

ON THE OCCURRENCE OF FOSSIL WOOD OF *SONNERATIA* : *SONNERATIOXYLON DAKSHINENSE* SP. NOV. FROM THE TERTIARY OF SOUTH ARCOT DISTRICT, MADRAS

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INTRODUCTION

THE species described here is represented by two small blocks of silicified wood, which were collected from near a village, Mortandra, 5 miles north-west of Pondicherry. A brief description of the species was published previously in a short note along with the other fossil woods resembling the modern families like Guttiferae, Celastraceae, Leguminosae and Euphorbiaceae (RAMANUJAM, 1954a). Besides this the author also reported the occurrence of woods resembling *Mangifera*, *Shorea* and *Albizia* (RAMANUJAM, 1953), and has described recently in detail the wood anatomy of fossil woods resembling the modern species of *Acacia*, *Caesalpinia*, *Shorea*, *Dipterocarpus* and *Terminalia* (RAMANUJAM, 1954b, 1955, 1956).

The fossils were found *in situ* in the Cuddalore sandstones, the geological age of which is believed to range from Eocene to Pliocene (SAHNI, 1931). Krishnan (1949) regards the Cuddalore series to be Miocene, while according to Wadia (1953) a great part of this series comes under Pliocene Age.

DESCRIPTION

Sonneratioxylon Hofmann

Sonneratioxylon dakshinense sp. nov.

The species is represented by two small pieces of silicified wood. One of the specimens shows a part of the pith also, but the preservation of this part is not good enough for seeing the anatomical details. The preservation of the secondary xylem is quite good.

There are no growth rings present in the fossil. The vessels are rather indistinct to the naked eye and show no great variation in size. They are mostly small, but sometimes approach to medium size, and orbicular to

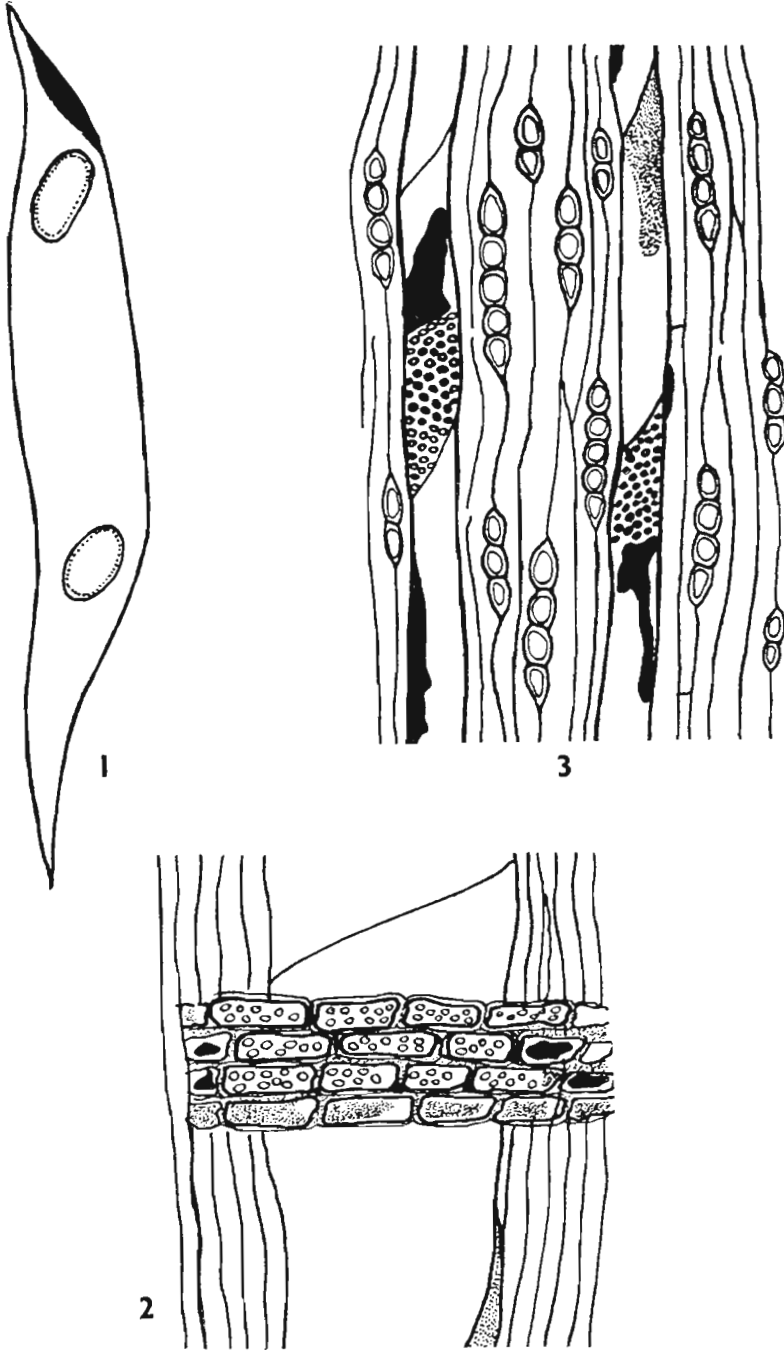
broadly oval or often flattened in outline. They are evenly distributed, considerably thick-walled and solitary or in radial multiples of 2-3 (PL. 1, FIG. 1). The proportion between the solitary vessels and radial multiples is 40:60. Tyloses are not present. The vessels in general are open but at some places their cavities are occluded with a dark gummy (?) deposit; when this is the case, the vessels at first glance may be mistaken for gum ducts, but careful examination always reveals their true nature. The vessel-segments are medium to long and truncate or attenuately tailed (TEXT-FIG. 1). The perforations are simple and mostly oblique to sometimes almost horizontal. Intervessel pitting is profuse; the pits are vested, of medium size, alternate and are more or less hexagonal due to contiguous nature (PL. 1, FIG. 2). Occasionally the pits although crowded are not placed in contact with each other and then are rounded and arranged in horizontal rows. The vessel-ray pits are very minute, rounded or slightly flattened, simple or narrowly bordered and many per cell (TEXT-FIG. 2).

The fibres solely constitute the ground tissue of the wood. They are libriform and very thick-walled with little or no lumina. They are polygonal in cross-section and aligned in regular radial seriations. The fibres for the most part are short to medium in length and distinctly septate. Pits to the fibres are few, minute, simple and rounded (PL. 1, FIG. 3).

The fossil does not possess any xylem parenchyma elements.

The xylem rays are indistinct to the naked eye, and even with a hand lens their outlines on the transverse and longitudinal surfaces of the fossil remain obscure. The rays are numerous and closely distributed. They are as a rule uniseriate, and only rarely do we come across biseriate ones (PL. 1, FIG. 4). They are always homogeneous and

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TEXT-FIGS. 1-3 — *Sonneratioxylon dakshinense* sp. nov. 1, vessel-segment highly enlarged to show the tailed nature and the simple, oblique perforations. $\times 250$. 2, vessel-ray pitting. $\times 300$. 3, tangential section showing the uniseriate xylem rays and intervessel pits. $\times 200$.

very short, being only 3-12 cells high (average 7 cells), but at times we come across rays 15 cells high. The rays in general are made up of short procumbent cells of various shapes (TEXT-FIG. 3). Pits on the tangential walls of the ray cells are sometimes observed; they are very few, minute, rounded and simple.

Comparison with the Living Species — Among the modern dicotyledons there are several families which exhibit a combination of some or all of the features present in the fossil. An important feature that helps to throw light on the affinities of the fossil is the presence of the vested pits. The evidence to date is to the effect that vested pits are extremely consistent in their distribution and for this reason their presence or absence appears to be of decided diagnostic importance in the identification of angiosperm woods. According to Bailey (1924), about 25 families are characterized by the possession of vested pits; the important ones are Vochysiaceae, Leguminosae, Myrtaceae, Melastomaceae, Combretaceae, Lythraceae, Euphorbiaceae and Sonneratiaceae. All these families excepting Sonneratiaceae, however, differ from the present fossil in other important characters.

The woods of Vochysiaceae, Leguminosae and Myrtaceae possess abundant xylem parenchyma which is conspicuous by its absence in our fossil specimen. The family Melastomaceae differs markedly in the possession of irregular clusters of very small vessels, and fairly abundant paratracheal parenchyma. In the case of Combretaceae and Lythraceae too the xylem parenchyma is fairly abundant. Moreover, in Combretaceae the ray cells are usually characterized by the presence of crystals. In Euphorbiaceae *Bridelia* and *Cleistanthus* are the only two genera in which distinct vested pits have been reported (BAILEY, 1924). Both these genera differ from the fossil wood in possessing a certain amount of xylem parenchyma and in the nature of the xylem rays.

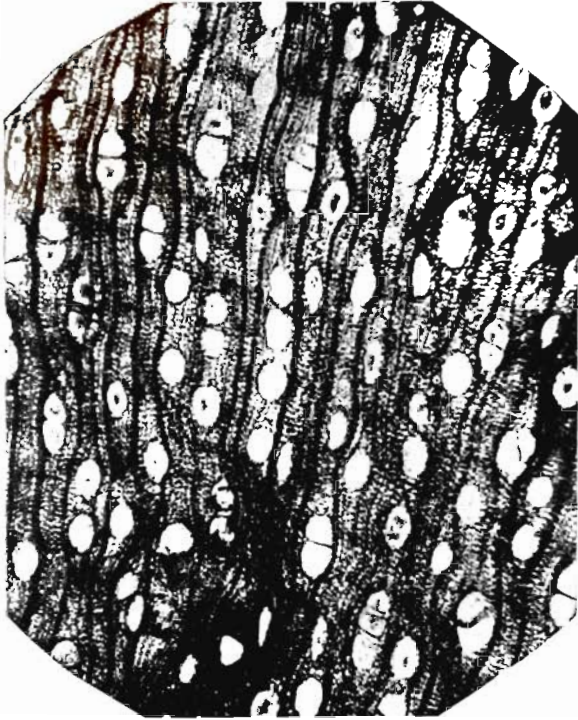
It is only in the woody genera of Sonneratiaceae that we come across many similarities with our fossil. A comparison with the species of *Sonneratia* and *Duabanga* shows that the fossil approaches the former more closely. The wood of the genus *Sonneratia* has the following characteristic features (SOLEREDOR, 1908; JANSSONIUS, 1940; METCALFE & CHALK, 1950): vessels small to medium, solitary or commonly in radial

multiples of 2-3. Perforations simple and oblique. Intervessel pits typically vested, alternate. Fibres septate, libriform. Parenchyma absent or very scanty. Rays mostly uniseriate and homogeneous. In all these anatomical characters it shows agreement with our fossil. *Duabanga* differs from the fossil in possessing certain amount of xylem parenchyma in the form of vasicentric sheaths and in its commonly biseriate rays (sometimes even triseriate) which are heterogeneous. Comparisons have been made with *Sonneratia apetala* and *Sonneratia acida* both of which are common in the estuarine forests of India.

Comparison with the Fossil Species — Among the fossil dicotyledonous woods described from India so far, the South Indian fossil shows some similarities with only one species, viz. *Dryoxylon mohgaense* (RODE, 1936) from the Deccan Intertrappean Series. Rode is of the opinion that *D. mohgaense* shows its nearest affinity to Combretaceae. The Deccan Intertrappean fossil has vested intervessel pits and in the nature and distribution of its vessels and fibres it resembles our fossil. The Intertrappean species, however, possesses certain amount of xylem parenchyma occurring around the vessels or as solitary cells distributed irregularly among the fibres; besides the vessels in this species are very commonly tylosed and the xylem rays are higher and heterogeneous.

Verma (1950) has published a short note about another dicot wood from Deccan Intertrappean Series which he has described as showing resemblances with *Sonneratia*. This wood differs from our specimen in the possession of aggregate heterogeneous rays with 1-3 resin canals and the absence of vested pitting. From the characters of the wood described by Verma it does not appear to bear any resemblance to the species of *Sonneratia*.

Our fossil exhibits more close resemblance with *Sonneratioxylon prambachense* Hofmann (1952), described from the Oligocene of Austria, than with the other fossil woods. In both the cases the nature and distribution of the vessels is almost alike, and so are the xylem rays and the fibres. But in *Sonneratioxylon prambachense* xylem parenchyma is present although in small quantity as diffuse cells, the solitary vessels are rare and lastly the rays are comparatively higher (6-30 cells high).



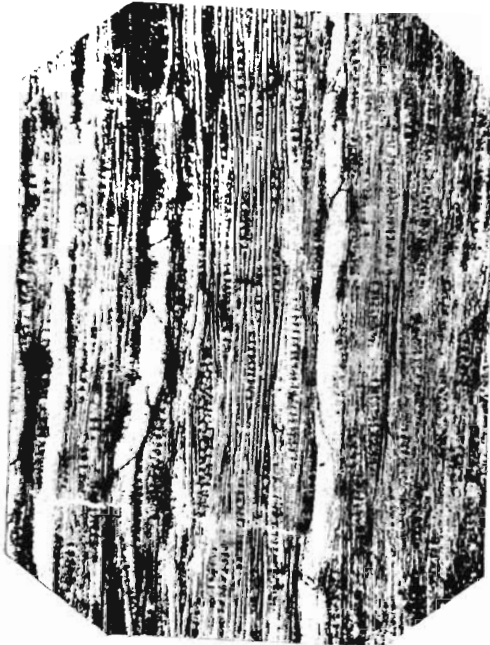
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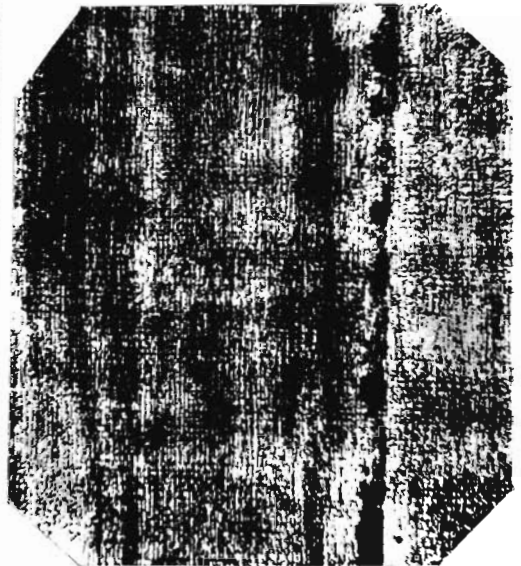
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It has been shown above that the fossil wood from South India agrees very closely with the wood type of *Sonneratia*, consequently it has been placed in Hofmann's genus *Sonneratioxylon*. As it differs from all the hitherto described species it is given a new specific name, *Sonneratioxylon dakshinense*, after the Sanskrit term *Dakshin Bharat*, meaning South India.

Diagnosis — A diffuse porous wood. Growth rings absent.

Vessels diffuse, 18-25 per sq. mm. Small, sometimes medium, 80-120 μ in diam. Solitary or in radial multiples of 2-3, solitary vessels orbicular to broadly oval. Vessel segments medium to long, 300-750 μ , truncate or attenuately tailed. Perforations simple, mostly oblique. Intervessel pits medium to large, alternate, hexagonal, distinctly vested. Vessel-ray pits minute, simple or narrowly bordered, rounded or slightly flattened, many per cell.

Fibres libriform, 14-18 μ in diam., 750-1150 μ long; septate. Polygonal in

cross-section, arranged in regular radial serialiations. Pits simple, minute, rounded.

Parenchyma absent.

Rays numerous, 25-40 per mm., closely distributed. Homogeneous with short procumbent cells. Mostly uniseriate, rarely biseriate. Very short, 3-12 cells high (average 7 cells). Pits to the tangential walls simple, minute.

Holotype: No. 4972 of the museum of Birbal Sahni Institute of Palaeobotany, Lucknow, India.

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EXPLANATION OF PLATE I

1. Cross-section showing the distribution of the vessels and the arrangement of the fibres. $\times 35$.
2. Vested intervessel pits. $\times 500$.
3. Pits to the fibres. $\times 500$.
4. Tangential section showing the nature and distribution of the xylem rays. $\times 35$.
5. Radial section showing the homogeneous nature of the rays. $\times 35$.