

STUDIES IN THE GLOSSOPTERIS FLORA OF INDIA—
10. *DADOXYLON BARAKARENSE* SP. NOV. FROM THE
JHARIA COALFIELD, INDIA

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ABSTRACT

A new species of *Dadoxylon*, *D. barakarense*, is described from Barakar Stage (Lower Permian). The species is distinguished by the presence of wood parenchyma, 1-2 seriate medullary rays, 1-3 seriate, hexagonal and alternate or round and opposite to sub-opposite radial pits and tracheidal pits on the tangential wall.

INTRODUCTION

RECENTLY ten more pieces of petrified woods were collected by one of us (Y. N. SAXENA) from the same locality, viz. 18th Coal Seam in Kharkhari Colliery, Barakar Stage, lat. $23^{\circ} 46' 24''$, long. $86^{\circ} 14' 36''$, Jharia coalfield, from where *Dadoxylon jhariense* (SURANGE & SAH, 1956, p. 100) was described. Out of the ten woods, six were identical with *D. jhariense*, the largest specimen being 11-12 cm. in diameter and 20-24 cm. in length. Some of these specimens, although identical with *D. jhariense*, showed deep medullary rays, 13-15 cells deep (PL. 1, FIG. 8). One large specimen, however, was quite different from the rest in that it showed wood parenchyma which was hitherto unknown in any of the Indian species of *Dadoxylon*. It was, therefore, thought worthwhile to describe it here in detail.

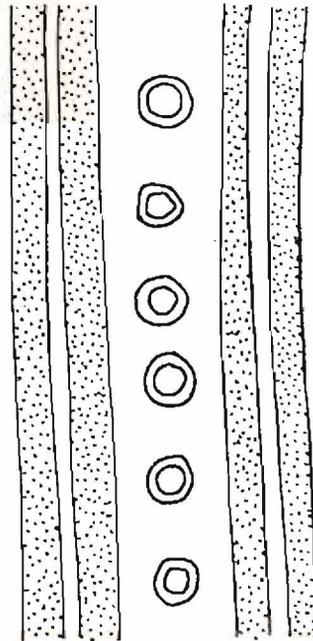
DESCRIPTION

Dadoxylon barakarense sp. nov.

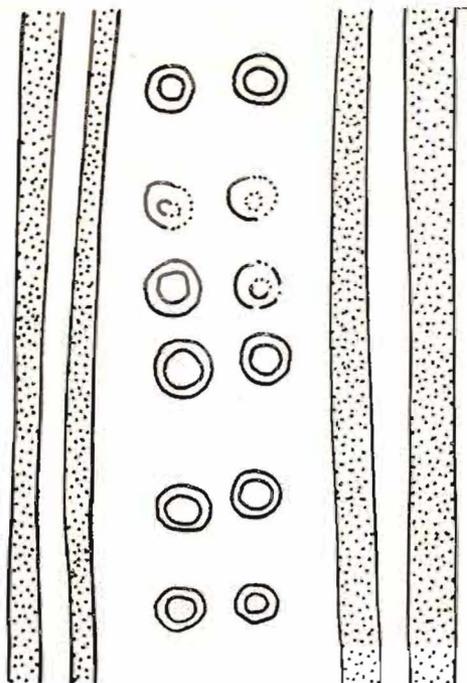
The specimen indicates a trunk of considerable girth. It consists of a portion of secondary wood of a stem devoid of pith and primary xylem, measuring 21 cm. in diameter and 19 cm. in length. The specimen is black in colour and is preserved exactly in the same way as *D. jhariense* and appears to be slightly crushed at the time of preservation. The annual rings, which are definitely present, are thereby distorted to some extent (PL. 1, FIG. 1). The autumn and spring wood is clearly visible under the microscope (PL. 1, FIG. 7). The spring wood is 30-40 cells wide and the tracheids

are squarish and thick-walled, measuring about $57 \times 47 \mu$ across. The autumn wood is narrow, 7-8 cells wide, and the tracheids are small and narrow, measuring $39 \times 18 \mu$ across. The xylem parenchyma is present and is scattered in the spring and autumn wood.

Radial Pitting — Pits on the radial walls of the tracheids are uniseriate to triseriate. Uniseriate pits are occasional, separate or contiguous and circular (TEXT-FIG. 1). The biseriate pits are predominant, contiguous, hexagonal and alternate or somewhat circular and opposite to sub-opposite (PL. 1, FIGS. 2, 4; TEXT-FIGS. 2, 3). Triseriate pits are rare, mostly contiguous and alternate. The pits are small in size, round or



TEXT-FIG. 1 — Radial view of tracheid, showing uniseriate bordered pits. $\times 800$.



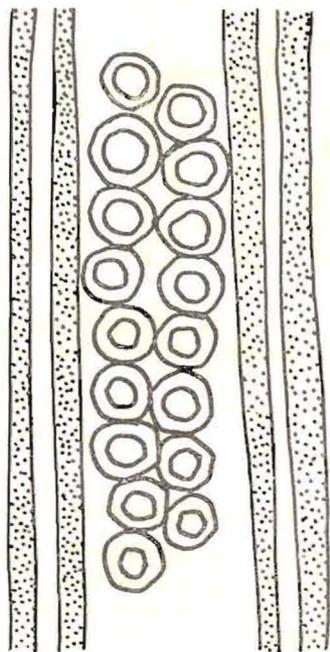
TEXT-FIG. 2 — Tracheid in radial section, showing biseriate, separate, circular and opposite pitting. $\times 800$.

slightly elliptic when free but flattened in hexagons when in contact. The pore is either circular or elliptical and inclined, measuring 4.5μ across. At some places it was noticed that the tracheids were arranged end to end (PL. 1, FIG. 6).

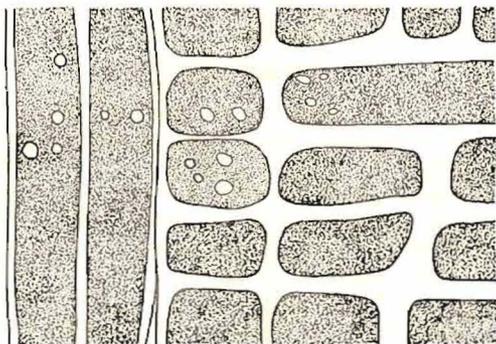
Tangential Pitting — In some late wood tracheids, a few pits are preserved on the tangential walls. They are uniseriate and arranged closely. The pore is well preserved and measures 4.5μ in diameter.

Medullary Rays — The rays are predominantly uniseriate (PL. 1, FIG. 3; TEXT-FIG. 6) and occasionally partly or wholly biseriate. In the long rays biseriate condition is found usually in a single cell or 2-3 cells, whereas some short rays (up to 6 cells) may be wholly biseriate. The average frequency of biseriate and uniseriate medullary rays is 16 and 84 per cent respectively. The rays are 1-22 cells in height (average 13 cells). The ray cells measure $25-36 \mu$. Field pits vary from 2 to 5, but mostly 4 in number (PL. 1, FIG. 2; TEXT-FIG. 4). On account of bad preservation, the border was not visible.

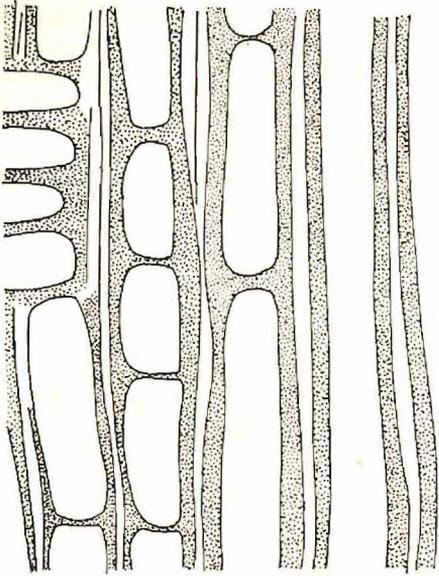
Xylem Parenchyma — Well-defined parenchymatous cells intervene at places between the vertical rows of tracheids near the region of medullary rays and can be made out in radial as well as tangential sections (PL. 1, FIGS. 3, 5; TEXT-FIGS. 5, 6). They are mostly empty and are shorter than tracheids, the length of a tracheid being equal to about 4-5 parenchymatous cells. The transverse



TEXT-FIG. 3 — Tracheid in radial view, showing typical Araucarian pitting. $\times 800$.



TEXT-FIG. 4 — Radial longitudinal section, showing pits in the field and the tracheids. $\times 250$.



TEXT-FIG. 5 — Radial longitudinal section, showing abundant wood-parenchyma. × 250.

walls are either straight or slightly curved at the corners. The wood parenchyma is scattered.

***D. barakarense* sp. nov.**

Diagnosis — Radial pits 1-3 seriate, flattened, contiguous and alternate, or somewhat circular, opposite or sub-opposite; pits on the tangential walls of the tracheids present, medullary rays 1-2 seriate, 1-22 cells high, average 13 cells; field pits 2-5 but mostly 4; xylem parenchyma present and scattered throughout the wood near the region of medullary rays.

Type Specimen — B.S.I.P. 28549/317

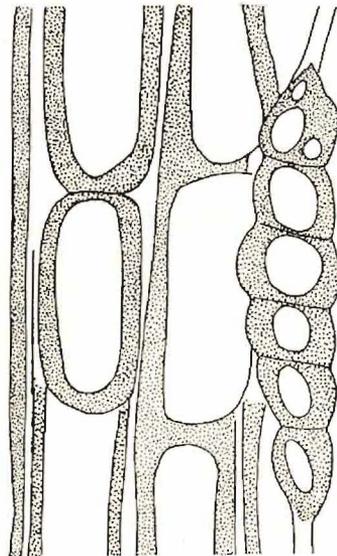
Horizon — Barakar Stage.

COMPARISON

In the identification of fossil woods, sometimes it becomes difficult to decide how much importance is to be attached to a particular morphological character. The case in point is the presence of wood parenchyma in the present species. As far as we know in none of the Southern *Dadoxylon* of Palaeozoic age (and perhaps in none of the Palaeozoic *Dadoxylon* of Northern hemisphere) the presence of xylem parenchyma is reported. Hence in *D. barakarense* its presence at once stands out as the most distinguishing

feature. Earlier a new genus, *Araucariopsis* was instituted by Caspary (see SEWARD, 1919, p. 179) for specimens distinguished from most examples of *Dadoxylon* by the presence of scattered xylem parenchyma. But Gothan (1910) and also Seward did not believe that this character was of sufficient importance as to warrant a new generic name. Will it not be more correct to regard that by its rarity (or even absence) in typical *Dadoxylon* of Palaeozoic age, the xylem parenchyma, if present, assumes an importance which merits recognition, especially more so when it is absent in the living araucariaceae or the fossil cordaitales to which the form genus *Dadoxylon* is supposed to show affinities?

In *D. barakarense* the presence of wood parenchyma is coupled with the presence of wholly or partly biseriate medullary rays, although this condition is known in a few Palaeozoic species of *Dadoxylon* such as *D. jhariense* (SURANGE & SAH, 1956), *D. whitei* Maniero (1944), *D. bengalense* (HOLDEN, 1917), *D. parbeliense* (RAO, 1935), *D. romingerianum* Arnold (1931) and *D. rhodanum* Goepf. Even a triseriate condition has been reported by Miner (1936) in one species, *D. steidmanii*, from Northern Illinois. Although in *Dadoxylon* uniseriate condition of medullary rays is predominant, the biseriate condition is not uncommon. Much



TEXT-FIG. 6—Tangential longitudinal section, showing medullary ray and wood parenchyma. × 250.

reliance, therefore, cannot be placed on this character.

However, as in our specimen of *D. barakarensis* the pith and the primary xylem (which may provide some other distinguishing characters of sufficient merit as to warrant its generic separation from *Dadoxylon*) are absent and as the presence of parenchyma is included as a generic character of *Dadoxylon* by Seward (1919, p. 172), we propose to relegate our specimen to the genus *Dadoxylon* for the present.

As regards other Indian species of *Dadoxylon*, *D. barakarensis* stands out alone by the possession of wood parenchyma.

In the absence of pith and primary xylem in the specimen of *D. barakarensis* a detailed comparison is not possible with *D. indicum* (HOLDEN, 1917) and *D. jhariense* (SURANGE & SAH, 1956), although the latter species comes from the same locality as *D. barakarensis*. In the secondary wood *D. indicum* resembles *D. barakarensis* in the number of field pits but differs in the absence of tangential pits, presence of only 1-2 seriate radial pits and uniseriate medullary rays. *D. jhariense*

resembles *D. barakarensis* in the possession of 1-2 seriate medullary rays and tangential pits, but differs from it in short medullary rays, radial pits occasionally in more than three rows and 2-6 bordered pits in the field.

D. bengalense (HOLDEN, 1917) differs from *D. barakarensis* in the tendency towards grouping of bordered pits, uniseriate medullary rays and 2-7 half bordered pits in the field. *D. zaleskyi* (SAHNI, 1933) resembles our specimen in possessing 1 to 4 field pits devoid of border, but differs in the low medullary rays and other details of the secondary wood. *D. parbeliense* (RAO, 1935) shows biseriate rays but they are very rare, whereas in *D. barakarensis* they are comparatively more common. Moreover, in *D. parbeliense* the radial pits are 1-5 seriate.

One of the younger species of *Dadoxylon* in which wood parenchyma is reported is *D. septentrionale* Goth. (Triassic age). But apart from the age, it differs from *D. barakarensis* in possessing bordered pits in a single row, separate or arranged in stellate clusters and uniseriate medullary rays.

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EXPLANATION OF PLATE I

1. A part of stem in transverse section, showing the growth rings and the distorted secondary xylem due to ill-preservation. × 35.

2. Radial longitudinal section, showing field-pitting and tracheal pitting, typically of Araucarian type. × 100.



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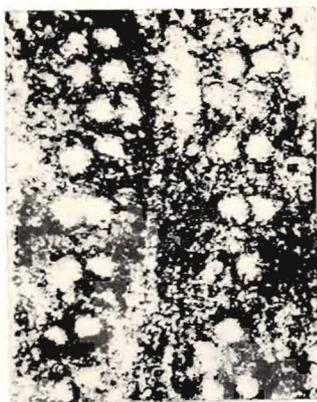
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3. Tangential longitudinal section, showing the presence of wood parenchyma in the secondary wood; and the medullary rays. $\times 100$.

4. Radial longitudinal section. Tracheids showing biseriate, opposite and separate pits. $\times 400$.

5. Radial longitudinal section, showing wood-parenchyma abundant and scattered. $\times 100$.

6. Radial longitudinal section, showing truncated end cells of the xylem. $\times 100$.

7. Transverse section, showing spring wood comparatively much more developed than the autumn wood. $\times 60$.

8. Tangential longitudinal section, showing a 13 cells high medullary ray in *D. jhariense*.