

A NEW FOSSIL WOOD BELONGING TO THE FAMILY ALANGIACEAE FROM THE TERTIARY OF SOUTH INDIA

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ABSTRACT

A new fossil wood has been described from the Tertiary of South India. In all the anatomical characters it shows closest resemblance with the wood of the modern genus *Alangium* of the family Alangiaceae.

INTRODUCTION

CONSIDERING the size and extent of the fossiliferous bed of the Cuddalore Series, exposed about 8-10 km. and 25 km. W.N.W. of Pondicherry, South Arcot district, Madras, the number and variety of petrified woods so far described is very large as compared to other Tertiary formations of India. They represent several genera and families of two higher groups of the plant kingdom, viz. Angiosperms and Gymnosperms, described by earlier workers. In addition, recently Lakhanpal and Awasthi (1964, 1965) and Awasthi (1966, 1967, 1969) have also described some angiospermic woods resembling the modern genera, such as *Mesua*, *Calophyllum*, *Mangifera*, *Gluta-Melanorrhoea*, *Millettia* and *Sonneratia*.

The fossil wood described in the present paper was also collected from near Murattandichavadi, about 8-10 km. W.N.W. of Pondicherry, South Arcot district, Madras. The wood consists of a single piece, measuring about 15 cm in length and 7 cm in diameter. The preservation is fairly good.

DESCRIPTION

Family — ALANGIACEAE

Genus — *Alangioxylon* gen. nov.

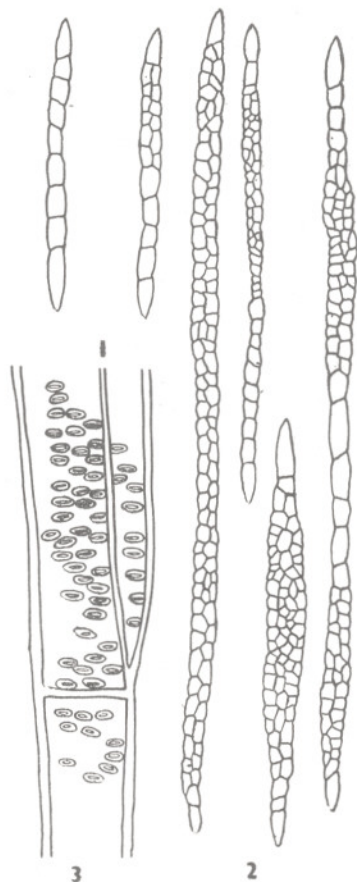
Alangioxylon scalariforme sp. nov.

Pl. 1, Figs. 1,3-6 Text-figs. 1-3

Topography — Wood diffuse-porous (PL. 1, FIG. 1). *Growth rings* not seen. *Vessels* visible to the naked eye as small crowded dots, small to medium, mostly medium-sized, solitary as well as in the radial multiples

of 2-9 (mostly 2-3) (PL. 1, FIG. 1), evenly distributed, about 20-30 vessels per sq. mm; tyloses present, appearing as thick-walled (PL. 1, FIG. 1). *Parenchyma* apotracheal, diffuse or in uniseriate tangential lines (PL. 1, FIG. 1), seen as dark coloured dots with the hand lens, cells meet with the neighbouring rays forming reticulum (PL. 1, FIGS. 1 & 4), about 8-12 parenchyma lines per mm, each separated by 4-5 radial rows of fibres. *Xylem rays* fine to moderately broad, 1-4 seriate (PL. 1, FIGS. 4, 5 & 6), ray tissue heterogeneous; uniseriate rays usually composed wholly of upright cells; multiseriate rays heterocellular, consisting of procumbent cells through the median thickened portion and 1-9 uniseriate marginal rows of upright cells at one or both the ends (PL. 1, FIGS. 5 & 6; TEXT-FIG. 2); sheath cells occasionally present; rays 7-61 cells and 500-2250 μ in height. *Fibres* aligned in radial rows between the two consecutive xylem rays.

Elements — *Vessels* circular to oval in cross-section (PL. 1, FIGS. 1, 4), t.d. 60-180 μ , r.d. 60-150 μ , thick-walled, common wall 8-12 μ in thickness; vessel-members 600-1200 μ in length, with truncated or tailed ends; perforations scalariform (PL. 1, FIG. 3), plates horizontal with fine bars, bars sometimes seen even in cross-section (PL. 1, FIG. 4); intervessel pits small, alternate, bordered, with linear apertures; vessel-parenchyma small, oval, with linear apertures (TEXT-FIG. 3); vessel-ray pits not seen. *Parenchyma cells* usually oval through the tangential plane in cross-section, t.d. 28-48 μ , r.d. 16-28 μ , thick-walled, infiltration dark; crystals not seen. Upright *Ray cells* 68-120 μ in tangential height, 40-90 μ in radial length, procumbent cells 20-32 μ in tangential height, 48-140 μ in radial length; crystalliferous contents occasionally present; infiltration dark. *Fibres* oval to angular (mostly hexagonal) in cross-section, sometimes tangentially flattened, t.d. 20-32 μ , r.d. 16-20 μ , nonseptate, thick-walled with narrow lumen, common walls 4-8 μ in thickness.



TEXT-FIGS. 1-3 — 1. Uniseriate xylem rays. $\times 70$. 2. Multiseriate xylem rays. $\times 70$. 3. Vessel-parenchyma pits. $\times 300$.

AFFINITIES AND DISCUSSION

Comparison with the modern woods — One of the most important and characteristic features of the present fossil wood is the presence of scalariform perforations. Among the modern woods scalariform perforations are found in 102 families of dicotyledons (METCALFE & CHALK, 1950, p. 1349). However, considering other important anatomical characters as well, such as (1) vessels solitary as well as in radial multiples of 2-8, tylosed; (2) parenchyma apotracheal, diffuse or in uniseriate lines; (3) xylem rays 1-4 seriate, heterogeneous; and (4) fibres non-septate and thickwalled, the present fossil wood shows its affinities with the woods of the family Cornaceae, Olacaceae, Passiflorae, Euphorbiaceae, Styracaceae and Alangiaceae.

In the family Cornaceae the genus *Cornus* resembles the fossil wood in having scalariform perforations, apotracheal or diffuse parenchyma, 1-4 seriate, heterogeneous xylem rays. However, the genus *Cornus* differs from the present fossil wood mainly in having solitary vessels and some other minor details.

The genus *Strombosia* of the Olacaceae shows the vessels and parenchyma similar in type and distribution as in the present fossil wood. But in possession of other anatomical details, such as scalariform intervessel pits, and long xylem rays the present fossil wood can be differentiated from *Strombosia*.

Similarly, the genus *Smeathmannia* of the Passiflorae shows near resemblance with that of present fossil wood in a number of characters except that in this modern genus the percentage of uniseriate xylem rays is high and they are composed wholly of upright cells. Besides, the fibres in *Smeathmannia* are with bordered pits.

In the family Euphorbiaceae there are a number of genera, among them the worth comparable genera are *Drypetes*, *Aprosa*, *Baccaurea* and *Putranjiva*. These resemble the present fossil wood in the nature and distribution of vessels, scalariform perforations, and apotracheal and diffuse type of parenchyma. However, all of them can be differentiated mainly in the type and distribution of the xylem rays which are normally uniseriate with some 2-3 seriate and relatively high, consisting of several rows of upright cells.

Of the remaining families, viz. Styracaceae and Alangiaceae, the present fossil wood approaches nearer to the latter one. The genus *Styrax* of Styracaceae differs in possession of long uniseriate rays and in having fibres with bordered pits, and moreover, the wood of *Styrax* is ringporous.

Lastly, it is the only genus *Alangium* of the Alangiaceae with which the present fossil wood resembles in all the anatomical details. Based on the wood structure, the genus *Alangium* can be divided into two groups (METCALFE & CHALK, 1950, pp. 741-745):

I. Vessels with scalariform perforation platse and small intervessel pitting, vessel-members and fibres very long. The species included under this group are *Alangium ebanaceum* Griff., *A. javanicum* (Koord. et Val.) Wang., *A. nobile* (Clarke) Harms,

A. rindleyi King, *A. sessiliflorum* Merr. and *A. meyeri* Merr.

II. Vessels with simple perforations and large intervacular pitting, vessel-members and fibres typically of medium length. The species included under this group are *Alangium chinense* (Lour.) Rehder, *A. longiflorum* Merr., *A. lamarckii* Thw., *A. viteense* (A. Gray) Harms.

Since in the present fossil wood the perforations are scalariform and intervessel pits are small it can be compared with the species included in the first group. Of these, thin sections of *A. javanicum* and *A. meyeri* were available for detailed comparison. Both these species resemble the present fossil wood in almost all the anatomical details except a few minor differences. In both the species of *Alangium* the vessels are less abundant, perforation plates slightly inclined or oblique and the xylem rays are relatively higher with more uniseriatae; whereas in the present fossil wood the vessels are abundant, i.e. their frequency is about 20-30 per sq. mm, perforation plates horizontal or slightly inclined and xylem rays are slightly less in height with a few uniseriatae. From these differences it seems quite likely that the fossil wood might show still closer resemblance with other modern species of *Alangium* which, however, were not available for comparison.

As far as the author is aware this is the first record of a fossil wood resembling the modern wood of *Alangium* hence it is assigned to a new genus, *Alangioxylon* and named as *Alangioxylon scalariforme* sp. nov., the specific name indicating the presence of scalariform perforations.

Present distribution of Alangium Lamk.—The genus *Alangium* consists of 17 species (WILLIS, 1966, p. 36) of trees and shrubs, distributed in the tropical regions of Africa (including Madagascar), Asia and East Australia. In India it is represented by a single species, *Alangium jamarckii* Thw. which is a small deciduous tree or shrub, occurring throughout the greater part of the country in dry region; in the sub-Himalayan tract from Saharanpur Siwaliks, eastward to Nepal, Oudh, Bengal, Bihar, Chotanagpur, Orrisa, Circar, Deccan and Carnatic, Western India in dry places down to Travancore, apparently scarce in Burma (GAMBLE, 1902). *Alangium javanicum*, *A. meyeri* and most of the species are found in Malayan region.

DIAGNOSES

Alangioxylon gen. nov.

Wood diffuse-porous. *Growth rings* indistinct. *Vessels* small to large (mostly medium-sized), solitary as well as in radial multiples; perforations simple as well as scalariform intervessel pits small to large, alternate, with linear apertures; tyloses present. *Parenchyma* apotracheal, diffuse mostly in uniseriate tangential lines, quite close, usually separated by 4-5 radial rows of fibres. *Xylem rays* fine to moderately broad, 1-4 seriate, ray tissue heterogeneous; rays heterocellular consisting of procumbent cells through the median thickened portion; and 1-several marginal rows of upright cells; sheath cells occasionally present; rays moderately high. *Fibres* non-septate, long, thick-walled, pits simple.

Genotype — *Alangioxylon scalariforme* sp. nov.

Alangioxylon scariforme sp. nov.

Wood diffuse-porous. *Growth rings* indistinct. *Vessels* small to medium (mostly medium) in size, solitary as well as in radial multiples of 2-3, sometimes upto 9 vessels, t.d. 60-180 μ , r.d. 60-150 μ , thick-walled; vessel-members 600-1200 μ in length, with truncated or tailed ends, about 20-30 vessels per sq. mm.; perforations scalariform, plates horizontal with fine bars; intervessel pits small, alternate, bordered, with linear apertures; tyloses present. *Parenchyma* apotracheal, in uniseriate tangential lines, cells often meet with the neighbouring rays forming reticulum, about 8-12 lines per mm, each separated by 4-5 radial rows of fibres. *Xylem rays* 1-4 seriate; ray tissue heterogeneous; rays heterocellular, consisting of 1-9 marginal rows of upright cells and procumbent cells in the median portion, sheath cells occasionally present; rays 7-61 cells and 500-2250 μ in height; crystals occasionally present. *Fibres* oval to angular, t.d. 20-32 μ , r.d. 16-20 μ , non-septate, thick-walled, with narrow lumen, 4-8 μ in thickness; pits simple.

Holotype — B.S.I.P. Museum No. 33708.

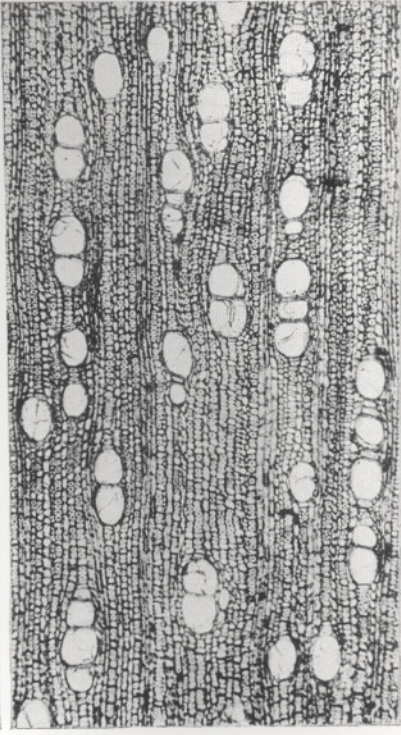
Locality — Murattandichavadi, about 8-10 km W.N.W. of Pondicherry, South Arcot district, Madras.

Age — Middle Tertiary.

Horizon — Cuddalore Series.



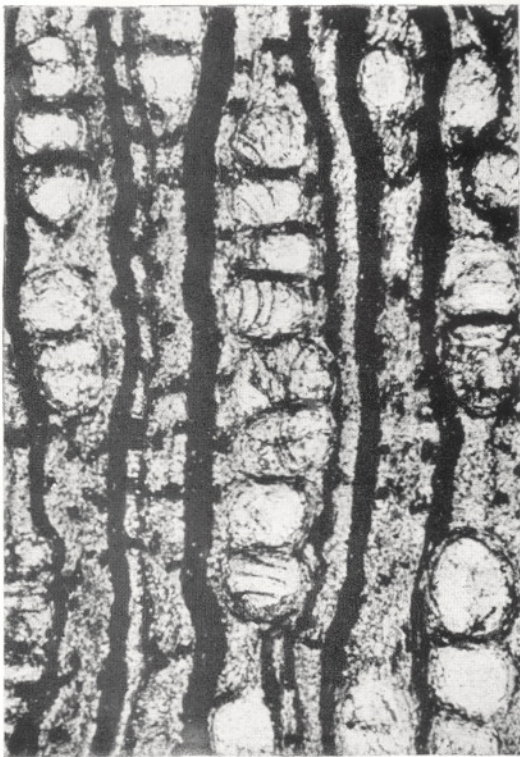
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2



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EXPLANATION OF PLATE 1

Alangioxylon scalariforme gen. et sp. nov.

1. Cross-section of the fossil showing nature and distribution of vessels and paranchyma. $\times 35$.
2. Cross-section of *Alangium javanicum* showing similar nature and distribution of vessels and paranchyma. $\times 35$.
3. Vessel of the fossil in radial longitudinal section showing scalariform perforation plate. $\times 160$.
4. Another cross-section of the fossil magnified to show the vessels, paranchyma and perforation bars. $\times 70$.
5. Tangential longitudinal section of the fossil showing xylem rays. $\times 50$.
6. Another tangential longitudinal section of the fossil magnified to show the ray cells. $\times 110$.