

AILANTHOXYLON PONDICHERRIENSE SP. NOV. FROM TERTIARY BEDS OF THE CUDDALORE SERIES NEAR PONDICHERRY, INDIA

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ABSTRACT

The present paper deals with the structural details of a new fossil dicotyledonous wood. The anatomical characters of the fossil reveal its resemblances with the modern wood of *Ailanthus* belonging to the family Simaroubaceae.

INTRODUCTION

FURTHER investigations in the Tertiary beds of the Cuddalore series near Pondicherry (WADIA, 1953; KRISHNAN, 1949) have shown the occurrence of a new fossil wood, apart from the already known rich silicified angiospermic woods (RAMANUJAM, 1953-1960 & NAVALE, 1955-62).

The fossil specimen is a small piece of wood measuring 8-10×24 cm in size. It is light coloured, often blotched by coloured patches. Only secondary xylem is preserved. The preservation is fairly satisfactory.

DESCRIPTION

The fossil wood shows the diffuse-porous type of structure (PL. 1, FIG. 1).

Growth rings are not visible either to the naked eye or with the help of the microscope.

Vessels are clearly visible as small round pores, even without the aid of a microscope. They are numerous, generally medium-sized, thin-walled, and evenly distributed without any distinct pattern. Vessels are solitary, less frequently in radial groups (PL. 1, FIG. 1; TEXT-FIG. 1). They are round to oval in shape and often filled with dark or brown deposits (PL. 1, FIG. 1). Also there appears to be tyloses in some vessels (PL. 1, FIG. 2). Intervessel pitting is not well preserved but can be recognized at some places. It is alternate, polygonal and small to medium in size (TEXT-FIG. 2). Vessel-ray pits are not clear but appear to be simple, rounded and many per cell.

Parenchyma is vasicentric aliform confluent-type with occasional metatracheal parenchyma (PL. 1, FIGS. 1 & 2; TEXT-FIG. 1).

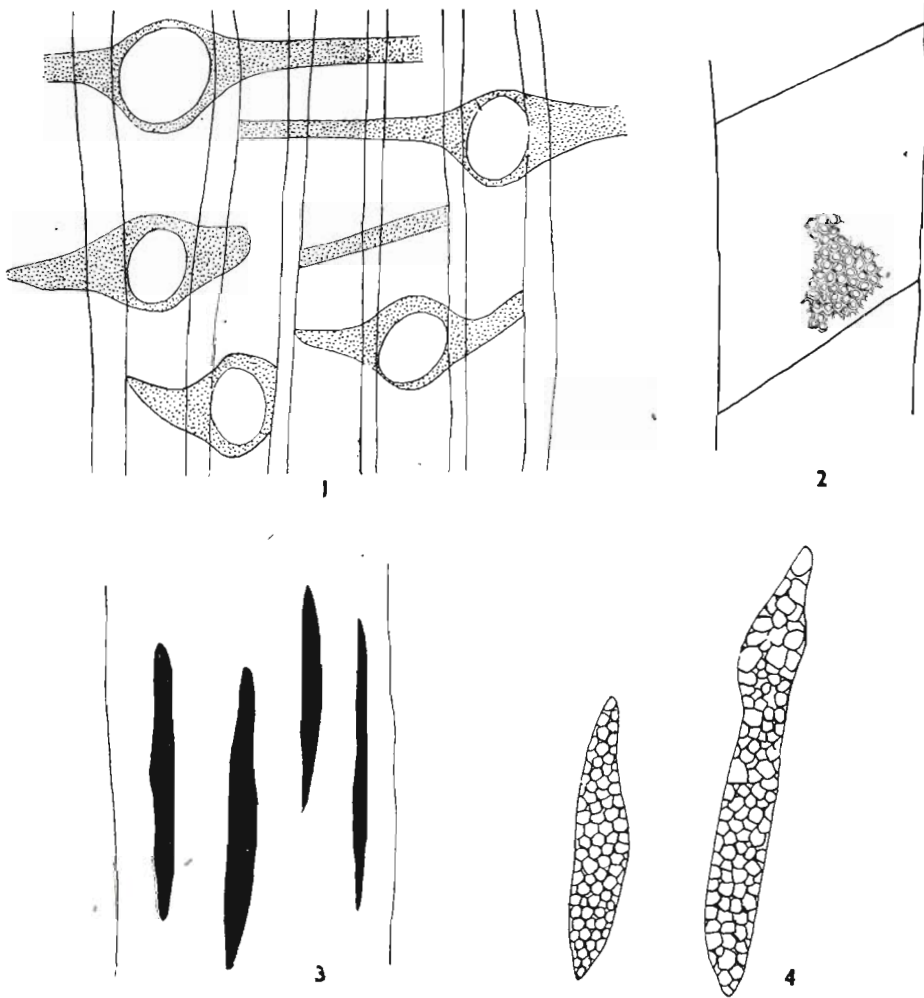
The paratracheal parenchyma forms a sheath around the vessels or vessel groups and extends tangentially forming fine strands (PL. 1, FIG. 1; TEXT-FIG. 1). The short lateral extensions of aliform parenchyma unite with the parenchyma of the other vessels and form confluent type appearing as continuous or sometimes discontinuous strands (PL. 1, FIGS. 1 & 2; TEXT-FIG. 1). The metatracheal parenchyma is distributed as short bands of few cells thick and extends tangentially often connecting the wood rays or ends blindly (PL. 1, FIG. 2; TEXT-FIG. 1). The tangential parenchyma is narrow, mostly 3-5 cells thick and when it encircles the vessels, the sheath formed is usually 1-2 layered (PL. 1, FIGS. 1 & 2). Parenchyma cells are thin-walled, oval or tangentially elongated (PL. 1, FIG. 1). Parenchyma pits are not clear as they are not well preserved.

Rays are visible under a hand lens as clear lines. They are numerous, uniformly distributed with adequate spacing (PL. 1, FIG. 4; TEXT-FIG. 3). Rays are rarely uniseriate to biseriate but usually multiseriata, 3 to 6 cells wide and 5 to 45 cells in height (PL. 1, FIG. 5; TEXT-FIG. 4). Ray cells are homogeneous and consist of procumbent cells only (PL. 1, FIG. 3; TEXT-FIG. 4). Ray cells are oval to angular in shape in tangential section (PL. 1, FIG. 5; TEXT-FIG. 4). Pits could not be made out on the tangential walls of the ray cells due to poor preservation.

Fibres are non-libriform (PL. 1, FIG. 1). Cells of the fibres are thin, more or less round in cross-section (PL. 1, FIG. 2). They are non-septate and medium in length (PL. 1, FIG. 5). Fibres are arranged in radial rows (PL. 1, FIG. 2). Inter-fibre pits are not seen clearly although at some places they are faintly visible. They are few per cell, simple and circular.

DISCUSSION

The diagnostic structural features of the fossil specimen are: vessels medium-sized,



TEXT-FIGS. 1-4 — 1, cross section showing aliform confluent and metatracheal parenchyma. $\times ca$ 140. 2, tangential section showing intervessel pits. ca 240. 3, tangential section showing the distribution of rays. $\times ca$ 75. 4, another tangential section showing the nature of ray cells. $\times ca$ 150.

diffuse, usually solitary, often with deposits; intervessel pitting medium-sized, alternate, oval to hexagonal; parenchyma aliform confluent and occasionally metatracheal with tangential parenchyma bands of 3-5 cells, thick; rays multiseriate, 3-6 cells wide, moderately high and mostly homogeneous; fibres thin-walled, round, non-septate and medium in length. All the above characters indicate that the fossil might belong to any one of the families such as Euphorbiaceae, Ebenaceae, Anonaceae, Meliaceae, Sapotaceae, Leguminosae, Combretaceae, Sabiaceae, Verbenaceae, Guttiferae and Simaroubaceae.

Woods of Euphorbiaceae and Ebenaceae can be discarded even if they show some resembling features as the above families differ by having usually uniseriate or few-seriate rays and abundant apotracheal parenchyma in diffuse condition in addition to paratracheal type. Members of the Anonaceae somewhat agree with the fossil in the nature of parenchyma and multiseriate rays. However, they do not compare in other characters. Vessels of the anonaceous woods are very small, often in radial pattern. Parenchyma although apotracheal is very numerous, closely placed and reticulate. Rays are typically very wide. Among Meliaceae,

woods of few genera show similarities with the fossil specimen in size, shape, and distribution of vessels, and the nature of parenchyma. But they differ in having terminal parenchyma in addition to the apotracheal type, short rays, resin canals and septate fibres in contrast to those in the fossil wood specimen (METCALFE & CHALK, 1950). In Sapotaceae, woods of *Pouteria* resemble the fossil in general features. In *Pouteria* vessels are small, rays are only uni- to biseriate, and it possesses vascentric tracheids, a combination of features not found in the fossil wood. Also in some members of Leguminosae and Combretaceae (*Acacia*, *Pterocarpus*, *Dalbergia*, *Cynometra*, *Cassia*, *Albizia* and *Terminalia*) woods do show aliform confluent and tangential parenchyma and broad homogeneous rays but the parenchyma is very abundant and conspicuous and the nature of the vessels is different. Rays and fibres also differ. In the family Sabiaceae the woods of *Meliosma ferruginea* resemble the fossil in some characters but differ widely in having heterogeneous rays and paratracheal vascentric parenchyma. Woods of *Gmelina arborea* (Verbenaceae) although agree in the nature of parenchyma, yet they differ in having heterogeneous rays and radial grouping of vessels. Among the members of Guttiferae genera *Symphonia* and *Garcinia* are comparable with the fossil. Woods of *Symphonia* differ in having broad, tangential parenchyma which is more regular, alternating with fibre bands, both having more or less equal width. Similarly woods of *Garcinia* can also be separated as the wood parenchyma of *Garcinia* is distributed in numerous regular apotracheal bands. It is with the family Simaroubaceae, that similar combination of characters, as seen in the fossil wood are met with (METCALFE & CHALK, 1950; PEARSON & BROWN, 1932; GAMBLE, 1902; MOLL & JANSSONIUS, 1906). A comparison with the living members of this family such as the genera *Simarcuba*, *Ailanthus* and *Picrasma* reveals that my fossil does not agree with *Simarouba* and *Picrasma*. In *Simarcuba*, parenchyma is not abundant, forms thin narrow lines in the ground mass, and rays are not broad. Similarly *Picrasma* also differs in having very small vessels and limited rays. But the genus *Ailanthus* resembles my specimen very closely in having similar anatomical characters. Wood sections of three species of *Ailanthus* (*A. excelsa*, *A.*

malabarica and *A. grandis*) were studied and matched with the fossil and my specimen closely agrees with *A. grandis*.

Ailanthoxylon scantiporosum from South India (RAMANUJAM, 1960), *Simarubaceoxylon mahurzari* (SHALLOM, 1959) and *Ailanthoxylon indicum* (PRAKASH, 1958) from the Deccan Intertrappean Beds, India; *Simarubinium crystallophorum* and *S. englehardtii* (PLATEN, 1908) from the Tertiary of Nevada county California; and *Suriana inordinata* (KRUSE, 1954) from Eocene of Eden Valley, Wyoming, U.S.A. are some of the fossil woods known in the family Simaroubaceae.

Considering the Indian fossils, *Ailanthoxylon scantiporosum* differs from the present fossil in having sparsely distributed, large vessels and typically scanty vascentric parenchyma. *Simarubaceoxylon mahurzari* (SHALLOM, 1959) agrees with the South-Indian fossil in gross general characters but differs distinctly in having diffuse parenchyma, broad and high rays. However the above genus was referred to *Ailanthoxylon mahurzarii* by the same author (SHALLOM, 1959c) *Ailanthoxylon indicum* although shows similarities with the fossil under investigation in some features yet it differs in having more abundant parenchyma in tangential bands, larger vessels and the rays ranging from uniseriate to multiseriate condition.

Comparing with the fossils of other countries. *Simarubinium crystallophorum*, differs in having small-sized, radially grouped vessels and in the nature of parenchyma which is filled with rhombohedral crystals of Calcium Oxalate. Similarly *S. englehardtii* differs in possessing radially grouped, small-sized vessels and also in parenchyma which is distributed in small masses associated with vessels.

As the present fossil shows close similarities in anatomical characters with the woods of *Ailanthus* of Simaroubaceae family, it is therefore assigned to the genus *Ailanthoxylon* (PRAKASH, 1958). Also the present specimen differs from the hitherto known fossil specimens and therefore is regarded as a new species of *Ailanthoxylon*.

***Ailanthoxylon pondicherriense* sp. nov.**

Diagnosis

General — A diffuse-porous type of wood.

Growth Rings — Indistinct.

Vessels — Medium-sized, 120-180 μ , 4-8 per sq. mm., uniformly distributed, solitary,

sometimes radial, thin-walled, often with deposits; intervessel pits medium, alternate, round to polygonal; vessel-ray pits 2 to 3 per cell, simple and elongated.

Parenchyma — Aliform to confluent with occasional metatracheal strands; paratracheal parenchyma forming a sheath around the vessel and tangentially extending to form typically thin filiform strands, 3-5 cells in thickness; metatracheal parenchyma in short abrupt bands 2-3 cells thick.

Rays — Multiseriate, rarely uniseriate to biseriate, visible to the naked eye, 3-6 cells broad, evenly distributed, 3-6 per sq. mm., 5-45 cells high, homogeneous with procumbent cells only.

Fibres — Non-libriform, medium, 12 μ in diameter, non-septate, round and thin-walled, radial, pits only few per cell, single and circular.

Holotype — No. 11787, Museum, Birbal Sahni Institute of Palaeobotany.

Locality — Usteri, near Pondicherry, South-India.

Horizon — Tertiary.

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EXPLANATION OF PLATE 1

Ailanthoxylon pondicherriense sp. nov.

1. Cross section showing the distribution of vessels, parenchyma and the rays. $\times 35$.
2. Another cross section to show aliform confluent, also metatracheal layers of parenchyma. $\times 35$.
3. Radial section showing the homogeneous nature of cells. $\times 100$.
4. Tangential section showing the distribution of rays. $\times 35$.
5. Another tangential section showing the nature of ray cells. $\times 100$.



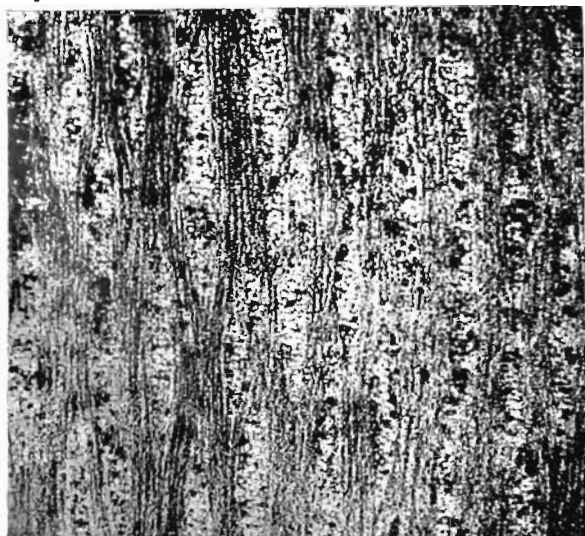
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