu$ .

*Holotype* — B.S.I.P. Museum No. 32787.

*Locality* — Mortandra (Murattandichavadi), about 8 Kilometres W.N.W. of Pondicherry, South Arcot district, Madras.

*Horizon* — Cuddalore Series.

*Age* — Middle Tertiary.

#### ACKNOWLEDGEMENTS

We are thankful to Shri K. Ramesh Rao, Officer-in-Charge, Wood Anatomy Branch, Forest Research Institute, Dehra Dun, for allowing us to consult the xylarium of that Institute. Our thanks are also due to the Director, Royal Botanic Gardens, Kew, England and the Director, Royal Botanic Gardens, Peradeniya, Ceylon, for sending us the wood specimens of *Mesua lepidota* and *M. thwaitesii* respectively.

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## EXPLANATION OF PLATE 1

1. Cross-section of the fossil wood showing distribution of vessels, parenchyma and rays (B.S.I.P. Museum Slide No. 1580). × 15.
2. Cross-section of *Mesua ferrea* L. showing similar distribution of vessels, parenchyma and rays (after Pearson & Brown, 1932, Fig. 24). × 15.
3. Tangential section of the fossil wood showing the type of rays and their distribution (B.S.I.P. Museum Slide No. 1581). × 130.
4. Tangential section of *Mesua ferrea* L. showing rays similar in type and distribution (B.S.I.P. Xylarium Slide No. 112). × 130.
5. Cross-section of the fossil magnified to show the tracheids around the vessels (B.S.I.P. Museum Slide No. 1580). × 44.
6. Tangential section of the fossil magnified to show intertracheidal pits (B.S.I.P. Museum Slide No. 1582). × 940.
7. Radial section of the fossil showing the heterogeneous rays (B.S.I.P. Museum Slide No. 1583). × 96.

