A NEW FOSSIL WOOD RESEMBLING THE GENUS PARINARIUM OF THE FAMILY ROSACEAE FROM THE TERTIARY OF SOUTH INDIA

N. AWASTHI

Birbal Sahni Institute of Palaeobotany, Lucknow

ABSTRACT

A fossil wood collected from near the villages Murattandichavadi and Kasipalayam, about 8-10 km. W.N.W. of Pondicherry is described. In all the anatomical characters it resembles the wood of the genus Parinarium of the Rosaceae. It is placed under the genus Parinaroxylon Pfeiffer & Van Heurn, and named as Parinaroxylon cuddalorense sp. nov.

INTRODUCTION

OUT of a large number of petrified woods collected in 1962 and 1963 from an area which lies between Murattandichavadi, Kasipalayam and Tiruchitambalam near Pondicherry, South Arcot district, Madras, only a few resembling Mesua, Calophyllum, Mangifera, Gluta-Melanorrhoea, Millettia and Sonneratia have been described so far (LAKHANPAL & AWASTHI, 1964, 1965; AWASTHI 1966, 1967, 1968). Besides, the earlier workers had described a large number of angiospermous and gymnospermous woods from the same area as already mentioned by Lakhanpal and Awasthi (l.c.) and Awasthi (l.c.). Further investigation of the material has shown the presence of some more new forms. One of them shows affinities with the modern genus Parinarium of the Rosaceae, and is described below.

DESCRIPTION

Family — ROSACEAE

Genus — Parinaroxylon Pfeiffer & Van Heurn, 1928

Parinaroxylon cuddalorense sp. nov.

Pl. 1, Figs 1, 2, 4, 6; Text-figs. 1-4

The fossil is represented by two pieces of silicified wood. The bigger one is about 36 cm. in length and 6 cm. in diameter. The preservation is fairly good.

Topography — Wood diffuse-porous (Pl. 1, Fig. 1). Growth rings not seen. Vessels not visible to the naked eye, visible with the help of a hand lens in cross-section as small pinholes, small to medium in size, exclusively solitary (Pl. 1, Figs. 1, 4; Text-fig. 1), showing tendency toward radial alignment, about 4-14 vessels per sq. mm., tylosed. Parenchyma apotracheal, in fine tangential lines or bands, each 1-3 (mostly 2) cells wide (Pl. 1, Figs. 1, 4; Text-fig. 1), wavy, continuous as well as broken, interrupted by xylem rays; 6-10 bands per mm. Xylem rays fine, uniseriate, occasionally biseriate due to pairing of procumbent cells through the median thickened portion (Pl. 1, Fig. 2; Text-Figs. 2, 3); ray tissue heterogeneous, rays heterocellular, consisting of procumbent cells and 1-2 marginal rows of upright cells at one or both the ends; rays 2-40 (mostly 10-30) cells and 70-1000 μ or sometimes more in height, 15-24 per mm. Fibres (Fibre-tracheids) aligned in radial rows between the two consecutive xylem rays (Pl. 1, Fig. 4).

Elements — Vessels circular to oval in cross-section (Pl. 1, Fig. 2), t.d. 90-150 μ, r.d. 90-195 μ, thick-walled, walls 6-16 μ in thickness; vessel-members with truncated or tailed ends; perforations simple; pits leading to contiguous fibre-tracheids small, about 4 μ in diameter, circular, with small circular or slit-like apertures (Pl. 1, Fig. 6). Parenchyma cells circular to oval along the tangential plane, t.d. 16-20 μ, r.d. 16-28 μ, vertical length 40-120 μ, walls 2-4 μ in thickness; infiltration dark. Upright Ray cells 35-52 μ in tangential height, 20-44 μ in radial length; procumbent cells 16-24 μ in tangential height, crystals occasionally present. Fibre-tracheids angular (mostly hexagonal), 8-24 μ in diameter, nonseptate, thick-walled, with narrow lumen, wall 4-8 μ thick, pits occasionally seen, frequent in the wider cells bordering the vessels, arranged in vertical rows, small, with slit-like apertures (Text-fig. 4).
AFFINITIES

Comparison with the modern woods—

The important anatomical features of the present fossil wood are: (1) vessels exclusively solitary and occasionally aligned in radial lines; (2) parenchyma apotracheal, in 1-3 seriate concentric tangential bands; (3) xylem rays fine, 1-2 (mostly 1) seriate, heterogeneous and (4) fibre-tracheids non-septate, thick-walled with bordered pits. Taking into consideration all these important characters the fossil wood shows affinities with the woods of Chrysobalanoidae of the family Rosaceae. However, its resemblance in some features has also been seen with the woods of Guttiferae (Mesua and Calophyllum) and Casuarinaceae (Casuarina).

Mesua resembles the present fossil wood in several features. In both, the vessels are exclusively solitary and more or less irregularly distributed, parenchyma apotracheal in concentric tangential bands and fibres thick-walled. But the present fossil wood differs from Mesua in several other important anatomical features, such as in having comparatively thinner apotracheal parenchyma bands, absence of vasicentric tracheids and presence of fibre-tracheids.
Moreover, in the present fossil wood the vessels are not so much distinctly arranged in groups along the radial line as in *Mesua*. Similarly, *Calophyllum* resembling the present fossil wood in a number of features, differs in possession of larger vessels, abundant vasicentric tracheids, usually broad apotracheal parenchyma bands and the nature of the fibres.

The wood of *Casuarina* also resembles the present fossil in several features except ray characters, i.e. in *C. equisetifolia* the xylem rays are 1-4 seriate (PEARSON & BROWN, 1932). Besides, some of the woods of *Casuarina* possess aggregate rays (METCALFE & CHALK, 1950).

The woods of the sub-family Chrysobalanoeideae are uniform in their anatomical features. Metcalfe and Chalk (1950, pp. 552-553, Figs. A-D) have given the general anatomy of the genera *Actida, Angelesia, Chrysobalanus, Couepia, Grangeria, Hirtella, Licania*, *Parastemon* and *Parinari* (*Parinarium*). From the general description of these woods it is evident that the present fossil wood resembles the genus *Parinarium* Juss. (*Parinari* Aubl.). The other genera differ from it in some significant features. According to Metcalfe and Chalk (l.c.) in *Chrysobalanus, Couepia, Grangeria, Hirtella* and *Licania* the xylem rays are exclusively uniseriate while in *Parinarium* they are predominantly uniseriate but with some biseriate. In the present fossil wood too the xylem rays are predominantly uniseriate and occasionally biseriate. Thus in ray characters it is different from the above genera except *Parinarium*. Genus *Couepia* and some species of *Licania* further differ in having of thinned walls fibres. In *Angelesia* the tyloses are sclerosed. The last genus, *Parastemon* differs from the present fossil in having homogeneous xylem rays and uniseriate lines of apotracheal parenchyma.

Among the modern species of *Parinarium* (*Parinari*) the present fossil wood was compared with the thin-sections of *Parinarium anamense* Hance, *P. campestris* Aubl., *P. corymbosum* Miq., *P. excelsum* Sab., *P. griffithianum* Benth., *P. holstii* Engl., *P. pachyphyllum* Rusby, *P. paries* Macb., *P. travancoricum* Bedd. and *Parinarium* sp. F.M.S. Including some of the above species the fossil wood was also compared with the description and figures of *Parinarium tenuifolia* A. Chev., *P. kerstingii* Engl., *P. robusta* Oliv. (NORMAND 1960, pp. 92-95, PL. 22-23), *P. excelsa* Sab. (NORMAND, l.c., pp. 92-95, PL. 22; HENDERSON, 1953, p. 53, FIG. 322), *P. campestris* Aubl. (KRIEBS, 1959, pp. 135-136, FIG. 451), *Parinarium griffithianum* Benth., *P. sumatranum* Benth. (MOLL & JANS-SONIUS, 1914, pp. 222-230, FIG. 171), *Parinari corymbosum* (Blume) Mignel (KANEHIRA, 1924, p. 30; DESCH, 1954, pp. 482-483, TABLE 96; REYES, 1938, pp. 108-109, PL. 14, FIG. 3; SCHNEIDER, 1916, p. 114, PL. 11, FIG. 13), *P. lauritum* A. Gray (SCHNEIDER, 1916, p. 114), *P. costatum* Bl., *P. asperulum* Miq., *P. glaberrinum* Hassk. Syn., *P. scabrum* Hassk., *P. nitidum* Hook. f., *P. oblongifolium* Hook. f., *P. rubiginosum* Ridl. (DESCH, 1934, pp. 480-483, TABLE 96) and *P. mobola* Oliv. (METCALFE & CHALK, 1950, p. 552, FIG. 121D). From the detailed comparative study it has been found that the present fossil wood shows nearest resemblance with the wood structure of *Parinarium corymbosum* (Blume) Mignel. in all the anatomical details except the vessel dimension, i.e. the size of the vessels in *P. corymbosum* is large with lesser frequency as compared to the present fossil wood. In general the other species differ from the present fossil wood in the size and frequency of the vessels and thickness of the parenchyma bands.

**Comparison with the fossil species** — So far only a few fossil woods of the family Rosaceae are known, viz. *Pruninium gummosum* Platen (1908) from the Miocene of Yellowstone National Park (Amethyst Mt.), *Prunus* sp. Szaler (1914) from the Pleistocene of Poland, *Pomoxylon* sp. Hofmann (1944) from the Miocene of Prambachkirchen, Germany, *Rosaceoxylon spiraeoides* Shikina (1958) from the Tertiary of Goderdzy Pass, Russia and *Parinarioxylon itersonii* Pfeiffer & Van Heurn (1928) from the Tertiary of Java (Boland), *Malodioxylon castellanense* Grambast (1966) from the Tertiary of Castellane (Basses-Alpes), France. Of these the only comparable one is *Parinarioxylon itersonii*. Both the woods, i.e., the present fossil wood and *Parinarioxylon itersonii* resemble each other in a number of features which are common in both, such as exclusively solitary vessels, apotracheal parenchyma bands, 1-2 seriate heterogeneous xylem rays and thick-walled fibres. However, it differs from *P. itersonii* in some other features. In the present fossil wood the vessels are small to medium
and their frequency is 4-14 per sq. mm., parenchyma bands are 1-3 (mostly 2) seriate and fibres are with bordered pits; whereas in P. iteronii the vessels are large to very large and their frequency is less, i.e. 1-2 vessels per sq. mm. and the apotracheal parenchyma is represented by fine uniseriate lines.

The present fossil wood is placed under the genus Parinarioxylon Pfeiffer & Van Heurn and named as Parinarioxylon cuddaloreense sp. nov., the specific name is after Cuddalore Series.

PRESENT DISTRIBUTION OF PARINARIUM

The genus Parinarium Juss. (Parinari Aubl.) consists of 60 species (Willis, 1966, p. 834) mostly shrubs or small trees though a few attain rather large proportions, very widely distributed in the tropical and sub-tropical regions of the southern hemisphere (Record & Hess, 1949). In India only two species are found, viz., Parinarium indicaum Bedd. and P. travancoricum Bedd., both grow in South India. Parinarium corymbosum with which the fossil wood resembles most is found only in the Malayan region.

Diagnosis—Wood diffuse-porous. Growth-rings absent. Vessels small to medium, t.d. 90-150 μ, r.d. 90-195 μ, exclusively solitary, showing a tendency towards radial alignment, 4-14 vessels per sq. mm.; perforations simple; pits leading to contiguous fibres-tracheid numerous, small, with circular or slit-like apertures. Parenchyma apotracheal, 1-3 seriate, in concentric tangential bands, wavy, 6-10 bands per mm. Xylem rays fine, uniseriate, occasionally biseriate due to pairing of procumbent cells through the median portion; rays tissue heterogeneous; rays heterocellular, consisting of procumbent cells and 1-2 marginal rows of upright cells at one or both the ends, 2-40 (mostly 10-30) cells in height; 14-24 rays per mm.; crystals occasionally present. Fibres nonseptate, thick-walled, 4-8 μ in thickness, pits bordered, small to minute, with circular or slit-like apertures.


ACKNOWLEDGEMENTS

The author is deeply indebted to Dr. R. N. Lakhanpal for his valuable guidance. He is also thankful to Shri K. Ramesh Rao, Officer-in-Charge, Wood Anatomy Branch, Forest Research Institute, Dehra Dun, for facilities to consult the authentic slides of modern woods.

REFERENCES

AWASTHI — A NEW FOSSIL WOOD RESEMBLING THE GENUS *PARINARIUM* 321


EXPLANATION OF PLATE 1

1. *Parinarioxylon cuddalorense* sp. nov. — Cross-section of the fossil wood showing nature and distribution of vessels and parenchyma. × 15.

2. *Parinarioxylon cuddalorense* sp. nov. — Tangential longitudinal section of the fossil showing xylem rays. × 135.

3. *Parinarium corymbosum* — Tangential longitudinal section showing similar xylem rays. × 135.

4. *Parinarioxylon cuddalorense* sp. nov. — Cross-section magnified to show the shape, size and distribution of vessels and parenchyma bands. × 60.

5. *Parinarium corymbosum* — Cross-section showing similar type and distribution of vessels and parenchyma. × 60.

6. *Parinarioxylon cuddalorense* sp. nov. — A portion of a vessel in tangential longitudinal section showing pits. × 500.