

# CANARIOXYLON SHAHPURAENSIS SP. NOV. FROM THE DECCAN INTERTRAPPEAN BEDS OF SHAHPURA, DISTRICT MANDLA (M.P.), INDIA

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## Abstract

In the present paper a new fossil wood resembling the modern taxon *Canarium* Linn. of the family Burseraceae is described from the Deccan Intertrappean beds of Shahpura, District Mandla, Madhya Pradesh.

## Introduction

The paper deals with the anatomical description and affinities of a fossil wood collected from the Deccan Intertrappean beds near Shahpura (80°N, 23/10° E) in Mandla District of M. P. Bande and Prakash (1980) have also reported four fossil woods, i. e. *Sterculioxylon shahpuraensis* sp. nov. (Sterculiaceae), *Caliphylloxyton dharmendrae* sp. nov. (Guttiferaceae), *Heyneoxyton tertiarum* sp. nov. (Meliaceae) and *Laurinoxylon deccanensis* sp. nov. (Lauraceae) from the same locality.

The fossil wood described here belongs to the family Burseraceae which is a new record from Mandla District. One fossil wood of this family, i.e. *Boswellioxylon indicum* Dayal (1964, 1966) has been described from the Deccan Intertrappean beds of Keria. The genus *Canarioxylon* is represented by two species, i.e. *Canarioxylon ceskobudejovicense* (Prakash, Brezenova & Awasthi, 1974) from South Bohemia, Czechoslovakia and *C. indicum* (Ghosh & Roy, 1979) from the Tertiary of West Bengal.

## Systematic description

Family Burseraceae

Genus : *CANARIOXYLON* Prakash *et al.* (1974)

*Canarioxylon shahpuraensis* sp. nov.

Pl. 1, Figs. 1-4

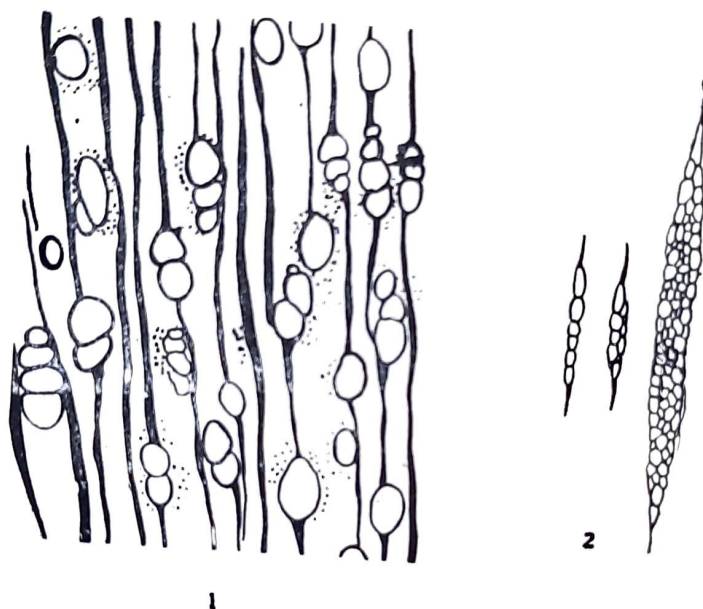
*Topography*—Wood diffuse-porous. *Growth rings* not visible. *Vessels* round or oval to elliptical in shape, small to large in size, mostly solitary and in radial multiples of 2-4 with a tendency to an oblique radial pattern. *Parenchyma* scanty paratracheal, sparse confined as a thin layer of 1 or 2 cells, around the vessels; parenchyma cells thin-walled. *Rays* 1-4 seriate, uniseriate rays very rare, mostly 2-3 cells wide, heterocellular; ray tissue heterogeneous, rays composed of procumbent cells in median portion and upright elongated cells at ends, ray to ray fusion present. *Fibres* constitute the greater part of the ground tissue; cells polygonal to hexagonal, semi to nonlibriform, septate. *Pith* constituting parenchymatous, thin-walled cells, hexagonal to polygonal in shape.

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*Elements*—*Vessels* t. d. 75-250  $\mu\text{m}$ , r.d. 75-295  $\mu\text{m}$ , frequency 12-25/ $\text{mm}^2$ ; vessel members 150-500  $\mu\text{m}$  in maximum length with horizontal or oblique end walls; intervessel pitting alternate, bordered, hexagonal to oval, borders angular with orbicular to linear aperture. *Parenchyma cells* thin-walled, 10-15  $\mu\text{m}$  in diameter. *Rays* 2-28 cells or 45-600  $\mu\text{m}$  in height and 15-40  $\mu\text{m}$  in width, frequency of rays 5-9/ $\text{mm}^2$ ; procumbent cells hexagonal in shape, 20-35  $\mu\text{m}$  in radial length and 15-20  $\mu\text{m}$  in vertical height; upright cells 25-40  $\mu\text{m}$  in vertical height and 10-15  $\mu\text{m}$  in radial length. *Fibres* hexagonal in cross section, 15-25  $\mu\text{m}$  in diameter, septate.

### Discussion and affinities

*Comparison with the living woods* A combination of the above mentioned anatomical features of fossil wood indicates its affinities with the members of the family Anacardiaceae and Burseraceae (Metcalf & Chalk, 1950; Pearson & Brown, 1932).



Text-fig. 1.—*Canarioxylon shahpuraensis* sp. nov: 1. Cross section of fossil wood showing distribution of vessels and parenchyma. 2. Xylem rays as seen in T. L. S. of fossil wood.

Anacardiaceae (Record, 1936; Moll & Janssonius, 1908; Pearson & Brown, 1932; Heimesch, 1942) has a number of genera which in gross anatomical characters show resemblance with the present fossil wood *Lanea coromandelica* (Houtt). *Buchanania* Roxb. and *Schinopsis* Engl. resemble the present fossil wood in various anatomical details but they differ from the fossil wood by the presence of radial canals in living taxa. *Melanorrhoea* Wall, *Gluta* Linn., *Swintonia* Griff. and *Bouca* Meiser., can be easily distinguished by the presence of abundant apotracheal parenchyma.

The family Burseraceae (Moll & Janssonius, 1908; Pearson & Brown, 1932; Webber, 1941; Heimesch, 1942; Metcalfe & Chalk 1950; Gamble, 1902) indicates the affinities of the present fossil wood with the modern taxon *Canarium* Linn. Two other genera of Burseraceae, i.e. *Bursera* and *Garuga* are anatomically very close to *Canarium*; however, our present fossil wood can be differentiated from it and thus *Bursera* can be differentiated from the fossil wood in having abundant tyloses, polygonal to contiguous pits and parenchyma very sparse, invisible, forming an interrupted uniseriate sheath around some ves-



sels. In *Garuga*, vessels mostly occluded with tyloses, parenchyma very sparse, fibres non-libriform, very variable in length, inter fibre pits confined to the radial walls, occasionally with a solitary crystal or elongated into a crystal sac containing several crystals, rays sometimes having gum canals, crystals in marginal ray cells very large, conspicuous, gummy deposits frequent. Thus all these distinguishing characters differentiate it from our present fossil wood.

A detailed comparison of the fossil wood was made with the available thin sections of *Canarium strictum* Roxb., *C. madagascariense* Roxb., *C. sikkimense* King., *C. bengalense* Roxb. (Table 1) and published work with illustrations of few other species of *Canarium*, viz., *C. zeylanicum* Bl., *C. brunneum* Bedd., *C. commune* Linn. (Gamble, 1902). Presence of intercellular canal in *C. zeylanicum* may differentiate it from the fossil wood. *C. coccineobracteatum*, *C. manii* and *C. euphyllum* can be separated from the present fossil wood due to the difference in frequency and distributional pattern of vessels, as well as thickness of rays and presence of resin ducts.

Table 1 highlights some anatomical characters of the living species of *Canarium*. *C. sikkimense* differs in vessel size, abundance of parenchyma, coalescent apertures and resinous ducts, etc. *C. madagascariense* also shows differences from the fossil wood in frequency of vessels and rays, thickness of rays and distribution of parenchyma. *C. bengalense* shows maximum affinities with the fossil wood, the only observed differences between the two are in the height of rays and frequency of vessels which is less in the living taxon as compared to the fossil wood.

*Comparison with fossil wood*—Only two species of *Canarioxylon*, *C. ceskobudejovicense* by Prakash *et al.* (1974) from South Bohemia, Czechoslovakia and *C. indicum* from the Tertiary of West Bengal by Ghosh and Roy (1979) have been described so far. From the study of published literature, it appears that the present fossil wood has affinities with both the fossil woods. It resembles *C. ceskobudejovicense* in the distribution of vessels and parenchyma, indistinct growth rings, in having 4 seriate (mostly 2-3), heterocellular rays, ray tissue heterogeneous and in the presence of septate fibres. However, *C. ceskobudejovicense* differs from the present fossil wood in having profusely occluded vessels with tyloses and also in size and frequency of vessels. *C. indicum* shows greater affinities with the present fossil wood, as both have vessels which may be solitary or they may be in radial multiples of 2-5, vessels oval to elliptical in cross section, perforations simple, parenchyma scanty, paratracheal, confined as a thin layer around the vessels, xylem ray heterocellular, ray tissue heterogeneous and septate fibres. However, the present fossil wood having above similarities also possesses a few other differentiating characters such as smaller vessels, broad xylem rays mostly 2-3 seriate, whereas *C. indicum* has mostly biseriate rays. *Growth rings* are visible in *C. indicum* but are not seen in present fossil wood. Having above differences with previously described species of *Canarioxylon*, the present fossil wood is placed under a new species, i.e. *Canarioxylon shahpuraensis* sp. nov.; the name of the species is after the locality, Shahpura.

*Canarium* extends to South East Asia, Ceylon, the Mascarenes, Madagascar, Africa and North Australia, Micronesia (Palau) and Malenesia to Fiji, Tonga and Samoa Islands (Willis, 1973).

### Specific diagnosis

*Canarioxylon shahpuraensis* sp. nov.

Wood diffuse-porous. *Growth rings* not demarcated. *Vessels* small to large, t.d. 75-

Table 1—Detailed anatomical comparison of

Name of species	Growth rings	Vessels
1. <i>Canarium strictum</i>	Absent	Wood-diffuse porous, vessels t. d. 90-250 $\mu\text{m}$ , r. d. 85-225 $\mu\text{m}$ , frequency 10-12/mm <sup>2</sup>  Perforation simple, with oblique end-walls; maximum length of vessel segments 250-480 $\mu\text{m}$ ; intervessel pits alternate with coalescent aperture.
2. <i>C. madagascariense</i>	Absent	Wood-diffuse porous, vessels t. d. 75-200 $\mu\text{m}$ , r. d. 75-200 $\mu\text{m}$ , frequency 13-20/mm <sup>2</sup>  Perforation simple; oblique end-walls; maximum length of vessel segment 280-700 $\mu\text{m}$ ; intervessel pits with linear to lenticular aperture.
3. <i>C. sikkimense</i>	Faintly marked	Wood-diffuse porous, vessels t. d. 120-280 $\mu\text{m}$ , r. d. 115-300 $\mu\text{m}$ , frequency 5-7/mm <sup>2</sup>  Perforation simple; oblique end walls, maximum length of vessel segment 400-1150 $\mu\text{m}$ ; intervessel pitting alternate with orbicular aperture.
4. <i>C. bengalense</i>	Absent	Wood-diffuse porous, vessels t. d. 60-175 $\mu\text{m}$ , r. d. 75-250 $\mu\text{m}$ , frequency 6-11/mm <sup>2</sup> . Perforation simple; horizontal and oblique endwalls; vessel segment 250-600 $\mu\text{m}$ ; intervessel pits alternate, hexagonal with linear aperture.
5. Fossil wood	Indistinct	Wood-diffuse porous, vessels-t. d. 75-250 $\mu\text{m}$ , r. d. 75-292 $\mu\text{m}$ , frequency 12-25/mm <sup>2</sup> . Perforation simple with horizontal end walls; maximum length of vessel segment 150-500 $\mu\text{m}$ , intervessel pits alternate, hexagonal with orbicular to linear aperture.

250  $\mu\text{m}$ , r. d. 75-295  $\mu\text{m}$ , mostly solitary and in radial multiples of 2-4 with a tendency to an oblique radial pattern, 12-25mm<sup>2</sup>/; vessel members 150-500  $\mu\text{m}$  with truncate end walls; perforations simple; intervessel pitting bordered, alternate with orbicular or linear to lenticular apertures. *Parenchyma* paratracheal, scanty, confined as a thin layer around the vessels. *Xylem rays* uni-to 4 seriate, 2-18 cells or 45-600  $\mu\text{m}$  in height and 15-40  $\mu\text{m}$  in width, frequency 5-9/mm<sup>2</sup>, rays heterocellular; ray tissue heterogeneous; procumbent cells 20-35  $\mu\text{m}$  in radial length and 15-20  $\mu\text{m}$  in vertical height; upright cells 25-40  $\mu\text{m}$  in vertical height and 10-15  $\mu\text{m}$  in radial length. *Fibres* hexagonal in cross section, 15-25  $\mu\text{m}$  in diameter, septate.



fossil wood with living spp. of *CANARIUM*

Parenchyma	Rays	Fibres
Paratracheal, vasicentric 1-2 cells thick layer around the vessels	Fine, uni-to biseriate—mostly uniseriate, heterocellular, uniseriate rays made-up of only upright cells but sometimes one or two procumbent cells may be present, i.e. ray tissue heterogeneous.  Frequency-17.24/mm <sup>2</sup> , height-2-28 cells.	Semilibriform, constituting ground mass, hexagonal in cross section, septate.
Paratracheal scanty, Vasicentric 2-3 cells thick, few scattered cells also present.	Uni-to triseriate, mostly biseriate, heterocellular, composed of procumbent cells in median portion and 1 or 2 upright elongated cells at tapering ends, few procumbent cells filled with crystalline substance.  Frequency-7-11/mm <sup>2</sup> , height-2-18 cells.	Semi to nonlibriform, polygonal to hexagonal in cross section, septate.
Paratracheal, vasicentric and scanty, 2-3 cells thick	Uni to biseriate mostly uniseriate, composed of only upright cells heterocellular, cells having resinous substance.  Frequency-6-15/mm <sup>2</sup> , height-2-26 cells.	Semi to nonlibriform, constituting whole ground mass, septate.
Paratracheal, vasicentric, 2-3 cells thick layer around the vessels.	Uni-to 5 seriate, heterocellular, procumbent cells present in median portion, upright cells on tapering ends as well as on margins. Frequency 8-13/mm <sup>2</sup> , height-2-33 cells.	Semi to nonlibriform polygonal to hexagonal in cross section, septate.
Paratracheal, scanty vasicentric, 1 or 2 cells thick layer around the vessels	Uni-to 4 seriate (mostly 2-3 seriate), heterocellular, procumbent cells present in median portion, upright cells placed at margins. Frequency. 6-9/mm <sup>2</sup> , height 2-20 cells.	Semi to nonlibriform, hexagonal in cross section, septate.

*Holotype*—B. S. Trivedi's Collection No. 5-20, Botany Department, Lucknow University, Lucknow.

*Locality*—Shahpura in Mandla District, Madhya Pradesh.

*Horizon & Age*—Deccan Intertrappean beds; Tertiary (Early Eocene).

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## Explanation of plate

*Canarioxylon shahpuraensis*. sp. nov.

1. T. S. of Fossil wood  $\times 50$
2. T. L. S. of Fossil Wood  $\times 50$
3. R. L. S. of Fossil Wood  $\times 50$
4. A vessel of fossil wood showing intervessel pitting  $\times 100$ .
5. T. S. of living wood of *Canarium bengalense*  $\times 50$
6. T. L. S. of living wood of *Canarium bengalense*  $\times 50$ .
7. R. L. S. of living wood of *Canarium bengalense*  $\times 50$ .
8. A vessel of *Canarium bengalense* showing inter-vesescl pitting  $\times 100$ .



