The Palaeobotanist, **32**(3): 310-320, 1984.

FOSSIL WOODS OF *LOPHOPETALUM* AND *ARTOCARPUS* FROM THE DECCAN INTERTRAPPEAN BEDS OF MANDLA DISTRICT, MADHYA PRADESH, INDIA

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ABSTRACT

Two fossil dicotyledonous woods, viz., *Lophopetalumoxylon indicum* gen. et sp. nov. from Ghughua near Shahpura and *Artocarpoxylon deccanensis* sp. nov. from a new locality of Sylthar in Mandla District, Madhya Pradesh have been described. The former closely compares with *Lophopetalum littorale* Ridley of Celastraceae while the latter shows maximum resemblance with *Artocarpus heterophyllus* Lamk. of Moraceae.

Key-words — Xylotomy, *Lophopetalum*, *Artocarpus*, Celastraceae, Moraceae, Deccan Intertrappean beds (India).

सारांश

मध्य प्रदेश (भारत) के मँडला जनपद की दक्खिन अन्तर्ट्रेपी संस्तरों से लोफ़ोपैटेलम् एवं आर्टोकार्पस – राकेश चन्द्र मेहरोत्रा, उत्तम प्रकाश एवं मोहन बलवंत बाँडे

मध्य प्रदेश के मँडला जनपद में शाहपुरा के समीपस्थ घुघुआ ग्राम के पास से लोफ़ोपैटेलमॉक्सीलॉन इन्डिकम् नव वंश व नव जाति तथा सिलथर के पास एक नवीन स्थान से आर्टोकार्पोक्सीलॉन दक्खिनेन्सिस नव जाति का वर्णन किया गया है। इनमें से पहला काष्ठ सिलेस्ट्रेसी कुल के लोफ़ोपैटेलम् लिटोरॅल रिडले तथा दूसरा काष्ठ मौरेसी कुल के आर्टोकार्पस हैट्रोफिल्लस लैम्क० से घनिष्ठ समानता प्रदर्शित करता है।

INTRODUCTION

THE flora of the Deccan Intertrappean beds is generally considered as a single unit even though the plant fossils may often belong to the Intertrappean layers far removed from each other in time and space (Lakhanpal, 1973). Lakhanpal (1973) has divided the Deccan Intertrappean flora into the following three florules or assemblages which can easily be distinguished on the basis of their fossil forms: (i) the Nagpur-Chhindwara assemblage, (ii) the Rajahmundry assemblage, and (iii) the Bombay-Malabar-Worli assemblage. Beside the above assemblages, since nearly last one decade a good number of plant fossils have also been described from various Deccan Intertrappean localities of Mandla District in Madhya Pradesh. Here the fossil flora is very rich in dicotyledonous woods which have been listed by Bande and Prakash (1983). These woods have been assigned to the families Verbenaceae, Annonaceae, Myrtaceae, Flacourtiaceae, Euphorbiaceae, Sterculiaceae, Tiliaceae, Elaeocarpaceae, Rutaceae, Guttiferae, Icacinaceae, Lecythidaceae, Anacardiaceae, Burseraceae, Meliaceae and Lauraceae. Two more dicotyledonous woods, viz., *Zizyphoxylon mandlaensis* and *Aglaioxylon mandlaense* have further been described from this area (Trivedi & Srivastava, 1982a, 1982b). In addition to the dicotyledonous woods, a few fruits, viz., *Hyphaeneocarpon indicum* (Bande, Prakash & Ambwani, 1982) and *Euphorbiocarpon drypeteoides* (Mehrotra, Prakash & Bande, 1983) resembling the modern genera *Hyphaene* and *Drypetes* and four monocotyledonous woods of Palmae are also known from here (Lakhanpal, Prakash & Ambwani, 1979; Ambwani, 1983; Ambwani & Prakash, 1983). The studies made so far

on these fossils indicate that the fossil flora of Mandla District constitutes a separate assemblage of plants (Bande & Prakash, 1982).

In this paper two more fossil woods resembling *Lophopetalum* of Celastraceae and *Artocarpus* of Moraceae are being described. The former was collected from the already known locality of Ghughua situated near Shahpura, while the latter was recovered from near the village Sylthar situated at a distance of about 22 km south-west of Shahpura in Mandla District of Madhya Pradesh.

SYSTEMATIC DESCRIPTION

FAMILY — CELASTRACEAE

Genus — *Lophopetalumoxylon* gen. nov.

Lophopetalumoxylon indicum gen. et sp. nov.

Pl. 1, figs 1, 3; Pl. 2, figs 5, 6, 7

Material — A single piece of wood measuring about 10 cm in length and 4 cm in diameter.

Topography — Wood diffuse-porous. *Growth rings* absent (Pl. 1, fig. 1). *Vessels* usually small, sometimes medium-sized, mostly in radial multiples of 2-5, occasionally solitary and also in tangential pairs or clusters, and evenly distributed, about 13-31 per sq mm; tyloses wanting (Pl. 1, fig. 1; Pl. 2, fig. 5). *Parenchyma* apotracheal in the form of 2-5 seriate continuous to interrupted tangential bands (Pl. 1, fig. 1; Pl. 2, fig. 5). *Xylem rays* closely spaced, 12-19 per mm, almost exclusively uniseriate, rarely with paired cells, made up of procumbent cells only, 8-12 μm in width and 4-48 cells or 80-720 μm in height (Pl. 1, fig. 3); ray tissue homogeneous (Pl. 2, fig. 6). *Fibres* arranged in tangential bands alternating with bands of parenchyma (Pl. 2, fig. 5).

Elements — Vessels mostly circular to oval when solitary, with flat contact walls when in multiples, t.d. 40-140 μm, r.d. 40-160 μm; vessel members 200-460 μm long with oblique to transverse ends; perforations simple; intervessel pit-pairs bordered, alternate, small, about 4 μm in diameter, circular to oval in shape with linear apertures (Pl. 2, fig. 7). *Parenchyma cells* thin-walled, 52-198 μm in height and 20-40 μm in diameter. *Ray cells* thin-walled, 32-52 μm in radial length and 16-32 μm in tangential height. *Fibres* semi-libriform, polygonal in cross-section, non-septate, 12-16 μm in diameter and 440-520 μm in length (Pl. 1, fig. 3); interfibre pits could not be seen.

Affinities — Important anatomical characters of the fossil wood, namely small to medium-sized vessels, apotracheal bands of parencyma, fine, homogeneous xylem rays, and non-septate fibres strongly indicate its affinities with the family Celastraceae (Pearson & Brown, 1932; Metcalfe & Chalk, 1950; Nigam, 1963). Further, it also shows a superficial resemblance with the modern woods of Sapindaceae. However, in this family the parenchyma is paratracheal banded and terminal as against the apotracheal bands of parenchyma present in our fossil wood (Pearson & Brown, 1932; Metcalfe & Chalk, 1950; Ramesh Rao, 1963).

Based on the wood structure, Nigam (1963, pp. 180, 181) has given a key for the identification of various Indian genera of Celastraceae. According to this key it is evident that our fossil wood shows maximum similarity with the woods of *Lophopetalum* Wight and *Kokoona littoralis* Lawson mainly in possessing thin, apotracheal bands of parenchyma and in having vessels arranged in short, radial rows. According to Hill's Index Kewensis (1921-25) *Lophopetalum littorale* Ridley and *Kokoona littoralis* Lawson are synonyms. Therefore, the fossil wood has been compared with various modern species of *Lophopetalum* including *L. littorale*. Slides of six species of *Lophopetalum*, viz., *L. fimbriatum* Wight, *L. wightianum* Arn., *L. littorale* Ridley, *L. wallichii* Kurz, *L. javanicum* Turcz. and *L. pachyphyllum* King were examined in detail. Besides, photographs and published descriptions of *Lophopetalum fimbriatum*, *L. wallichii*, *L. wightianum*, *L. littorale* and *Lophopetalum* sp. were also studied (Pearson & Brown, 1932; Henderson, 1953; Nigam, 1963). After detailed comparison with all these species, it was found that the fossil wood is very similar to *Lophopetalum littorale*. A number of modern wood samples of *L. littorale* belonging to different parts of the Indian subcontinent were available for study in the Forest Research Institute, Dehradun. All these samples exhibited some anatomical variations and the anatomical characters of the fossil wood were

found to occur in different wood samples of this species belonging to different areas. In shape, size and distribution of vessels, the fossil wood is very similar to the wood sample no. 2300 belonging to Andamans but in another wood sample no. 2513 from Burma, the vessels are bigger and fewer in number than in the present fossil wood. In parenchyma and ray pattern the fossil wood shows close similarity with all the samples of *L. littorale* so far studied. In the fossil as well as in the modern species, the parenchyma is in 2-5 seriate, continuous to interrupted, tangential bands and the rays are almost exclusively uniseriate made up of procumbent cells only. Lastly the fibres in the fossil wood are non-septate like that of the wood sample nos. 2513 and 278. However, in the wood sample no. 2300 they are septate.

As the present fossil wood shows close similarity with the modern woods of *Lophopetalum littorale* in its anatomical characters (Pl. 1, figs 1-4) and this being the first record of a fossil wood of *Lophopetalum*, it has been placed under a new genus *Lophopetalumoxylon*. The specific name *Lophopetalumoxylon indicum* indicates its occurrence in India.

Although this is the first record of a fossil wood of *Lophopetalum*, the leaves, fruits and woods of Celastraceae are not unknown in the fossil state from different parts of the world. A wood of Celastraceae was first described from the Tertiary of Egypt as *Celastrinoxylon affine* (Schenk, 1888). Later on few more species were further described from different parts of the world. These are: *Celastrinoxylon celastroides* and *Celastrinoxylon* sp. from Egypt (Kraüsel, 1939), *C. meyeri* Schönfeld (1956) from Germany, *C. dakshinense* Ramanujam (1960) from South India and *Celastrinoxylon* sp. Kramer (1974) from south-east Asia. However, the species described by Ramanujam (1960) has recently been transferred to *Ailanthoxylon indicum* Prakash (Awasthi, 1975). The leaves of Celastraceae were recorded as *Celastrinites venulosus* from the Tertiary of France (Saporta, 1865a, 1868) and *Celastrophyllum attenuatum* from the Tertiary of Java (Goeppert, 1854). A capsule of Celastraceae was described by Berry (1930) from the Eocene of Wilcox Group as *Celastrocarpus eocenicus* and another fruit belonging to this family was also described as *Celastrinanthium hauchecornei* (Conwentz, 1886) from the Early Tertiary amber deposits of West Prussia.

Lophopetalum Wight embraces about 20 Indo-Malayan species of trees and shrubs and is distributed in India, Malaya and Java (Nigam, 1963; Santpau & Henry, 1973). According to Santpau and Henry (1973) three species of this genus are found in India. *Lophopetalum littorale* with which the fossil wood shows maximum similarity, grows in Pegu and Tenasserim especially on the inundated low lands along rivers (Gamble, 1972).

Generic Diagnosis

***Lophopetalumoxylon* gen. nov.**

Wood diffuse-porous. *Growth rings* absent. *Vessels* usually small, sometimes medium-sized, mostly in radial multiples occasionally solitary; perforations simple; intervessel pit-pairs bordered, alternate and small. *Parenchyma* in continuous to interrupted, apotracheal tangential bands. *Xylem rays* fine; ray tissue homogeneous. *Fibres* semi-libriform and non-septate or septate.

Genotype — *Lophopetalumoxylon indicum* gen. et sp. nov.

Specific Diagnosis

Lophopetalumoxylon indicum sp. nov.

Wood diffuse-porous. *Growth rings* absent. *Vessels* usually small to sometimes medium-sized, t.d. 40-140 μm, r.d. 40-160 μm, mostly in radial multiples of 2-5, occasionally solitary and also in tangential pairs or clusters, 13-31 per sq mm; vessel members 200-460 μm long; perforations simple; intervessel pit-pairs bordered, alternate, about 4 μm in diameter, circular to oval in shape with linear apertures. *Parenchyma* apotracheal in the form of 2-5 seriate, continuous to interrupted, tangential bands. *Xylem rays* almost exclusively uniseriate, rarely with paired cells, 12-19 per mm; ray tissue homogeneous. *Fibres* semi-libriform and non-septate, 12-16 μm in diameter and 440-520 μm in length.

Holotype — B.S.I.P. Museum no. 35535.

Locality — Ghughua near Shahpura in Mandla District of Madhya Pradesh.

Age — Early Tertiary.

FAMILY — MORACEAE

Genus — *Artocarpoxylon* Prakash & Lalitha, 1978

Artocarpoxylon deccanensis sp. nov.

Pl. 2, figs 9, 10, 11, 13; Pl. 3, figs 14, 16

Material — A single piece of secondary wood measuring about 25 cm in length and 12 cm in diameter. It shows quite good preservation.

Topography — Wood diffuse-porous. *Growth rings* absent (Pl. 3, fig. 14). *Vessels* mostly small to medium in size, very rarely large, solitary and in radial multiples of 2-4-(6), rarely in tangential pairs or clusters, evenly distributed, 9-20 per sq mm (Pl. 3, fig. 14); tyloses occasionally present. *Parenchyma* paratracheal, usually vasicentric, forming 1-3 seriate sheath, rarely aliform and confluent enclosing adjacent vessels (Pl. 2, fig. 9; Pl. 3, fig. 14). *Xylem rays* 1-6 (mostly 4-6) seriate, 7-9 per mm (Pl. 3, fig. 16); ray tissue heterogeneous (Pl. 2, fig. 11); rays divisible into two types: (i) uniseriate rays made up of either only upright cells or both of procumbent and upright cells, 12-16 μm wide and 3-8 cells or 120-320 μm in height, and (ii) multiseriate rays made up of procumbent cells in the central portion and 1-3 (usually 1) rows of upright cells at one or both the ends, 20-64 μm wide and 9-48 cells or 200-800 μm in height sheath cells present in some of the rays; end to end ray fusion rarely seen. *Fibres* aligned in somewhat irregular radial rows in between the xylem rays. *Latex tubes* observed in some of the rays, circular to oval in shape and 16-36 μm in diameter (Pl. 2, fig. 10).

Elements — Vessels circular to oval when solitary, with flat contact walls when in groups, t.d. 80-180 μm, r.d. 64-220 μm; vessel members 200-400 μm in length with oblique to horizontal ends; perforations simple; intervessel pit-pairs bordered, alternate, 8-12 μm in diameter, circular to oval in shape with lenticular apertures (Pl. 2, fig. 13). *Parenchyma cells* thin-walled, 20-40 μm in diameter and 32-80 μm in length. *Ray cells* thin-walled; procumbent cells 12-24 μm in tangential height and 28-72 μm in radial length; upright cells 40-100 μm in tangential height and 20-40 μm in radial length. *Fibres* non-libriform, oval to polygonal in cross section, non-septate (Pl. 3, fig. 16), 12-20 μm in diameter and 525-126 μm in length; interfibre pits not seen.

Affinities — Important anatomical characters of the fossil wood are small to medium-sized vessels, vasicentric to rarely aliform and confluent parenchyma, 1-6 seriate heterocellular xylem rays with latex tubes and non-libriform and non-septate fibres. All these characters indicate the affinities of the present fossil wood with the woods of the family Moraceae (Pearson & Brown, 1932; Tippo, 1938; Metcalfe & Chalk, 1950; Kribs, 1959). Beside Moraceae, the fossil wood also shows some similarities with Datiscaceae. However, the latex tubes in the rays and non-storied fibres and parenchyma of the fossil wood separate it from Datiscaceae where fibres and parenchyma are storied and the latex tubes are absent (Pearson & Brown, 1932; Metcalfe & Chalk, 1950; Kribs, 1959). Among the various genera of Moraceae, the fossil wood shows similarity with the modern woods of the genus *Artocarpus* Forst. and differs from other taxa of this family especially in the presence of sheath cells and latex tubes in xylem rays and in having mostly vasicentric parenchyma (Pearson & Brown, 1932; Tippo, 1938; Metcalfe & Chalk, 1950; Kribs, 1959). Wood slides of 10 species of *Artocarpus* available at the Xylaria of the Birbal Sahni Institute of Palaeobotany, Lucknow and the Forest Research Institute, Dehradun, were examined in detail for comparison with the fossil. These species are *Artocarpus chaplasha* Roxb., *A. gomeziana* Wall. ex Trec., *A. heterophyllus* Lamk., *A. hirsuta* Lamk., *A. elastica* Reinw., *A. lakoocha* Roxb., *A. sericicarpus* Farrett, *A. sepicanus* Diels, *A. tomentosulus* Farrett and *A. nitida* Trec. Besides, photographs and published descriptions of *Artocarpus communis* Forster, *A. cumingiana* Trecul, *A. chaplasha* Roxb., *A. lakoocha* Roxb., *A. gomeziana* Wall. ex Trec. add *A. hirsuta* Lamk. were also studied (Kanehira, 1924a, 1924b; Pearson & Brown, 1932; Henderson, 1953; Kribs, 1959; Purkayastha, Juneja & Kazmi, 1976). Thus after a detailed comparison with all these species it was found that the fossil shows close resemblance with *Artocarpus heterophyllus*. Several wood samples of *A. heterophyllus* collected from different places of the Indian subcontinent were also examined. The study shows that there is some variation

in the amount of parenchyma and in the size and distribution of vessels in all these different wood samples (see F.R.I. slide nos. 756, 2444, 8184 & 8252). The fossil wood shows maximum similarity with F.R.I. slide no. 8184 in parenchyma and vessel distribution, shape and size of intervessel pits and in the structure of fibres and xylem rays (Pl. 2, figs 12, 13; Pl. 3, figs 14-17) but differs from it only in the size of vessels which are slightly smaller in the fossil. However, similar size, shape and distribution of vessels may be seen in F.R.I. slide no. 8252.

Prakash and Lalitha (1978) instituted a new genus *Artocarpoxylon* for the fossil woods of *Artocarpus* of Moraceae and described *Artocarpoxylon kartikcherraensis* from the Tertiary of Assam which is the only record of a fossil wood of this genus from India and abroad. However, the present fossil wood is different from *A. kartikcherraensis* in size and distribution of vessels and in parenchyma pattern. In the present fossil wood the vessels are mostly small to medium in size (t.d. 80-180 μm) against mostly medium to large (t.d. 105-315 μm) vessels in *A. kartikcherraensis*. Moreover, the frequency of the vessels in *A. kartikcherraensis* is comparatively very less, i.e. only 2 to 3 per sq mm, whereas the vessels are 9-20 per sq mm in the present fossil. Further, the parenchyma is vasicentric to mostly aliform and rarely confluent joining two adjacent vessels in *A. kartikcherraensis* whereas in the present fossil wood, it is comparatively less, varying from mostly vasicentric to rarely aliform and confluent joining two adjacent vessels. As the fossil wood is quite different from *Artocarpoxylon kartikcherraensis*, it is being described as a new species of *Artocarpoxylon*, *Artocarpoxylon deccanensis* sp. nov., the specific name indicating its occurrence in the Deccan Trap country.

Beside the woods, leaves and fruit remains of *Artocarpus* are also known in the fossil state from the different parts of the world. First record of this genus is in 1851 when Unger described a leaf fragment as *Artocarpidium integrifolium* from the Tertiary of Austria. Saporta (1865b, 1868) also described the leaves as *Artocarpoides perampla* and *A. concephaloidea* from the Eocene of France. Two more species, *A. balli* Berry and *A. wilcoxensis* were later on described from the Eocene of Texas (Ball, 1931). Dawson (1894) also described a leaf fragment from the Cretaceous of Canada as *Artocarpophyllum occidentale*. Nathorst (1908) described both leaves and parts of the fruit of *Artocarpus dicksoni* from the Cretaceous of Greenland. He also pointed out that certain leaves described by Lesquereux (1874, 1878) as *Myrica* (?) *lessigiana* hnd *Myrica*(?) *lessigii* from the Laramie beds of Boulder County, Colorado, were really those of *Artocarpus*. So, Knowlton (1893) transferred both these species of *Myrica* into *Artocarpus lessigiana* (Lesquereux) Knowlton. In 1883, Lesquereux further recorded certain leaves as *Aralia pungens* from the Denver Formation at Golden, Colorado. Hollick (1899) discovered similar type of leaves from the Lower Eocene of Louisiana and recognized their true affinity as belonging to the genus *Artocarpus* and described them as *Artocarpus pungens*. He also recorded a new species, *A. dubia*. Its two more species *A. similis* and *A. dissecta* were later on described by Knowlton (1917) from the Cretaceous of the Raton and Vermejo formations. Ball (1930) collected a number of leaves of *Artocarpus* from the Eocene of Texas and by their detailed study he concluded that all the above five species of *Artocarpus* are actually variations of one and the same species and these five species should be combined under the name *Artocarpus lessigiana* (Lesquereux) Knowlton which has the right of priority. From India also leaf impressions of *Artocarpus* have been reported. Sharma and Gupta (1972) described a leaf of *Artocarpus murreecus* from the Lower Miocene Murree shales near Liranwali in Thanamandi area of Jammu and Kashmir. Recently Bhattacharya (1983) also described a leaf impression of *Artocarpus garoensis* from the Tura Formation of Eocene age in Garo Hills, Meghalaya.

Artocarpus is an evergreen or deciduous tree consisting of 50 species which are widely distributed through Indo-Malaya and Polynesia, a few occurring in tropical Africa, tropical Australia and Madagascar (Pearson & Brown, 1932; Santapau & Henry, 1973). There are 18 species of *Artocarpus* indigenous to India (Santapau & Henry, 1973). *Artocarpus heterophyllus*, with which the present fossil shows a near resemblance, is a native

of Western Ghats (Hooker, 1885; Santapau & Henry, 1973).

Specific Diagnosis

Artocarpoxylon deccanensis sp. nov.

Wood diffuse-porous. *Growth rings* absent. *Vessels* mostly small to medium-sized, t.d. 80-180 μm, r.d. 64-220 μm, solitary and in radial multiples of 2-4 (6), circular to oval, 9-20 per sq mm, occasionally tylosed; vessel members 200-400 μm long with oblique to horizontal ends; perforations simple; inter-vessel pit-pairs bordered, alternate, 8-12 μm in diameter, circular to oval with lenticular apertures. *Parenchyma* usually vasicentric forming 1-3 seriate sheath, rarely aliform and confluent enclosing adjacent vessels. *Xylem rays* 1-6 (mostly 4-6) seriate, occasionally with latex tubes, 7-9 per mm; ray tissue heterogeneous; rays divisible into two types: (i) uniseriate rays made up of only upright cells or with both procumbent and upright cells, and (ii) multiseriate rays made up procumbent cells in the central portion and 1-3 (usually 1) rows of upright cells at one or both the ends; sheath cells present in some of the rays; end to end ray fusion rarely seen. *Fibres* non-libriform, oval to polygonal in cross section, non-septate, 12-20 μm in diameter and 160-620 μm in length; interfibre pits could not be seen.

Holotype — B.S.I.P. Museum no. 35536.

Locality — Sylthar near Shahpura in Mandla District of Madhya Pradesh.

Age — Early Tertiary.

ACKNOWLEDGEMENT

The authors are thankful to Dr Ramesh Dayal, Officer-in-Charge, Wood Anatomy Branch, Forest Research Institute, Dehradun for facilities and help in examining the modern wood slides at the Xylarium of the Institute.

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EXPLANATION OF PLATES

PLATE 1

1. *Lophopetalumoxylon indicum* gen. et sp. nov.— Cross section of the fossil wood in low power showing shape, size and distribution of vessels and bands of parenchyma. × 30; slide no. 7043.
2. *Lophopetalum littorale*. Cross section of the modern wood showing similar shape, size and distribution of vessels and parenchyma bands. × 30.
3. *Lophopetalumoxylon indicum* gen. et sp. nov.— Tangential longitudinal section of the fossil wood showing exclusively uniseriate xylem rays and non-septate fibres. × 80; slide no. 7044.
4. *Lophopetalum littorale* — Tangential longitudinal section of the modern wood showing similar type of xylem rays and fibres. × 80.

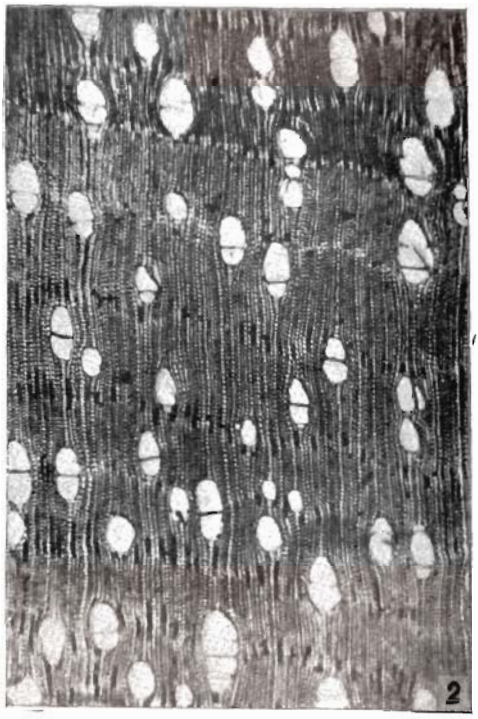
PLATE 2

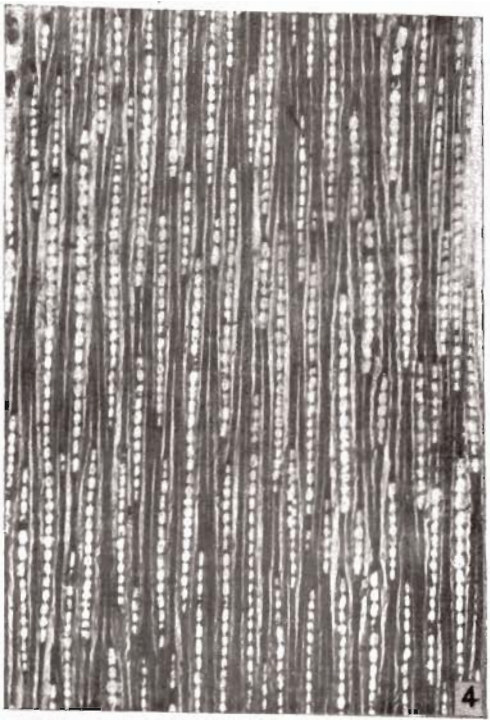
5. *Lophopetalumoxylon indicum* gen. et sp. nov.— Magnified cross section of the fossil wood showing parenchyma bands alternating with the bands of fibres. × 90; slide no. 7043.
6. *Lophopetalumoxylon indicum* gen. et sp. nov.— Radial longitudinal section of the fossil wood showing homocellular xylem rays composed of procumbent cells. × 190; slide no. 7045.
7. *Lophopetalumoxylon indicum* gen. et sp. nov.— Magnified intervessel pit-pairs of the fossil wood. × 500; slide no. 7044.
8. *Lophopetalum littorale* — Similar intervessel pit-pairs of the modern wood. × 500.
9. *Artocarpoxylon deccanensis* sp. nov.— Magnified cross section of the fossil wood showing parenchyma distribution. × 75; slide no. 7046.

10. *Artocarpoxylon deccanensis* sp. nov.—Tangential longitudinal section magnified to show latex tube in the ray. × 165; slide no. 7047.
11. *Artocarpoxylon deccanensis* sp. nov.— Radial longitudinal section of the fossil wood showing heterocellular xylem rays. × 120; slide no. 7048.
12. *Artocarpus heterophyllus* — Magnified intervessel pit-pairs of the modern wood. × 310.
13. *Artocarpoxylon deccanensis* sp. nov.— Magnified intervessel pit-pairs. × 310; slide no. 7047.

PLATE 3

14. *Artocarpoxylon deccanensis* sp. nov.— Cross section of fossil wood in low power showing shape, size and distribution of vessels and parenchyma pattern. × 45; slide no. 7046.
15. *Artocarpus heterophyllus* — Cross section of the modern wood showing similar distribution of vessels and parenchyma. × 45.
16. *Artocarpoxylon deccanensis* sp. nov.— Tangential longitudinal section of the fossil wood showing xylem rays and non-septate fibres. × 70; slide no. 7047.
17. *Artocarpus heterophyllus* — Tangential longitudinal section of the modern wood showing similar xylem rays and fibres. × 70.





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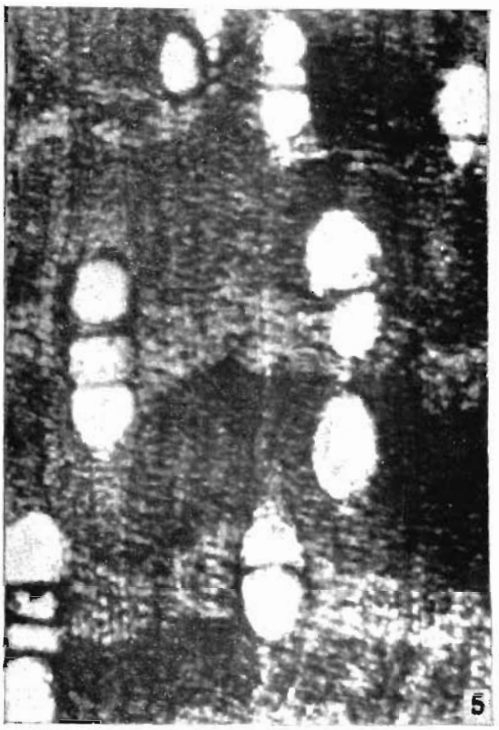
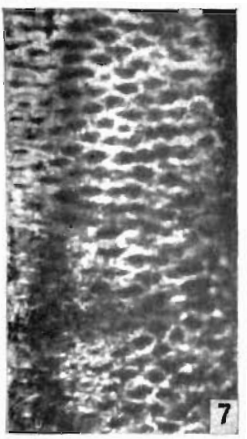
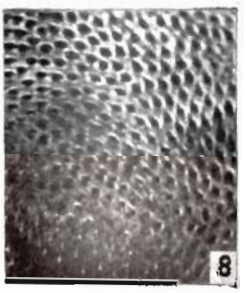






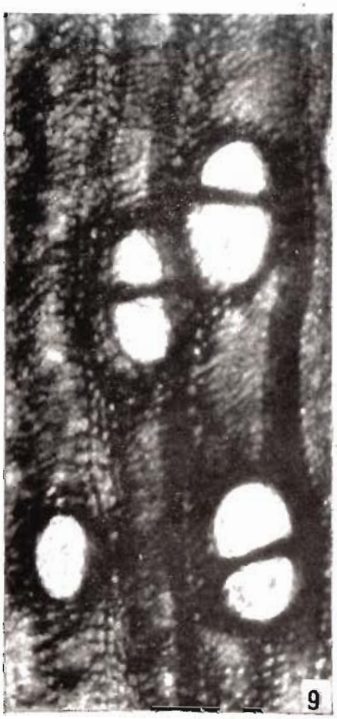
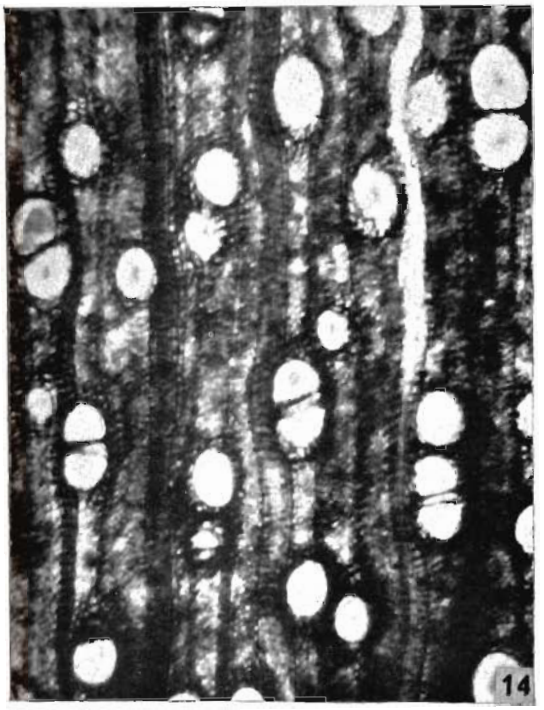
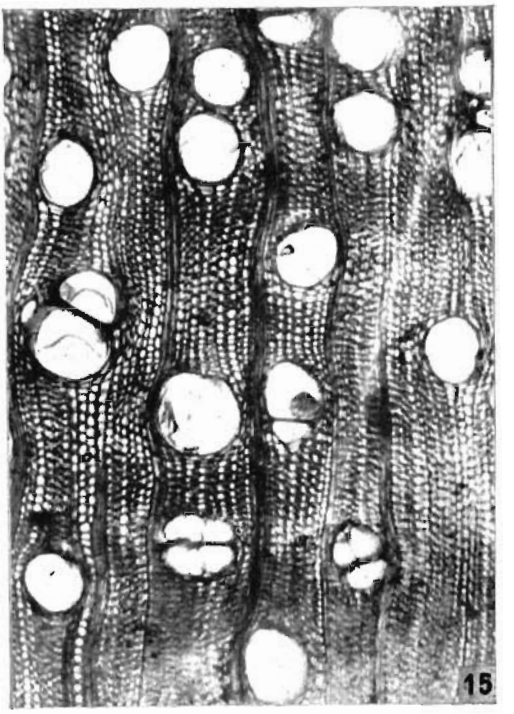


PLATE 2





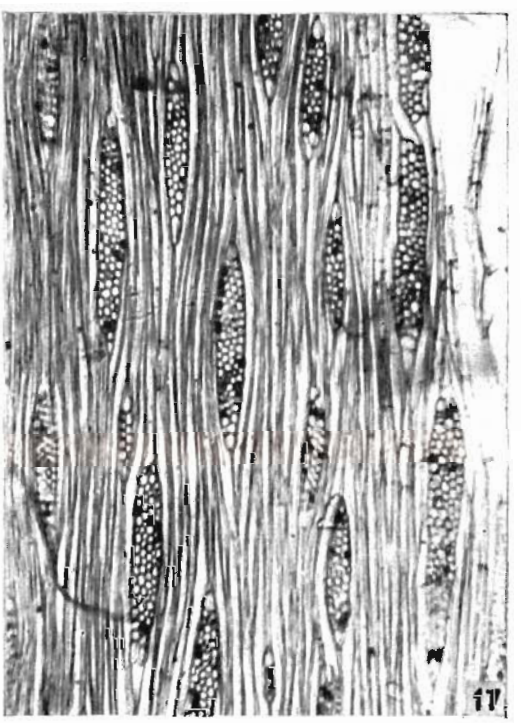


PLATE 3