STUDIES IN THE DECCAN INTERTRAPPEAN FLORA — 4. TWO SILICIFIED WOODS FROM MADHYA PRADESH

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ABSTRACT

Two fossil woods belonging to Euphorbiaceae and Simarubaceae are described here from the Deccan Intertrappean Series of Madhya Pradesh. The first, *Glochidioxylon sahnii* belongs to Bharatwada (21° 14′ N.; 79° 1′ E.) and the second, *Ailanthoxylon indicum* is from the well-known locality of Mohgaon Kalan (22° 1′ N.; 79° 11′ E.).

INTRODUCTION

THE present paper describes two new fossil woods belonging to Euphorbiaceae and Simarubaceae collected from the Deccan Intertrappean beds of Madhya Pradesh. The first described as *Glochidioxylon sahnii* belongs to Bharatwada (21° 14′ N.; 79° 1′ E.) and the second, *Ailanthoxylon indicum*, was collected from the locality of Mohgaon Kalan.

From the Deccan Intertrappean Series, so far only a few dicot woods have been reported (RODE, 1936; VARMA, 1950; PRAKASH, 1956, 1957; SHALOM, 1959). However, from other Tertiary formations of India a number of dicot woods are known.

DESCRIPTION

Family — Euphorbiaceae

Genus — *Glochidioxylon* Ramanujam

Glochidioxylon sahnii sp. nov.

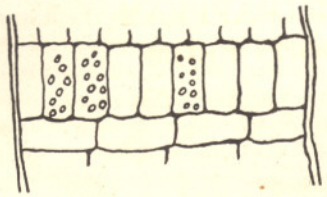
The fossil wood shows only secondary xylem. The specimen is about 8 cm. in diameter and 9 cm. in length. It shows the structure of a diffuse-porous wood.

Growth-rings are feebly marked and can be detected only in some parts of the wood.

Vessels are visible as empty holes under a hand lens. They are thin-walled, moderately numerous and small in size. They are sometimes solitary but mostly in radial groups (PL. 1, FIG. 1). The radial groups of 2-5 vessels are very common. The solitary vessels are oval in shape, while those in the radial groups are usually tangentially flattened due to mutual pressure (PL. 1, FIG. 1). Tyloses are commonly present in the vessels (PL. 1, FIG. 2). Perforations are simple and the perforation plates are generally horizontal to slightly inclined. Intervessel pits are bordered and more or less alternate (PL. 1, FIG. 4; TEXT-FIG. 1). They are medium-sized. Their aperture is linear and the border appears to be oval. The border of the intervessel pits is not very clear due to poor preservation. Vessel-ray pitting is simple; the pits are circular and many per cell (TEXT-FIG. 2). Vessel-parenchyma pits are not seen.

Wood parenchyma is very scanty. It is (PL. 1, FIG. 5; TEXT-FIG. 3) mostly found as scattered cells among the fibrous ground mass of the wood but sometimes it also occurs in association with the vessels. In cross-section, the parenchyma cells are oval. They are usually empty but sometimes they contain a black deposit. In longitudinal sections, these cells can be more easily distinguished by the presence of horizontal partitions. The pits to parenchyma cells could not be detected due to poor preservation.

Xylem rays are indistinct to the naked eye, but with a hand lens they are visible as radiating lines on the transverse surface of the wood. They are (PL. 1, FIG. 3) 1-7 seriate (mostly uniseriate and 4-7 seriate), closely spaced and markedly heterogeneous (PL. 1, FIG. 6). They exhibit a good variety in the proportion and arrangement of the vertical cells to the procumbent cells. They are of two distinct sizes, few moderately broad rays with a number of fine rays in between them (PL. 1, FIGS. 1, 2). They are only few tracheids apart, and usually touch the vessel-walls (PL. 1, FIG. 1). Uniseriate rays are common, while both the biseriate and triseriate rays are very rare. The broad rays (4-7 seriate) are also commonly present (PL. 1, FIGS. 1, 2). The uniseriate rays are composed of either upright cells or both upright and procumbent



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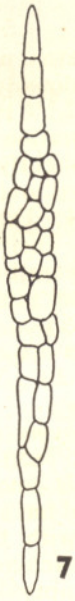

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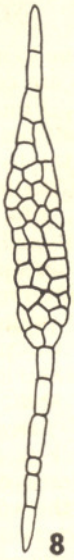

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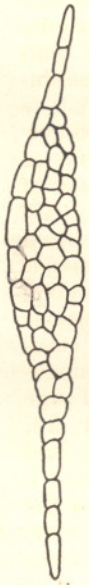

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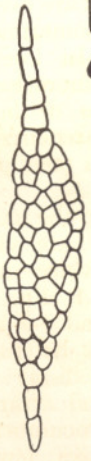

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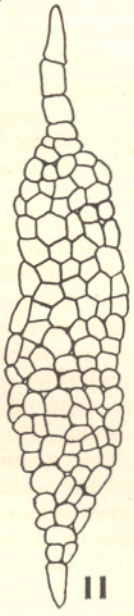

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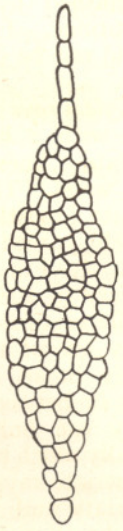

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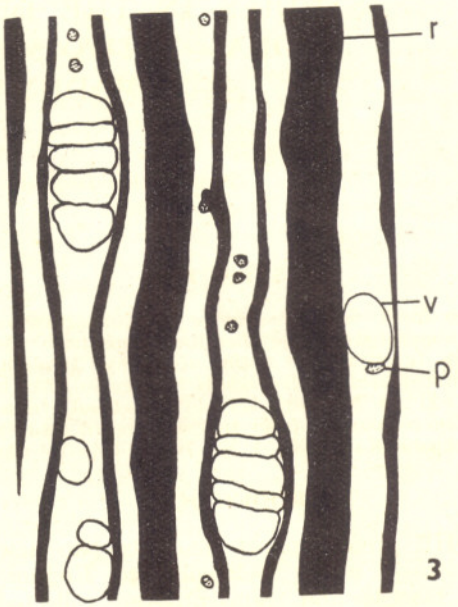

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Glochidioxylon sahnii sp. nov.

(Semi-diagrammatic camera lucida sketches)

TEXT-FIGS. 1-13 — 1, magnified intervessel pits. × 373. 2, radial longitudinal section, showing vessel-ray pitting. × 386·5. 3, cross-section, showing the distribution of parenchyma (p). v, vessel, r, ray. × 80. 4, uniseriate ray, showing upright cells only. × 110. 5, another uniseriate ray, showing both upright and procumbent cells. × 110. 6, biseriate ray, showing both upright and procumbent cells. × 110. 7, triseriate ray, showing both upright and procumbent cells. × 110. 8, tetraseriate heterogeneous ray. × 110. 9, another tetraseriate heterogeneous ray. × 110. 10, 5-seriate heterogeneous ray. × 110. 11, 6-seriate heterogeneous ray. × 110. 12, 7-seriate heterogeneous ray. × 110. 13, fibres under high magnification; note their size and shape. × 290.

cells (TEXT-FIGS. 4, 5). The second type of uniseriate rays are rare. The biseriate rays are formed of both upright and procumbent cells (TEXT-FIG. 6). The multiseriate rays (3-7 seriate) are also made up of upright and procumbent cells (PL. 1, FIG. 3; TEXT-FIGS. 7-12). The multiseriate rays consist of marginal rows of upright cells or both upright and procumbent cells at each end and wholly of procumbent cells through the central portion or with upright cells along the flanks (TEXT-FIGS. 7-12). Sometimes a multiseriate ray shows upright cells at only one end (TEXT-FIG. 12). There are usually 1-4 rows of upright cells at the uniseriate ends of the multiseriate rays. The procumbent cells show variation in size and form when seen in the tangential plane (PL. 1, FIG. 3). The rays show considerable variation in their height. A few are only 4 cells high while others are as many as 82 cells high. The ray cells are thin-walled and usually contain a black deposit.

Wood fibres in general are not well preserved. However, at some spots they show satisfactory preservation. The fibres are (PL. 1, FIG. 5; TEXT-FIG. 13) oval to slightly angular in cross-section. They are semi-libriform to libriform and typically septate although the septa are often not clearly seen. They show marked variation in their size. Individual fibres show gradual tapering and they appear to be long to medium in length. Inter-fibre pits could not be seen.

Ripple marks are absent.

Gum canals are absent.

COMPARISON AND DISCUSSION

So far only a few fossil woods of the family Euphorbiaceae are known both from India and abroad. The present fossil wood shows such a combination of characters that it stands quite apart from all the species of Euphorbiaceous fossil woods so far recorded.

The species *Euphorbioxylon kräuseli* Prakash (1957) also, described from the Deccan Intertrappean Series, differs markedly from this Bharatwada fossil wood. Thus, *E. kräuseli* differs from this wood in having distinctly vestured intervessel pits, limited paratracheal parenchyma, 1-3 seriate xylem rays and in the absence of tyloses.

Glochidioxylon tertiarum Ramanujam (1956), described from the Tertiary rocks (? Cuddalore Series) of South India, is similar to *Glochidioxylon sahnii* in the nature of growth-rings, size and arrangement of the vessels, and to a less extent in the nature of parenchyma and the fibres. However, *Glochidioxylon tertiarum* also differs from *G. sahnii* in the absence of tyloses and in having 1-4 seriate, heterogeneous xylem rays with 1-6 marginal rows of vertical cells. In *G. sahnii* the multiseriate rays also possess vertical cells along the flanks which are absent in *G. tertiarum*.

Phyllanthinium pseudo-hobashiraishi Ogura (OGURA, 1932; WATARI, 1943) from the Tertiary of Japan differs from *Glochidioxylon sahnii* in having crystalliferous elements in the parenchyma, and in much shorter, 1-4 seriate, heterogeneous to homogeneous medullary rays.

All other Euphorbiaceous fossil woods, viz. *Euphorbioxylon speciosum* Felix (1888), *Dryoxylon drypeteoides* Bancroft (1932b), *Euphorbioxylon lefrancii* Boureau (1951), *Heveoxylon microporosum* Kruse (1954), *Putranjivoxylon puratanam* Ramanujam (1956), and *Bridelioxylon cuddalorense* Ramanujam (1956), differ markedly from the present fossil in a number of features.

Comparison with the Living Species — The fossil wood described here is characterized by the following characters: vessels usually small in size, sometimes solitary but commonly in radial groups of 2-5 cells and tylosed. Intervessel pits, medium-sized, oval, bordered and more or less alternate. Perforations simple and perforation plates usually horizontal to slightly inclined. Fibres thick-walled and septate. Parenchyma scanty, mostly scattered, often paratracheal. Rays 1-7 cells wide, markedly heterogeneous, closely spaced, of two distinct sizes, few moderately broad rays with numerous fine rays in between them. There is no single, salient structural feature in this fossil wood, which, if considered alone, may help in its identification. The form, structure and distribution of the wood parenchyma, of the vessels, of the fibres, and of the rays are of types which occur in remotely related orders and families. The only method of determining its affinities is the laborious one of searching for similar combinations of anatomical characters in extant dicotyledons. This combination of characters is met with in varying degrees in Rubiaceae, Corylaceae, Elaeocarpaceae, Flacourtiaceae, Pittosporaceae, Tiliaceae and Euphorbiaceae, especially the last four families with which a detailed

comparison of the fossil wood has been made.

The woods of Flacourtiaceae resemble the fossil wood in only some features, but differ greatly in having scalariform perforations, and in possessing only scanty paratracheal parenchyma (METCALFE & CHALK 1950, Vol. 1, pp. 116-127). The parenchyma is often also absent in the members of the family Flacourtiaceae.

The woods of Pittosporaceae resemble our fossil in a number of features but differ from it in having almost homogeneous xylem rays as against the markedly heterogeneous rays in the fossil wood (METCALFE & CHALK, 1950, Vol. 1, pp. 128-131).

In Tiliaceae, the fossil wood approaches the species *Echinocarpus dasycarpus* in general features but differs from it in the nature of parenchyma, which is very sparse, metatracheal and diffuse in *E. dasycarpus* (PEARSON & BROWN, 1932, Vol. 1, pp. 180, 181, Fig. 66) against scanty, mostly scattered, sometimes paratracheal parenchyma in the present fossil.

However, the family Euphorbiaceae shows similar combinations of characters as seen in the fossil. On the basis of their anatomical characters, the woods of this family are classified under four heads. All these groups show marked differences in parenchyma pattern and medullary ray characters.

It is with the wood-type of the *Glochidion* group of family Euphorbiaceae that the present fossil wood resembles most. The *Glochidion* group of woods are characterized by simple perforations, typically septate, thick-walled fibres, markedly heterogeneous rays (the ray cells commonly filled with dark deposits), and very scanty parenchyma. This group of *Glochidion*-type of woods includes a number of genera, e.g. *Bischofia, Glochidion, Phyllanthus, Antidesma, Aporosella, Hymenocardia, Acalypha, Bridelia* and *Cleistanthus.*

Out of these genera *Bridelia* and *Cleistanthus* can be distinguished at once by the presence of vestured pits on the vessel-walls and usually fine medullary rays, generally 1-3 seriate (rarely even up to 5-seriate) (PEARSON & BROWN, 1932, Vol. 2, p. 876).

A comparison with other genera of *Glochidion*-type of wood reveals that the fossil approaches quite closely the genera *Glochidion* and *Antidesma*, particularly the last one (JANSSONIUS, 1930, Vol. 10, pp. 505-547, FIG. 320; JANSSONIUS, 1934, Vol. 11, pp. 628-640, FIG. 327; METCALFE & CHALK, 1950, Vol. 2, pp. 1220-1222, FIGS. 293C, 293F; KANEHIRA, 1924b, pp. 48, 49). I have also cut and examined sections of the species *Glochidion velutinum* and *Antidesma diandrum.*

In *Antidesma* which approaches the fossil in a number of characters, the species *A. diandrum* and *A. bunis* (JANSSONIUS, 1934, Vol. 11, pp. 628-635, FIG. 327) are worth mentioning, because they resemble the fossil more than any other species. The resemblance is in the presence of radial groups of vessels, thick-walled, septate fibres, nature of parenchyma and heterogeneous xylem rays, which are of two distinct sizes, few moderately broad rays with numerous fine rays in between them. In *A. bunis* (JANSSONIUS, 1934, VOL. 11, pp. 632, 633) even the range in size of the vessels (R. 50-130 μ, T. 30-110 μ) is somewhat similar to that of the fossil wood (R. 45-118 μ, T. 48-100 μ).

However, the above two species also differ from the fossil wood in some characters, particularly in the frequency of the vessels, which are much more closely placed (especially in *A. diandrum*) and the radial groups are not so very common as in the fossil specimen. In addition to this, there are a number of other differences in details between the two.

It can, therefore, be said that the present fossil is an Euphorbiaceous wood, showing the wood structure of *Glochidion* group (except genera *Bridelia* and *Cleistanthus*, which possess vestured intervessel pits) and resembling the genera *Glochidion* and *Antidesma*, particularly the last one; although none of them are quite the same as the fossil in each and every respect. As such the fossil wood is included in the genus *Glochidioxylon* Ramanujam (1956). This generic name indicates a strong similarity of the fossil with the wood of *Glochidion* group of the section *Phyllanthoideae* in the family Euphorbiaceae. The fossil is specifically named as *Glochidioxylon sahnii* after the late Professor Birbal Sahni, with whom the author was associated as a student.

Diagnosis — Growth-rings faintly marked. Vessels moderately numerous, 24-50 per sq. mm., usually small in size, 48-100 μ in tangential diameter, 45-118 μ in radial diameter, sometimes solitary, mostly in radial groups of 2-5 vessels, thin-walled, oval or tangentially compressed; mean vessel member length up to 180 μ; tyloses present;

perforations simple, perforation plates horizontal to slightly inclined; intervessel pits medium-sized, bordered, aperture linear and border oval; vessel-ray pits simple; vessel-parenchyma pits not seen.

Wood parenchyma scanty, mostly scattered, often paratracheal, occurs mostly as solitary cells; cells oval, 16-20 μ in diameter.

Xylem rays numerous, closely arranged, 13-15 per millimetre, markedly heterogeneous, fine to moderately broad, 1-7 seriate (mostly uniseriate and 4-7 seriate), 16-128 μ in width; 4-82 cells in height, 224-1840 μ in length; uniseriate rays formed of upright cells or both upright and procumbent cells; biseriate rays composed of both upright and procumbent cells; multiseriate rays also possess both upright and procumbent cells, usually with 1-4 rows of upright cells at the uniseriate ends and procumbent cells in the multiseriate part or with some upright cells along the flanks; ray cells thin-walled, usually contain a black deposit.

Wood fibres semi-libriform to libriform, oval to slightly angular, and arranged in radial rows; typically septate; probably long to medium in length; 16-32 μ in diameter.

Locality — Bharatwada, Nagpur District, Madhya Pradesh.

Type Specimen — B.S.I.P. Museum No. 10363.

Family — Simarubaceae

Genus — *Ailanthoxylon* gen. nov.

Ailanthoxylon indicum sp. nov.

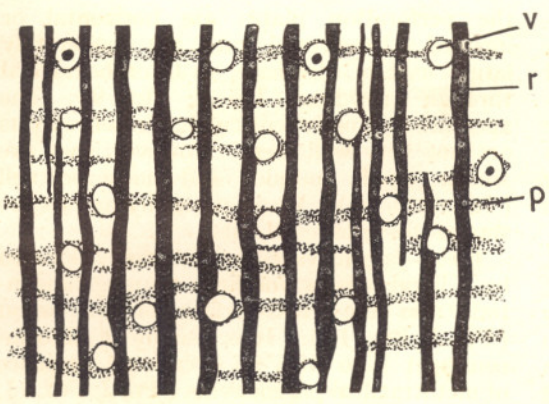
The fossil wood is represented by two small specimens. The figured specimen is 6 cm. in length and 5 cm. in diameter. The fossil shows the structure of a diffuse-porous wood.

Growth-rings are indistinct.

Vessels are visible to the naked eye as minute dots on the transverse surface of the wood. They are moderately thick-walled, usually large, often medium-sized (Pl. 2, Figs. 12, 13), moderately numerous and evenly distributed. The vessels are mostly isolated (Pl. 2, Fig. 13), often in pairs (15 per cent) and very rarely in groups of 3 cells. The vessels (Pl. 2, Figs. 11, 13) are round to oval in cross-section. They are usually empty but often some brown or black substance is present in them (Pl. 2, Figs 10, 12). Perforations are simple and the perforation plates are horizontal or inclined. Intervessel pits are moderately large, usually alternate, oval or hexagonal through crowding (Pl. 2, Fig. 9). The aperture is usually lenticular. Vessel-ray pits are not very well seen. However, they are simple, small, rounded and many per cell (Text-fig. 14). Vessel-parenchyma pits are similar to intervessel pits.

Wood parenchyma can be easily located by a hand lens as fine lines running tangentially on the cross-surface of the wood (Pl. 2, Fig. 12). It is usually of aliform-confluent type with an occasional presence of metatracheal parenchyma (Pl. 2, Fig. 13; Text-fig. 15). The short lateral extensions of the aliform parenchyma usually connect with the parenchyma from other vessels thus becoming confluent at most of the places. The metatracheal parenchyma, however, forms short bands, only few cells thick, which extend tangentially and connect wood rays or end abruptly (Text-fig. 15). The tangential parenchyma bands (which often run for a short distance) are narrow to moderately broad and up to 7 cells thick in their thickest part (Pl. 2, Figs. 11, 13). Usually the parenchyma bands are 3-5 cells thick. Frequently they are only 2-3 cells thick. When the parenchyma encircles the vessels, the parenchyma sheath, thus formed, is usually in 1-2 layers (rarely in 3 layers) of cells (Pl. 2, Fig. 13). The parenchyma cells are thin-walled, oval or tangentially elongated (Pl. 2, Fig. 11). Pits between the parenchyma cells are not seen in the present specimen because of their bad preservation.

Xylem rays are quite prominent on the transverse surface of the wood. They are 1-6 seriate (mostly 4-5 seriate, exceptionally 6 seriate) (Pl. 2, Fig. 8), somewhat closely spaced, and homogeneous (Pl. 2, Fig. 7). They are more or less fusiform in shape (Pl. 2, Fig. 8). The uniseriate as well as the biseriate rays are rare. Both of them are wholly composed of procumbent cells (Text-figs. 16, 17). The broad rays are quite prominent in the tangential sections. They are also composed of only procumbent cells (Pl. 2, Fig. 8; Text-figs. 18-21). The ray cells show different size (Pl. 2, Fig. 8) and shape. They are oval to angular in tangential section. In most of the ray cells some black substance is often present (Pl. 2, Fig. 8). The rays vary in height. A few are only 2 cells high, while others are as many



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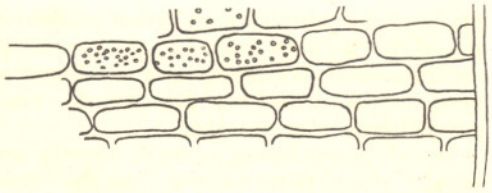

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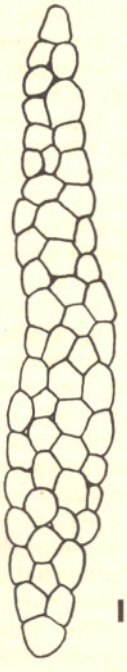

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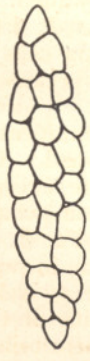

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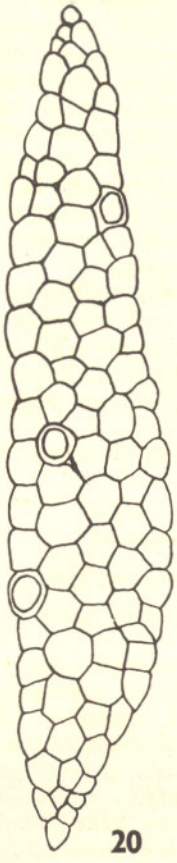

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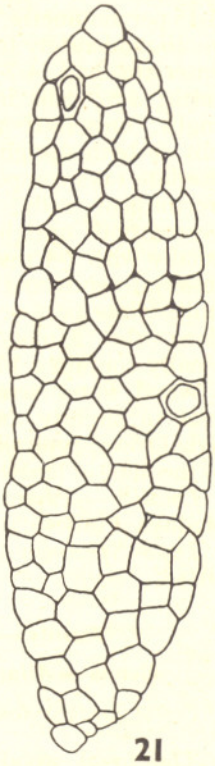

21

Ailanthoxylon indicum gen. et sp. nov.

(Semi-diagrammatic camera lucida sketches)

TEXT-FIGS. 14-21 — 14, l.s. of a vessel showing vessel-ray pitting. × 240. 15, cross-section showing the distribution of parenchyma (p). v, vessel, r, ray. × 18. 16, uniseriate ray with only procumbent cells. × 146·5. 17, homogeneous bi-seriate ray. × 146·5. 18, homogeneous triseriate ray. × 146·5. 19, homogeneous tetraseriate ray. × 146·5. 20, homogeneous 5-seriate ray. × 146·5. 21, homogeneous 6-seriate ray. × 146·5.

as 54 cells high. Pits of the ray cells are not seen.

Wood fibres are poorly preserved and it is only at some places, where the section is quite thick, the thickness of the fibre-walls can be seen. They are non-libriform, non-septate (PL. 2, FIG. 8) and oval to angular in cross-section (PL. 2, FIGS. 11, 13). The lumen of the fibres is quite big. The fibres are usually arranged in distinct radial rows (PL. 2, FIG. 13). The inter-fibre pits are not very conspicuous. In some of the fibres they appear to be simple.

Ripple marks and *gum canals* are absent.

COMPARISON AND DISCUSSION

So far only a few fossil woods of the family Simarubaceae are known from the Tertiary formations. They are *Simarubinium crystallophorum* (PLATEN, 1907) and *S. Engelhardti* (PLATEN, 1907) from the Tertiary of Nevada County, California, *Suriana inordinata* (KRUSE, 1954) from the Eocene of Eden Valley, Wyoming and *Simarubaceoxylon mahurzari* (SHALLOM, 1959) from the Deccan Intertrappean beds of Mahurzari near Nagpur.

The present fossil wood shows such a combination of characters that it can be easily distinguished from all the species of Simarubaceous fossil woods so far recorded.

Simarubaceoxylon mahurzari Shallom (1959) from the Deccan Intertrappean Series, while resembling our fossil in some characters, differs from it in having small to medium-sized vessels, in the presence of diffuse parenchyma in addition to that present about the pores with lateral extensions and in possessing 2-7 seriate and 1-70 cells high medullary rays.

All other fossil woods belonging to Simarubaceae, viz. *Simarubinium crystallophorum, S. Engelhardti* (PLATEN, 1907) and *Suriana inordinata* (KRUSE, 1954), differ markedly from the present fossil in a number of features.

Comparison with the Living Species — The fossil wood described here possesses following characters: Vessels large to medium-sized, mostly solitary, often in pairs. Intervessel pits moderately large, usually alternate, oval or hexagonal through crowding, the aperture being usually lenticular. Perforations simple and perforation plates horizontal or inclined. Wood parenchyma aliform-confluent and occasionally metatracheal, with tangential parenchyma bands usually 3-5 cells thick. Fibres non-libriform and non-septate. Xylem rays 1-6 cells wide and homogeneous. The characters of the wood mentioned above are such that they are met with in varying extents in the members of the families Sabiaceae, Verbenaceae, Guttiferae and Simarubaceae, especially in the last two.

In the family Sabiaceae, the species *Meliosma ferruginea* (MOLL & JANSSONIUS, 1908, Vol. 2, pp. 428-434, FIG. 134), while resembling our fossil in some characters, differs from it in the heterogeneous nature of xylem rays and in having mostly paratracheal parenchyma (loc. cit., FIG. 134). Sometimes the parenchyma in *M. ferruginea* is also of metatracheal type.

In the family Verbenaceae, the species *Gmelina arborea* (PEARSON & BROWN, 1932, Vol. 2, pp. 799-801, FIG. 252) approaches the present fossil in the general structure of the wood. However, in the presence of radial groups of vessels and in 1-5 seriate, somewhat heterogeneous xylem rays, *G. arborea* differs markedly from our fossil wood.

In the family Guttiferae, the fossil wood is only slightly comparable to the genera *Symphonia* and *Garcinia*, especially to the latter. However, in *Symphonia* the tangential parenchyma bands are more regular, continuous and broad (BANCROFT, 1932a; HENDERSON, 1953) even almost equal to the alternating zone of fibres in *Symphonia globulifera* (BANCROFT, 1932a, PL. 12, FIG. 6; HENDERSON, 1953, p. 29, FIG. 125).

On the other hand, the species of *Garcinia* also differ from the present fossil wood in a number of features particularly in the presence of numerous, regular apotracheal bands of parenchyma (METCALFE & CHALK, 1950, Vol. 1, p. 174; MOLL & JANSSONIUS, 1906, Vol. 1, pp. 256-272; KANEHIRA, 1924b, pp. 4, 5; CHOWDHURY & GHOSH, 1947, p. 12; GAMBLE, 1902, pp. 49-55). Therefore, the family Guttiferae can be easily eliminated.

However, the family Simarubaceae shows similar combinations of characters as seen in the fossil wood. A comparison of the Intertrappean fossil with the various members of the family Simarubaceae has revealed that it approaches the genera *Simaruba* and *Ailanthus*, and it is with the wood type of *Ailanthus* that the present fossil agrees most closely (METCALFE & CHALK, 1950, Vol. 1, pp. 317-325; HENDERSON, 1953, p. 68;

PEARSON & BROWN, 1932, Vol. 1, pp. 214, 215; KANEHIRA, 1924b, pp. 15, 16; MOLL & JANSSONIUS, 1908, Vol. 2, pp. 77-83). The resemblance occurs in all the major anatomical features, viz. pore distribution and size, intervascular pitting, perforations in the vessels, ray characteristics and the type of wood parenchyma and the fibres. I have also cut and examined sections of the species *Ailanthus excelsa*, *A. grandis* and *A. malabarica*. The fossil wood approaches somewhat more nearly the species *A. malabarica* and *A. grandis* but none of them are almost identical to the present fossil.

The genus *Ailanthus* is almost entirely tropical and represented by three species in India, viz. *A. malabarica*, *A. grandis* and *A. excelsa*. The species *A. excelsa* has a wide distribution being indigenous in Central and Southern India and the Western Peninsula. It is also extensively cultivated in many parts of India in the vicinity of villages (PEARSON & BROWN, 1932, Vol. 1, p. 214).

Name of the Fossil and Diagnosis — Since our specimen shows a marked resemblance with the modern genus *Ailanthus* of the family Simarubaceae, a new generic name *Ailanthoxylon* has been proposed for the present fossil. It is specifically named as *Ailanthoxylon indicum*.

Ailanthoxylon gen. nov.

A diffuse porous wood.

Growth-rings indistinct.

Vessels large to medium-sized, mostly solitary, often in pairs, moderately thick-walled, round to oval in cross-section; vessels usually empty, often filled with brown or black gummy deposits; vessel-segments short, truncate; perforations simple nearly horizontal to oblique; intervessel pits moderately large, alternate, border usually hexagonal, aperture usually lenticular; vessel-ray pits not well preserved, appear simple, small, rounded and many per cell.

Wood parenchyma not visible to the naked eye; usually of aliform-confluent type with occasional presence of metatracheal parenchyma; tangential parenchyma bands usually short in length, narrow to moderately broad (up to 7 cells thick); paratracheal parenchyma sheath 1-3 layered; cells thin-walled, oval or tangentially elongated in cross-section.

Xylem rays uniformly distributed, moderately numerous, somewhat closely packed; 1-6 seriate (mostly 4-5 seriate, rarely 6 seriate), 4-54 cells high, more or less fusiform in shape; homogeneous with oval to angular cells, often filled with a dark deposit.

Wood fibres non-libriform, oval to angular in cross-section, arranged regularly in radial seriations; wall thin and lumen quite big; typically non-septate; short to medium in length; inter-fibre pits not very conspicuous.

Ailanthoxylon indicum sp. nov.

Vessels 100-240 μ in tangential diameter, 112-265 μ in radial diameter; evenly distributed, 3-5 per sq. mm.; mostly solitary, often in pairs, moderately thick-walled, usually empty, often filled with black or brownish gummy deposits; vessel-segments 216-320 μ long; intervessel pits alternate, distinctly bordered, usually hexagonal; orifice usually lenticular.

Wood parenchyma usually of aliform-confluent type with occasional presence of metatracheal parenchyma; tangential parenchyma bands short, narrow to moderately broad (up to 7 cells thick), 40-200 μ wide, usually 3-5 cells thick; paratracheal parenchyma sheath 1-3 (usually 1-2) layered; parenchyma cells oval or tangentially elongated in cross-section, 16-24 μ in radial diameter and 24-40 μ in tangential diameter.

Xylem rays 4-6 per mm.; 1-6 cells or 16-144 μ wide; 4-54 cells or 80-1376 μ high; homogeneous with oval to angular cells often filled with a dark deposit.

Wood fibres 720-1360 μ long, 20-40 μ in diameter; non-libriform; non-septate; oval to angular in cross-section; inter-fibre pits not very conspicuous.

Locality — Mohgaon Kalan in Chhindwara District of Madhya Pradesh.

Type Specimen — B.S.I.P. Museum No. 5568.

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EXPLANATION OF PLATES

PLATE 1

Glochidioxylon sahnii sp. nov.

1. Cross-section showing the size, shape and distribution of vessels. Note the radial vessel groups. × 31.

2. Cross-section magnified to show the distribution of vessels and narrow and broad xylem rays. × 180.

3. Tangential longitudinal section showing the distribution and nature of the xylem rays. × 31.

4. Part of a vessel showing intervessel pitting. × 210.

5. Part of a cross-section magnified to show the distribution of parenchyma (p) and the nature of fibres. × 175.

6. Radial longitudinal section showing the heterogeneous nature of xylem rays. × 60.

PLATE 2

Ailanthoxylon indicum gen. et sp. nov.

7. Radial longitudinal section showing the homogeneous nature of the rays. × 55.

8. Tangential section showing the form, distribution and nature of the xylem rays. × 37.

9. Magnified intervessel pits. × 210.

10. A vessel showing gummy deposits. × 100.

11. Part of a cross-section magnified to show the fibres and a parenchyma band with oval or tangentially elongated parenchyma cells. × 75.

12. Cross-section of the fossil under low magnification to show the gross structure. × 5.

13. Cross-section showing the form and size of vessels and the distribution of parenchyma (p). Note solitary vessels and tangential parenchyma bands. × 34.

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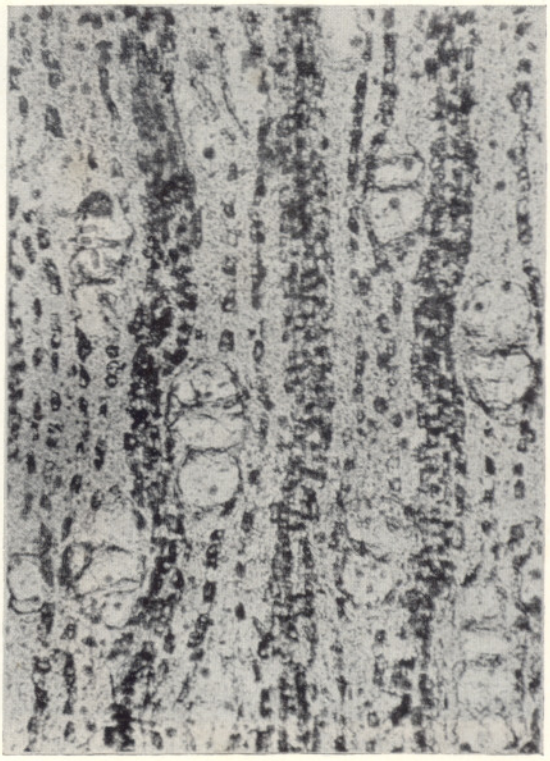

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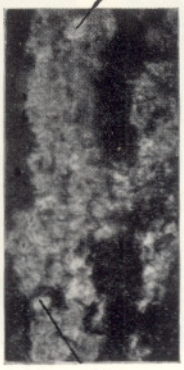

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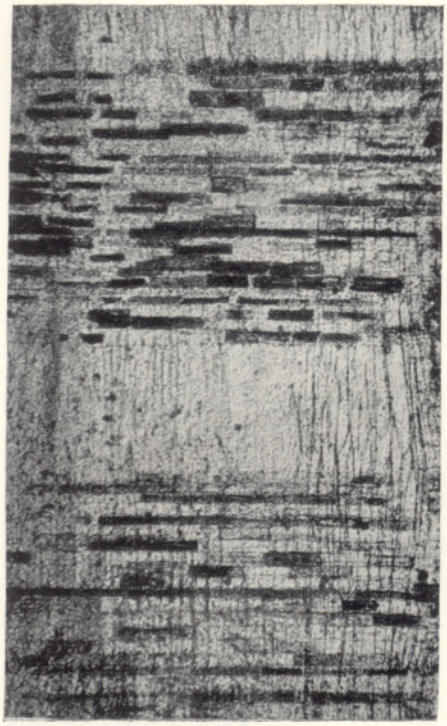

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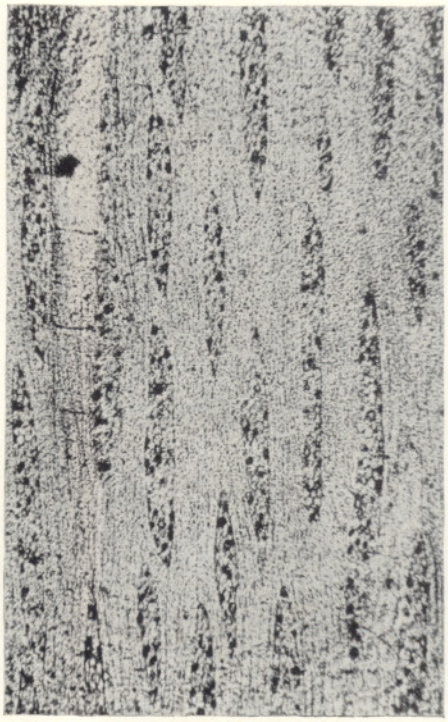

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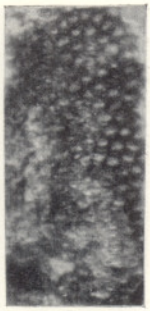

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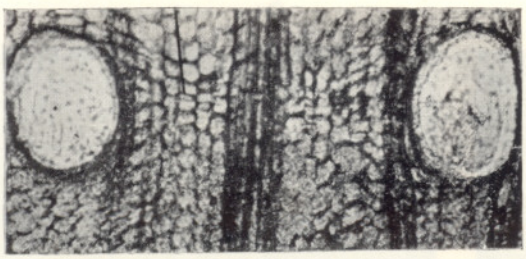

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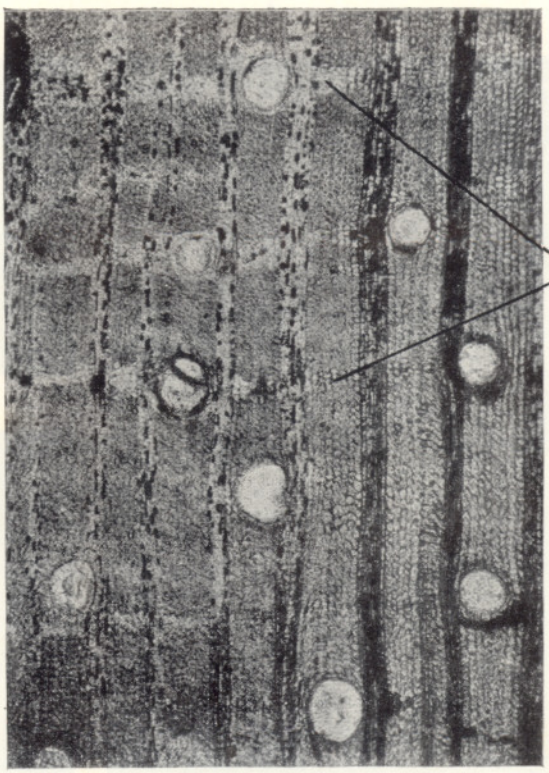

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