Fossil wood of Anacardiaceae from the Deccan Intertrappean sediments of Betul district, Madhya Pradesh, India

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A fossil dicotyledonous wood showing resemblance with the wood of extant genus *Lannea* A. Rich. belonging to family Anacardiaceae has been reported from Betul district, Madhya Pradesh. Dicotyledonous woods have not so far been reported from Betul. The wood was recovered from a Ghat Section about 4 km short of Multai on Betul – Multai road. Until now *Lannea* has been recorded from the Oligocene and Miocene sediments of Assam and West Bengal. Present reports pushes antiquity of the genus to Maastrichtian–Danian.

Key-words– Fossil wood, Anacardiaceae, Deccan Intertraps, Madhya Pradesh, Maaestrichtian-Danian.

INTRODUCTION

A large number of fossil woods are known from the Deccan Intertrappean sediments of India (Bande *et al.* 1988; Guleria & Mehrotra 1998; Guleria & Srivastava 2001). A perusal of the literature shows that most of the woods have been reported from Central India. The present wood is reported from the Deccan Intertrappean sediments of Betul district situated in the western part of Madhya Pradesh. The area has not been explored properly for the fossil plants and only two palm woods, viz., *Palmoxylon betulensis* and *P. licualaense* have so far been reported from this district (Gayakwad & Patil 1989). Thus the present report forms the first record of a dicotyledonous wood from the area. The fossil resembles the wood structure of genus *Lannea* A. Rich., belonging to family Anacardiaceae. The figured specimens and slides are preserved in the museum of Birbal Sahni Institute of Palaeobotany, Lucknow.

SYSTEMATIC DESCRIPTION

Family - Anacardiaceae

Genus - *Lanneoxylon* Prakash & Tripathi 1967

Lanneoxylon grandiosum Prakash & Tripathi 1967

Pl.1, Figs 1-7

Material-The species is based on a single petrified wood piece measuring about 12 cm in length and 7.6 cm in width. The specimen is well preserved showing all the anatomical details.

Description-Wood diffuse - porous. *Growth rings* indistinct, marked by denser fibres and smaller vessels (Pl. 1, fig.1). *Vessels* small to large (mostly medium sized), tangential diameter 65 - 200 µm, radial diameter 22-220 µm; evenly distributed, 11-16 vessels per sq. mm; solitary and in radial multiples of 2 -5 or more (Pl. 1, fig. 1), circular to oval when solitary, with flattened contact walls when in multiples, open or filled with tyloses; vessel members 240-500 µm long with oblique end walls; perforations simple; inter-vessel pits large, bordered with linear aperture, 10 -12.5 µm in diameter (Pl. 1, fig. 7). *Parenchyma* scanty, paratracheal (Pl. 1, fig. 1); each cells 28 - 42 µm in diameter and 38.5 - 71.5 µm in length. *Rays* 1- 4 (mostly 2 - 3) seriate (Pl. 1, figs. 2, 3); 26-32 rays per mm; heterocelluar (Pl. 1, fig. 5); uniseriate rare, short, 2-6 cells or 55 - 250 µm long, multiseriate with radial gum canals (Pl. 1, figs 2 - 3); made up of procumbent cells in the centre and upright cells at one or both ends; rhomboidal crystals rarely seen in both procumbent and upright cells (Pl. 1, fig. 4); silica inclusions present in ray cells; procumbent cells 16 - 22 µm in tangential height and 55 - 60 µm in radial length; upright cells 38.5 - 55 µm in tangential height and 16.5 - 22 µm in radial length; vessel-ray pits large, many per cell (Pl. 1, fig. 6). *Gum canals* radial,

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sporadic (Pl. 1, figs 2, 3), large, solitary, 55 - 82 µm in diameter; encircled by single layered epithelial lining (Pl. 1, fig. 3). *Fibres* aligned in radial rows, polygonal in cross section, semilibriform, septate; 22 - 28 µm in diameter.

Specimen no. – BSIP Museum No. 39100.

Locality - A ghat section about 4 km short of Multai, on Betul - Multai road, Betul district, Madhya Pradesh.

Horizon - Deccan Intertrappean beds.

Age - Maastrichtian - Danian

Affinities - The important anatomical features of the present wood are: (i) growth rings indistinct (ii) vessels small to medium in size, solitary and in radial multiples of 2 - 5, profusely tylosed (iii) parenchyma scanty, paratracheal (iv) rays fine, 1-3 seriate, ray tissue heterocellular, crystals and silica inclusions present in ray cells (v) fibres thick walled, septate (vi) radial gum canals present. Among these, the presence of gum canals in rays is a very significant feature in identifying the wood. The occurrence of normal radial gum canals in the xylem rays is confined to 21 families (Metcalfe & Chalk 1950; Record 1925, 1944; Carlquist 1988). A combination of the above noted features indicate the affinity of the fossil wood with some genera of the family Burseraceae and Anacardiaceae. Among the Indian genera of Burseraceae only two, viz., *Boswellia* and *Garuga* show apparent resemblance with the fossil. Similarly among the Indian anacardiaceous genera which possess radial gum canals (Pearson & Brown 1932; Ghosh & Purkayastha 1963) only *Lannea* and *Spondias* show close resemblance with the fossil. It has been observed that extant woods of *Boswellia, Garuga, Lannea* and *Spondias* show overlapping anatomical features and they can only be distinguished in their finer anatomical differences. In view of their close anatomical similarly, Chauhan and Dayal (1990) investigated anatomical features of the Indian species of these genera in detail. According to them, woods of the genera can be separated on the basis of differences in their gum-canals, ray and fibre cell inclusions (Chauhan & Dayal 1990, table 1, pp. 456 - 457). *Boswellia, Garuga* and *Spondias* possess 1-2 cells thick epithelial lining around the gum-canals whereas the lining is only one cell thick in *Lannea coromandelica*. Moreover, crystals are present in both the ray and fibre cells of *Garuga;* in only ray cells of *Boswellia* and *Lannea*; and are absent in the ray and fibre cells of *Spondias*. Similarly, silica inclusions are absent in ray and fibre cells of *Garuga* and *Spondias*; present in both, rays and fibre cells of *Boswellia*; and confined to ray cells only in *Lannea*.

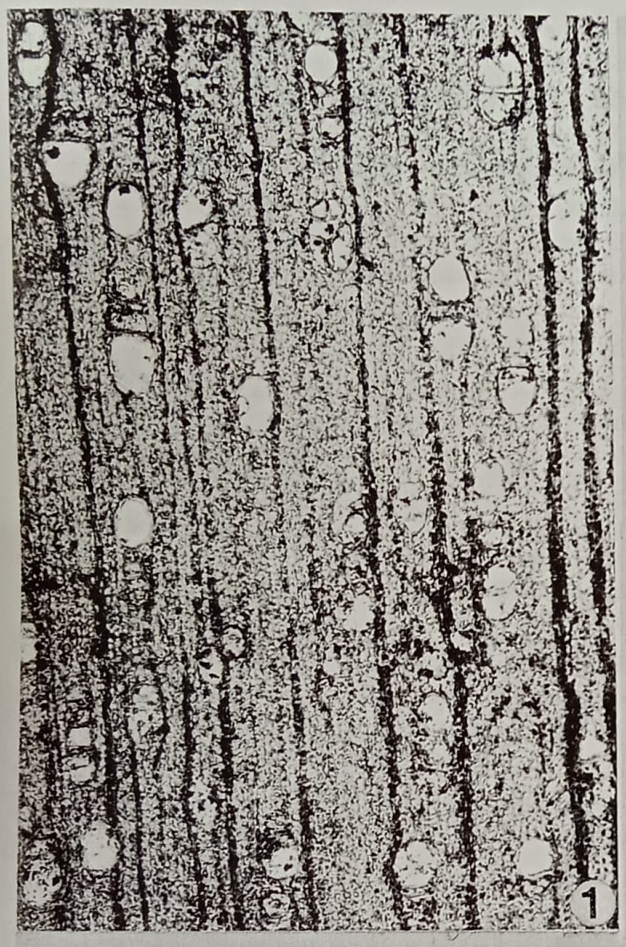
Since in the present fossil wood epithelial lining of radial gum ducts is one cell thick, silica inclusions and crystals are confined to ray cells only, it is apparent that the fossil shows closest anatomical similarity with the extant wood of genus *Lannea* A. Rich. viz., *L. coromandelica* (Houtt.) Merr. [Syn. *L. grandis* (Dennst.) Engler] (Raizada 1958), the only species found in India.

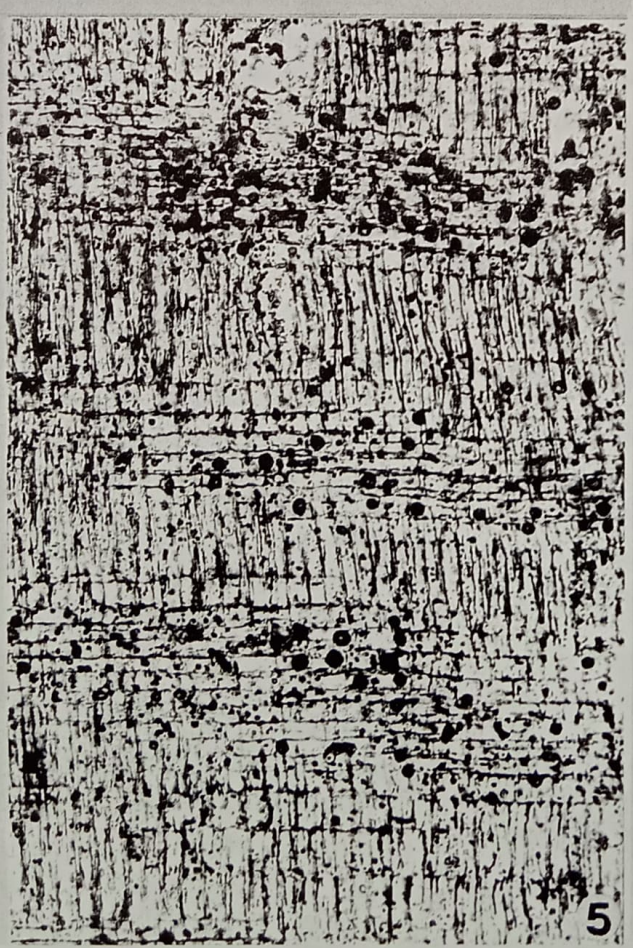
Fossil wood representing *Lannea coromandelica* was first described by Prakash and Tripathi (1967, 1969) from the Tipam Series (Miocene) of Mikir Hills in Assam as *Lanneoxylon grandiosum*. The species has subsequently been reported from the Miocene sediments of Birbhum district, West Bengal by Roy and Ghosh (1981). Since the present fossil resembles in all its characters with the wood structure of *Lanneoxylon grandiosum* Prakash and Tripathi, it is placed under the same species.

PLATE - 1 →

Lanneoxylon grandiosum Prakash & Tripathi 1967

1. Cross section showing vessel arrangement and scanty paratracheal parenchyma. X40; Slide no. BSIP 39100-1.
2. Tangential longitudinal section showing distribution of rays with radial gum canals. X100; Slide no. BSIP 39100-2.
3. Same section enlarged showing a ray with radial gum canal having single layered epithelial lining. X400; Slide no. BSIP 39100-2.
4. Same section enlarged showing a ray with crystaliferous cells. X1000; Slide no. BSIP 39100-2.
5. Radial longitudinal section showing heterocellular rays and septate fibres. X100; Slide no. BSIP 39100-3.
6. Same section enlarged showing parenchyma-ray pits. X400; Slide no. BSIP 39100-3.
7. Tangential longitudinal section showing alternate, hexagonal, bordered, intervessel pits with linear aperture. X1000; Slide no. BSIP 39100-2.





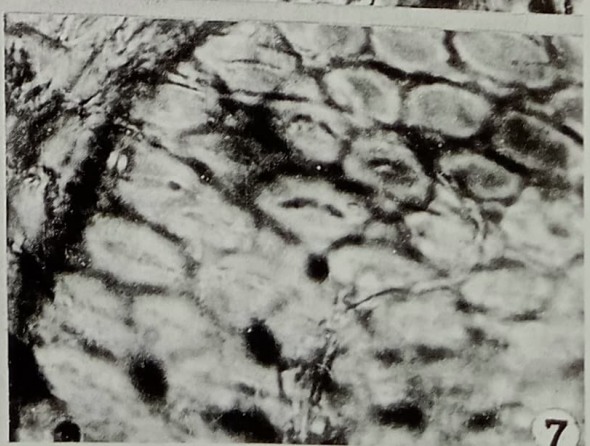


PLATE 1

DISCUSSION

A survey of literature shows that the family Anacardiaceae is poorly represented in the Deccan Intertrappean beds of India. The authors are aware of only three records of the family. They are *Anacardioxylon semecarpoides* (cf. *Semecarpus*) from Mahurzari, Nagpur district, Maharashtra (Prakash & Dayal 1965); *Dracontomelumoxylon mangiferumoids* syn. *D. palaeomangiferum* from Parapani and Shahpura, two localities in Dindori (previously in Mandla) district of Madhya Pradesh (Bande & Khatri 1980; Bande & Prakash 1983). From the anatomical point of view the present wood is characterised by low proportion of parenchyma and heterogeneous ray tissue as is the case in majority of other dicot woods reported from the Deccan Intertrappean sediments of India.

The genus *Lannea* A. Rich consists of about 15 species of small to large deciduous trees and is found in tropical Africa and Asia (Mabberely 1997). *Lannea coromandelica* (Houtt.) Merr. (Syn *L. grandis* Engl.), the only Indian species is fairly wide in its distribution and is found in dry forests of all states except part of Punjab, Rajasthan and Saurashtra. It is found in the sub-Himalayan tract and the lower Himalayas from the Indus eastwards up to 1200 m and is common in Siwaliks, Dun and Saharanpur forests and other parts of Uttar Pradesh, Bengal, Bihar, Orissa and Assam, very common in Travancore and in the deciduous forests of Karnataka and Tamil Nadu. In the Andamans, the tree grows frequently in damp places along streams (Ghosh & Purkayastha 1963).

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