

AN ARAUCARIAN FOSSIL WOOD FROM THE DECCAN INTERTRAPPEAN BEDS OF MOHGAON KALAN

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ABSTRACT

A fossil gymnospermous wood with araucarian affinities has been described from the Deccan Intertrappean beds of Mohgaon Kalan in Chhindwara District of Madhya Pradesh. This fossil provides further evidence in support of the presence of Araucariaceae in the Deccan Intertrappean flora.

INTRODUCTION

DURING a recent visit to the well known locality of Mohgaon Kalan in Chhindwara District of Madhya Pradesh, a small piece of fossil wood was found in a block of chert belonging to the Deccan Intertrappean Series. On sectioning and studying in detail it was found to consist only of secondary wood showing araucarian characters.

Already, from the Chhindwara District, five araucarian woods have been described as species of *Dadoxylon* (*Araucarioxylon*) by Shukla (1938, 1944), Billimoria (1948), Chitale (1949) and Singhai (1958). Out of them the three species described respectively by Billimoria, Chitale and Singhai are stated to belong to the Deccan Intertrappean beds whereas Shukla has not mentioned this fact clearly. However, both his species, coming from the same district, may also be presumed to belong to the Deccan Intertrappean beds. In fact, he has himself admitted this possibility (see Shukla, 1938, p. 355, 362; 1944, p. 87). On comparison the present wood shows certain features which are distinct from those of the earlier species and hence is being described here as a new species.

Besides the woods, an araucarian cone, *Mohgaostrobus sahnii* (Prakash, 1957, 1962) is also known from the Deccan Intertrappean beds of Mohgaon Kalan.

SYSTEMATIC DESCRIPTION

Araucarioxylon Kraus, 1870

Araucarioxylon mohgaensis sp. nov.

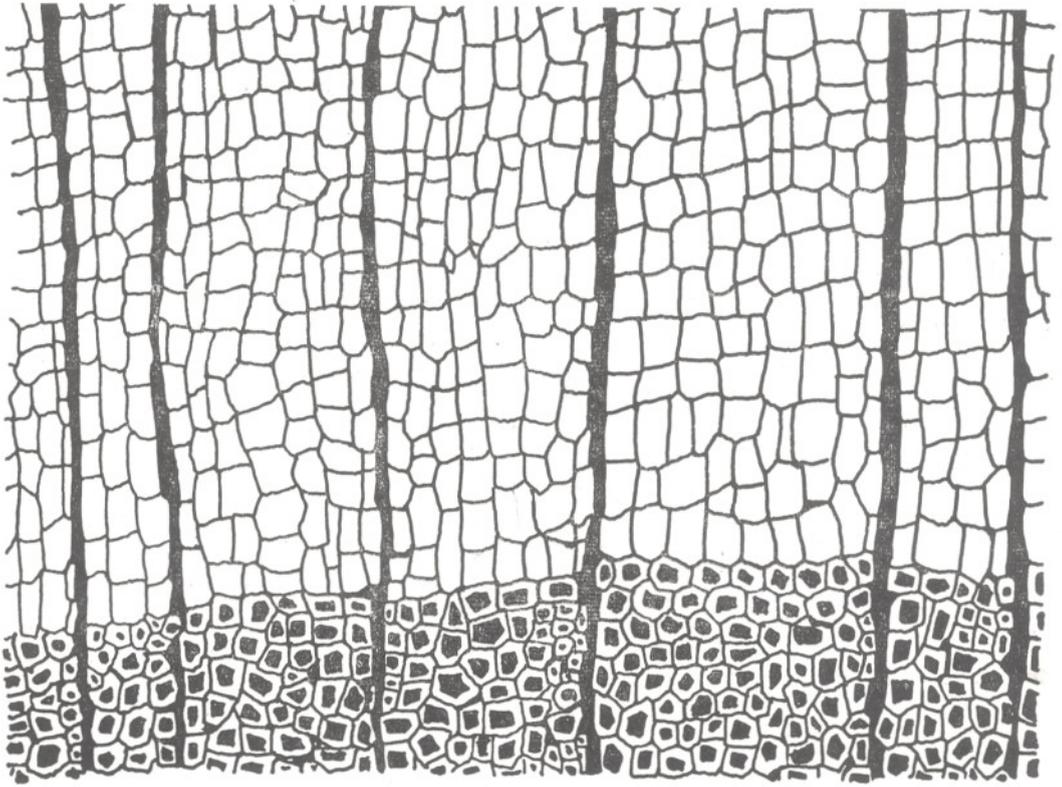
The material consists of a piece of decorticated secondary wood 3 cm long

and 1.5 cm in diameter. The structural details of the wood are fairly well preserved.

Growth rings distinct (Pl. 1, fig. 1), delimited by a band of late wood tracheids, 200 to 1000 μ wide. Transition from early wood (spring wood) to late wood (autumn wood) abrupt (Pl. 1, fig. 2; Text-fig. 1). *Late wood zone* quite wide (Pl. 1, figs. 1, 2), about 8-26 cells (in one case only 2 cells) in width, composed of thick walled (Text-fig. 1), compactly arranged, squarish to tangentially elongated tracheids arranged in radial rows, 16-20 μ in diameter. *Early wood* contributing more than 50% of the growth ring (Pl. 1, fig. 1), 4-16 cells wide, consisting of thin-walled, quadrangular, radially elongated tracheids arranged in radial rows (Text-fig. 1). Radial diameter of the tracheids 40-60 μ , tangential diameter 20-30 μ . Tangential walls of tracheids appearing to be smooth, without any pits but their radial walls profusely pitted (Pl. 1, figs. 4, 5) in the early wood. *Parenchyma* absent. The *tracheid pits* numerous (Text-figs. 2, 3), 1-3 seriate (mostly 2-seriate), alternate, contiguous, polygonal (hexagonal) in shape, with circular to oval orifices and 6-8 μ in diameter. Pits on the radial walls of late wood tracheids not observed. *Bars of Sanio* absent. *Xylem rays* numerous (Pl. 1, fig. 3; Text-fig. 4), evenly distributed, 6-8 per mm, homogeneous, uniseriate, 2-30 cells (mostly 8-15 cells) high, made up of elongated, barrel-shaped cells in tangential section. *Pits in the cross-field* 1-2, cupressoid, circular to oval in shape (Text-fig. 5). *Resin canals* not seen.

DISCUSSION

Such anatomical characters of the fossil wood as alternate, hexagonal pits on the radial walls of the tracheids, cupressoid cross-field pits and uniseriate xylem rays clearly indicate its araucarian affinities. Fossil gymnospermous woods with araucarioid pitting on the radial walls of the

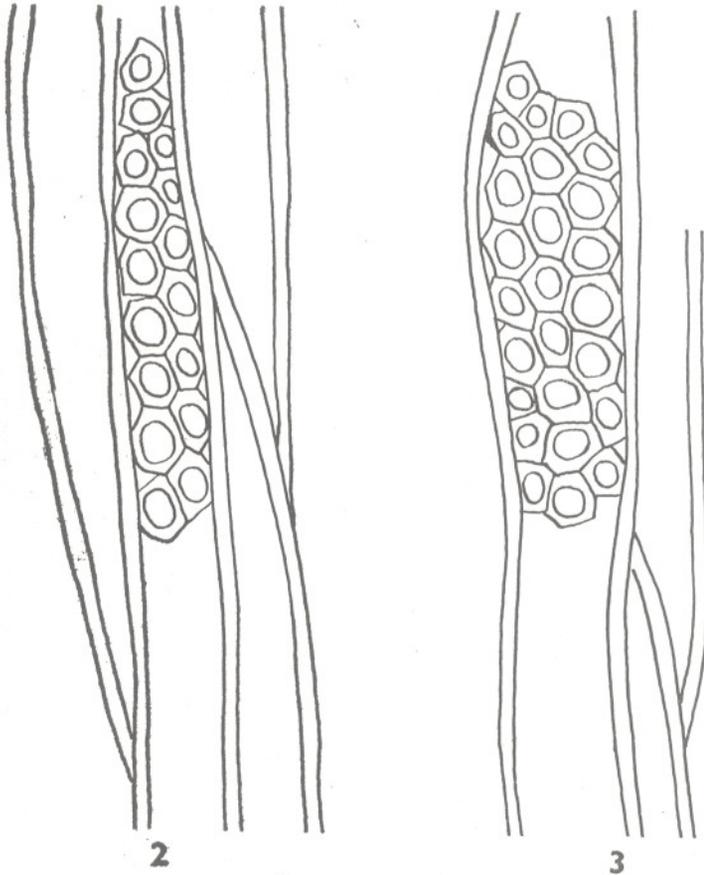


TEXT-FIG. 1 — Cross section of fossil wood showing thick-walled late wood tracheids and thin-walled, radially elongated early wood tracheids $\times 100$. Slide no. 35240/5042.

tracheids are known since the Palaeozoic. They have usually been assigned either to the form genus *Dadoxylon* Endlicher (1847) or to *Araucarioxylon* Kraus (1870, in Schimper 1870-72). For a long time all fossil woods of this type from the Palaeozoic were included in *Dadoxylon* while those from the younger strata were put under *Araucarioxylon* (Seward, 1963, p. 249) because the former were thought to belong to Cordaitales and the latter to Araucariaceae.

Recently while revising some Lower Gondwana wood taxa, Maheshwari (1972, p. 4, 5) has aptly remarked that "The purpose of taxonomy is to achieve useful classification according to significant botanical features that denote, or may denote, phyletic relationship. A classification of fossil woods according to geologic age may be useful for certain purposes (if age is accurately known), but age, as such, can not be regarded as a botanical criterion. Fossils

are relied on to provide an indication of geologic age; if age is accepted as a criterion for taxonomic distinction, a perfect circularity of reasoning results that would nullify one of the important purposes of paleontologic work". In his opinion, to systematize a large amount of data as in the case of fossil woods with araucarioid tracheidal pitting, taxonomy based on convenience may perhaps be the most feasible solution. According to him fossil woods consisting only of secondary xylem with "araucarioid" radial pitting and "cupressoid" crossfield pits, having uniseriate or rarely partly biseriate xylem rays should be placed in the genus *Araucarioxylon* while similar woods having usually more than 1-seriate xylem rays should be assigned to *Dadoxylon*. By distinguishing these two genera only by the width of their xylem rays, Maheshwari seems to lay too much stress on a character which wood anatomist

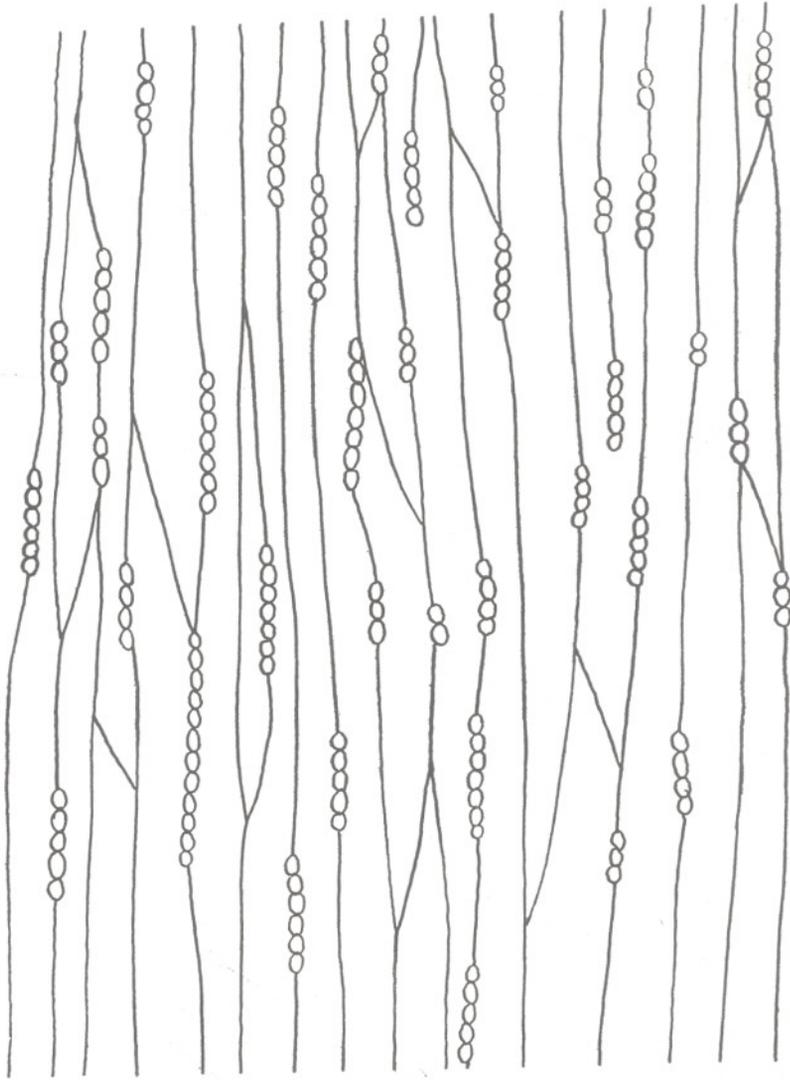


TEXT-FIG. 2 — Early wood tracheids in radial section to show biseriate, alternate, hexagonal pits $\times 600$. Slide no. 35240/5044.

TEXT-FIG. 3 — Early wood tracheids in radial section to show triseriate, alternate pits $\times 600$. Slide no. 35240/5044.

usually regard as rather variable. He has himself (Maheshwari, *loc. cit.*, p. 4) quoted Lindley and Hutton remarking that "the passages of medullary rays are variable in size, sometimes appearing to consist of as many as four layers of muriform cellules placed side by side, sometimes not having more than two". Dayal (1972, p. 118) has given a number of instances of variations in rays in a number of living plants. Particularly relevant to the present context, would be the variations in the height and width of xylem rays reported by Bailey and Faull (1934, pl. 104, figs. 32, 33, 35-37) in *Sequoia sempervirens*.

From the view point of convenience, however, the classification of fossil woods with araucarioid pitting (*Dadoxyleae*) as given by Lepekhina (1972) seems more suitable. It is also more comprehensive as her study is based on more than 300 samples of fossil woods. According to her there is no difference in the secondary wood of *Araucarioxylon* and *Dadoxylon*, in both of which the xylem rays are as a rule uni-biseriate and rarely up to 5-seriate. The difference between the two is that whereas *Araucarioxylon* consists only of the secondary wood, *Dadoxylon* comprises secondary wood as well as endarch primary xylem



TEXT-FIG. 4 — Tangential longitudinal section showing uniseriate xylem rays $\times 100$. Slide no. 35240/5043.

with gradual transition from spiral to pitted tracheids and rather large, non-septate pith without secretory canals. Lepekhina's interpretation of these two genera is in accordance with their original diagnoses as given for *Araucarioxylon* Kraus in Schimper (1870-72, pp. 380-381) and for *Dadoxylon* by Endlicher (1847, p. 298).

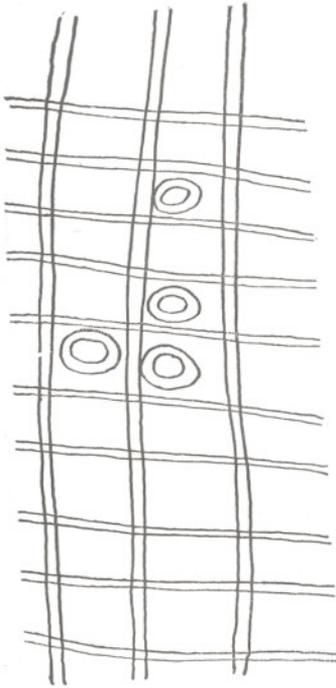
In possessing araucarioid tracheidal pits, cupressoid cross-field pits and uniseriate xylem rays our fossil wood consisting only

of secondary xylem, conforms to Lepekhina's definition of *Araucarioxylon*.

A large number of fossil woods with araucarioid pitting have been described from India (Sah & Jain, 1964; Maheshwari, 1972; Lepekhina, 1972). They have mostly been referred to as species of *Dadoxylon*. It is highly desirable that a critical revision of all these woods is made keeping in view the recent studies of Maheshwari (1972) and Lepekhina (1972). Here we propose

TABLE 1 — ANATOMICAL CHARACTERS OF ARAUCARIAN FOSSIL WOODS FROM THE DECCAN INTERTRAPPEAN SERIES

| NAME OF SPECIES | GROWTH RINGS | RADIAL TRACHEID PITS | CROSS-FIELD PITS | XYLEM RAYS | PARENCHYMA | RESINIFEROUS TRACHEIDS | BARNS OF SANTO |
|--|--------------|---|---------------------------|---|------------|------------------------|----------------|
| 1. <i>Dadoxylon deccani</i> Shukla (1938) | Well marked | 1-2 seriate, usually alternate, sometimes opposite, round to elliptical, hexagonal due to contact | 1-6, bordered | Mostly uniseriate, rarely biseriate in the middle, 2-49 cells high (average 18 cells) | Absent | Present | Absent |
| 2. <i>D. resinosum</i> Shukla (1944) | Well marked | 1-4 seriate, separate or contiguous, alternate, sometimes opposite, hexagonal | 1-10, simple, round | 1-2 seriate, 1-39 cells high (average 22 cells) | Absent | Present | Absent |
| 3. <i>D. chhindwariensis</i> Billimoria (1948) | Clear | 1-3 seriate, <i>Dadoxylon</i> type, also opposite | 1-7, simple or bordered | 1-2 seriate | — | Present | Present |
| 4. <i>D. eocenium</i> Chitale (1949) | Present | 1-3 seriate, irregularly present, alternate, also opposite, circular to hexagonal | 1-7, bordered or simple | 1-2 seriate, 1-15 cells high (average 4 cells) | — | Present | — |
| 5. <i>D. shuklai</i> Singhai (1958) | Well marked | 1-2 rarely 3 seriate, contiguous, alternate to subopposite | 1-4, bordered or simple | 1-2 seriate, 2-10 cells high (max. 28 cells) | — | Absent | Absent |
| 6. <i>Araucarioxylon mohgaensis</i> sp. nov. | Distinct | 1-3 (mostly 2) seriate, contiguous alternate, hexagonal | 1-2, bordered, cupressoid | 1-seriate, 2-30 (mostly 8-15) cells high | Absent | Absent | Absent |



TEXT-FIG. 5 — Cross-field pits $\times 600$. Slide no. 35240/5044.

to confine our comparison of the present fossil to only those species which are from younger horizons and displaying similar anatomical characters.

So far only five species of fossil araucarioid wood are known which can be compared with the present specimen. They are all from the Deccan Intertrappean beds and described under the genus *Dadoxylon*. They are *Dadoxylon deccani* Shukla (1938), *D. resinosum* Shukla (1944), *D. chhindwarensis* Billimoria (1948), *D. eocenium* Chitale (1949) and *D. shuklai* Singhai (1958). Their important anatomical details are given in Table 1 along with those of the present fossil.

A critical analysis of the characters of *D. chhindwarensis* and *D. eocenium* shows that most probably they are identical. Having come from the same locality and described from the same laboratory, the chances are

that duplicates of the same species were described as different species by the two authors.

The present fossil although displaying general resemblance with the previous species shows certain differences especially in the number of bordered pits in the field and the height of the xylem rays which are exclusively uniseriate whereas in the earlier species they were 1-2 seriate. We are, therefore, describing it as a new species, *Araucarioxylon mohgaoensis*, named after the locality Mohgaon Kalan.

The anatomical characters of *Araucarioxylon mohgaoensis* as well as of the earlier species described from the Deccan Intertrappean beds under the genus *Dadoxylon* show a very close resemblance with the wood of the modern Araucariaceae. This evidently shows that representatives of Araucariaceae were a part of the Deccan Intertrappean flora. Another evidence of this conclusion is the record from the same beds of a fossil cone, *Mohgaostrobus sahnii* Prakash (1962), which has also been referred to Araucariaceae.

SPECIFIC DIAGNOSIS

Araucarioxylon mohgaoensis sp. nov.

Growth rings distinct, 200-1000 μ wide; transition from early wood to late wood abrupt. *Late wood* 8-26 cells wide composed of thick-walled, usually squarish tracheids. *Early wood* 4-16 cells wide with thin-walled radially elongated tracheids. *Parenchyma* absent. *Pits* on the radial walls of the tracheids, 1-3 seriate, alternate, polygonal (hexagonal) with circular to oval aperture; pits on tangential walls absent. *Bars of Sanio* absent. *Xylem rays* uniseriate, homogeneous, 2-30 cells high and 6-8 per mm, composed of barrel-shaped cells. *Cross field pits* 1-2, bordered, cupressoid and circular to oval in shape. *Resin canals* absent.

Holotype — B.S.I.P. Museum no. 35240.

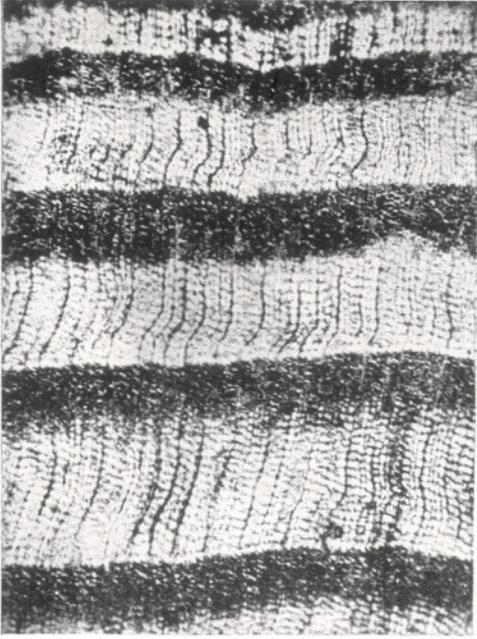
Locality — Mohgaon Kalan, Chhindwara District, Madhya Pradesh.

Horizon & Age — Deccan Intertrappean series; Early Tertiary.

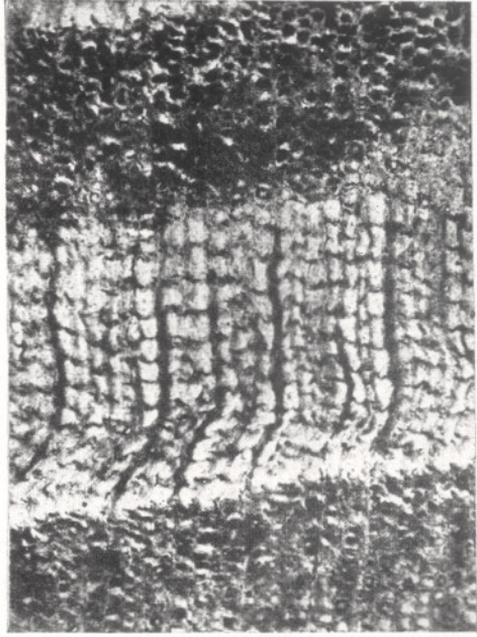
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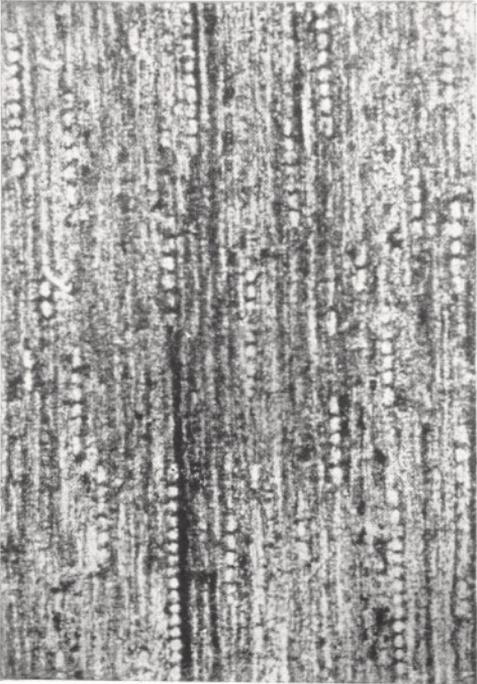
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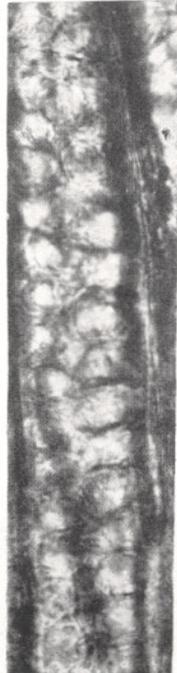
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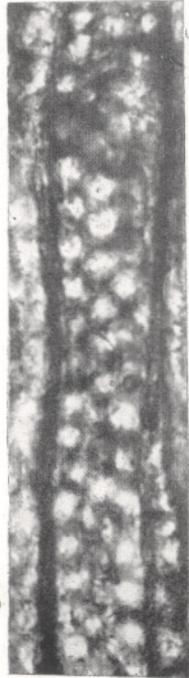
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EXPLANATION OF PLATE

PLATE 1

Araucarioxylon mohgaensis sp. nov.

1. Cross section in low power showing growth rings with early and late wood tracheids. $\times 30$. Slide no. 35240/5042.

2. Cross section magnified to show thin-walled early wood tracheids and thick-walled late wood tracheids and the xylem rays. $\times 90$. Slide no.

35240/5042.

3. Tangential longitudinal section showing uniseriate xylem rays. $\times 125$. Slide no. 35240/5043.

4. Radial longitudinal section of a tracheid showing biseriate, alternate, hexagonal pits. $\times 500$. Slide no. 35240/5044.

5. Radial longitudinal section of another tracheid showing triseriate, alternate, hexagonal pits. $\times 450$. Slide no. 35240/5044.