

STUDIES IN THE GLOSSOPTERIS FLORA OF INDIA—

7. *DADOXYLON JHARIENSE* SP. NOV. FROM THE JHARIA COALFIELD, BIHAR

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ABSTRACT

A new species of fossil wood, *Dadoxylon jhariense*, is described from the Barakar stage of the Lower Gondwanas of India. The wood possesses distinct growth rings, a solid pith, continuous ring of endarch primary xylem and secretory sacs in the pith. Circular pits are rarely present on the tangential walls of the tracheids. Pitting on the radial wall of the tracheids usually uni-, bi-, triseriate or rarely more; pits round to elliptic, contiguous, rarely separate, usually alternate, sometimes opposite or sub-opposite. Medullary rays less numerous and low. Pits in the field 2-6 having elliptic with obliquely placed pores.

INTRODUCTION

FROM the Lower Gondwanas of India only three species of *Dadoxylon* have so far been described. Two species, *Dadoxylon indicum* Holden and *Dadoxylon bengalense* Holden, belong to Barakar stage, while the third, *Dadoxylon zaleskyi* Sahni, is known from the Raniganj stage.

The new species of *Dadoxylon* described here was collected by one of us (S. C. D. SAH) from the 18th coal seam of Kharkhari colliery (lat. 23°46'24"; long. 86°14'36") in the Jharia coalfield, about 3-4 miles west of Katrasgarh Railway Station (see Survey of India Sheet No. 73 I/1). The fossil wood, therefore, belongs to the Barakar stage (Lower Permian).

Three pieces of woods were collected but only one showed excellent preservation.

DESCRIPTION

Dadoxylon jhariense sp. nov.

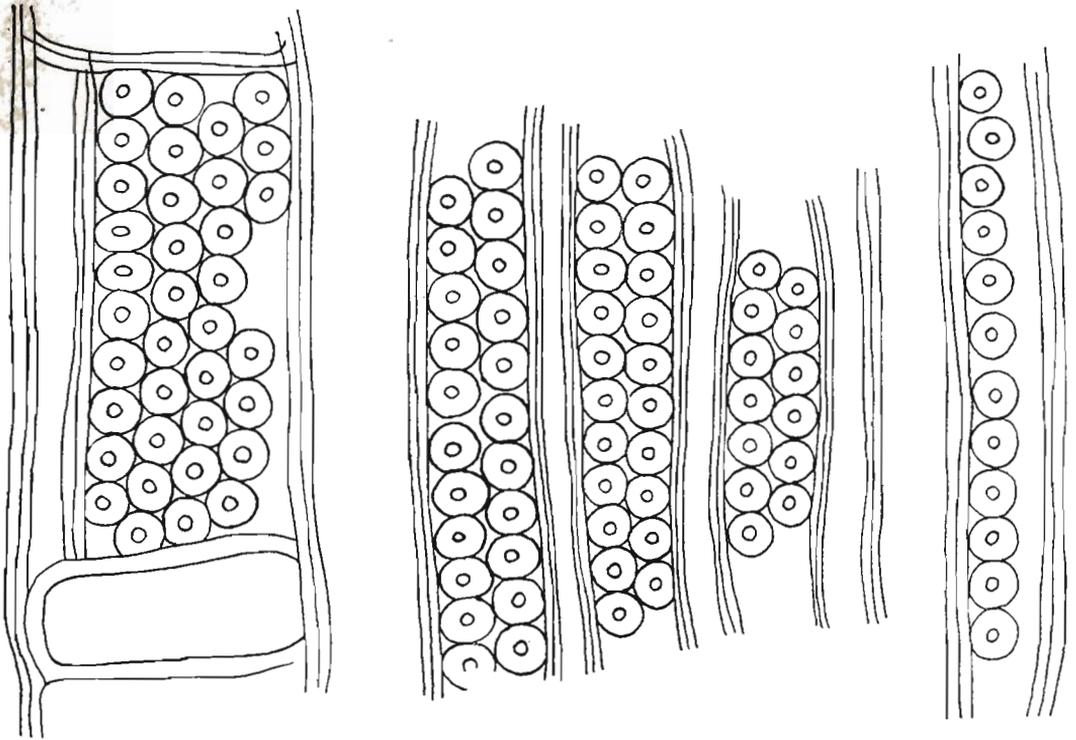
The stem is cylindrical, about 10 cm. in length and 6 cm. in diameter. Secondary xylem, pith and primary xylem are well preserved but the cortical region is missing. The wood is almost black or dark brown in colour and the growth rings are not visible to the naked eye. Under the microscope, however, the growth rings are well marked and are not more than 3-4 cells in width.

Pith—The pith is solid and fairly large, about 1.5-2 cm. and is composed of round, slightly thick-walled cells which are loosely arranged, leaving intercellular spaces. In longitudinal section the pith cells are squarish to rectangular and arranged in tiers. A striking feature is the presence of secretory sacs scattered in the outer region of the pith (PL. 1, FIG. 1). The secretory sacs vary in size and are surrounded by small rectangular cells. Sclerotic nests or the secretory cells which are characteristic of *D. zaleskyi* and *D. indicum* respectively are absent.

Primary Xylem—The primary xylem, which is about 5-12 cells deep, projects into the pith at some places and forms a continuous ring (PL. 1, FIG. 1). The xylem elements are 4 to 5-sided and are smaller and less thickened than the secondary xylem elements. The primary xylem is distinct even in a transverse section. In longitudinal section the protoxylem appears to be endarch showing spiral thickening. The other elements of the primary xylem show scalariform thickening (PL. 1, FIG. 4). No transfusion tissue is present as is the case in *D. indicum*.

Secondary Wood—It abuts directly on the primary xylem. Growth rings are well marked under the microscope (PL. 1, FIG. 3). The spring wood zone is broader, 35-45 cells deep and the tracheids are thick-walled, rectangular to squarish and 38-45 μ across with small circular lumen in the centre. The autumn wood zone is narrow, about 3-6 cells broad (usually 2-4 cells) with tracheids comparatively smaller and transversely elongated. They measure 19-32 μ . Xylem parenchyma is absent.

Medullary rays are essentially uniseriate but rarely biseriate, the biseriate condition being confined only to one or two cells (PL. 1, FIG. 2). The rays are very low, 1-6 cells high (average 3 cells) and not crowded. The ray cells measure 30 \times 20 μ .



TEXT-FIG. 1 — Part of early wood tracheids in radial section showing uni- to multiseriate bordered pits. $\times 650$.

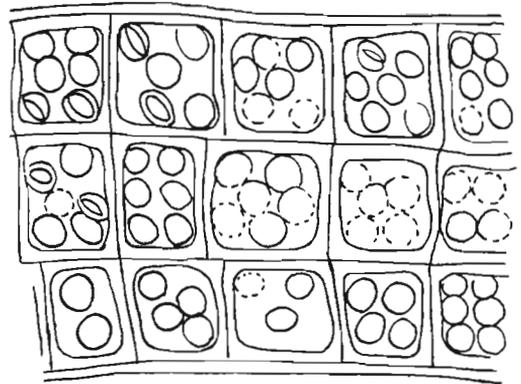
and are higher than broad. Pits in the field are 2-6 (usually 4), and bordered. The pore is rarely seen but appears to be elliptical and obliquely placed (PL. 1, FIG. 8; TEXT-FIG. 2).

Pits on the radial walls of the tracheids are usually bi- to triseriate, seldom uniseriate. Pits more than 3 in a row are also frequently met with (PL. 1, FIG. 6). When uniseriate, they are round to elliptic and separate or contiguous (TEXT-FIG. 1). In biseriate tracheids pits are alternate, rarely opposite or sub-opposite (PL. 1, FIG. 7), contiguous, usually round to elliptic and sometimes form hexagons. When triseriate or more, pits are alternate, contiguous and round or elliptic. Pore circular or oblique and measures 3-4 μ in diameter.

Another striking feature of the wood is that a few late wood tracheids show small circular pits on their tangential walls (PL. 1, FIG. 5). They are, however, rare, few in number, bordered and contiguous or well spaced.

Diagnosis — Secretory sacs in the pith; primary xylem endarch and in a continuous

ring; medullary rays short, 1-6 cells high, uniseriate, rarely biseriate; pitting in the radial walls of the tracheids uni- to bi-, or triseriate or more, pits circular or elliptical, separate or contiguous, alternate, rarely opposite or sub-opposite. Pits in the field 2-6, usually 4, pore elliptical and obliquely



TEXT-FIG. 2 — Pits in the field. $\times 650$.

placed; pits on the tangential walls of the tracheids present.

Locality—18th coal seam, Kharkhari colliery, Jharia coalfield, Bihar.

Type Specimen No. 21773.

COMPARISON

Dadoxylon jhariense shows clear affinities with the *Dadoxyla* of the southern hemisphere but it is not referable to any of the known species.

Of the three known Indian species, *D. indicum* is distinguished by the absence of secretory sacs in the pith, presence of transfusion tissue in the primary xylem and its localization into bundles. The secondary wood has also points of differences. In *D. indicum* tracheids are unpitted tangentially and uni- to biseriate. The two species, however, show well-marked growth rings and very low rays. In *D. bengalense* Holden only secondary wood is known but it is quite distinct from *D. jhariense*. In *D. bengalense* growth rings are remarkably broad, pits are usually small, confined to the radial walls and are in groups of 2-5. They are invariably opposite. The medullary rays are always uniseriate and range from 1 to 20 cells in height. The third species, *D. zaleskyi* Sahni, possesses no secretory elements but is characterized by the presence of sclerotic nests in the pith. The tracheids show

pitting only on the radial walls. Also the pits are 1 to 4-seriate and mostly of rounded distant type. *D. jhariense* resembles the three Indian species only in the possession of well-marked growth rings, but it is at once distinguished from them by the presence of secretory sacs in the pith and pits on the tangential walls of the tracheids. The latter character is known in *D. chaneyi* Daugherty from the Upper Triassic of Arizona.

Dadoxylon arberi Seward, which is based on an Australian specimen, differ from *D. jhariense* in the possession of higher medullary rays and in the tendency of the bordered pits to form groups. Another species from Australia, *Dadoxylon krauseli* Sahni, also differs from our wood in the occurrence of pits only on the radial walls, presence of rims of Sanio and high medullary rays.

The Brazilian species *Dadoxylon pedroi* Zeiller resembles *Dadoxylon jhariense* in the possession of secretory sacs in the pith and 1 to 2-seriate medullary rays. The Brazilian species, however, is clearly distinguished from our species by the presence of three equidistant bays in the pith and less numerous and less crowded pits on the radial walls of the tracheids.

Thus the present fossil wood differs from all the known southern species of *Dadoxylon* and is, therefore, described here under a new specific name.

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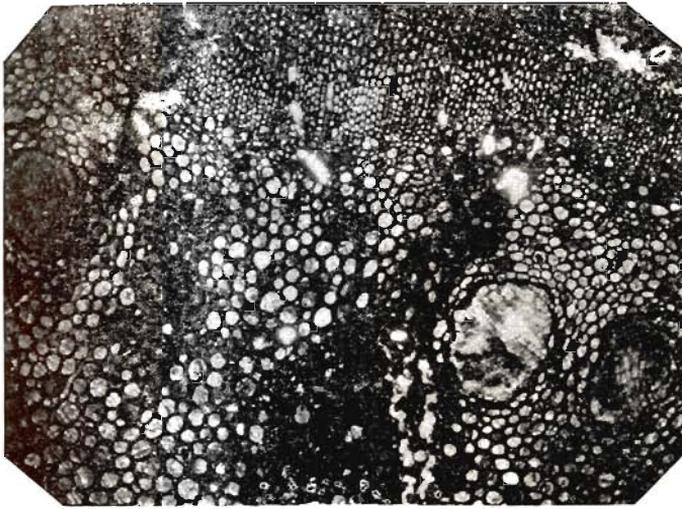
EXPLANATION OF PLATE I

Dadoxylon jhariense sp. nov.

1. A part of the stem in transverse section enlarged to show the secretory sacs in the pith, a continuous ring of primary xylem and part of the secondary xylem. $\times 30$.

2. A part of secondary xylem in tangential section showing uni- to biseriate and very low medullary rays. $\times 90$.

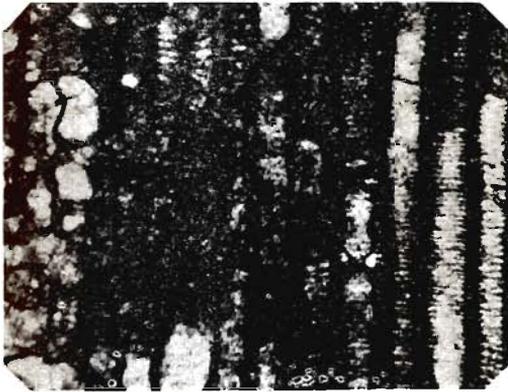
3. A part of the stem showing a well-marked growth ring with spring wood comparatively much more developed than the autumn wood. $\times 50$.



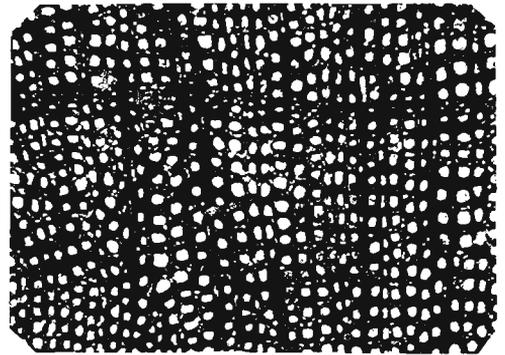
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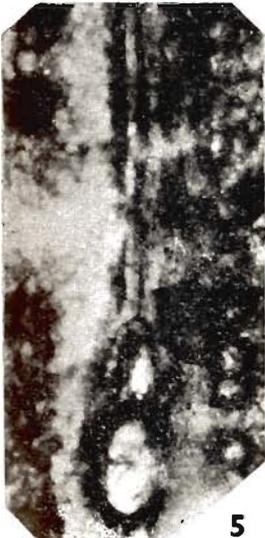
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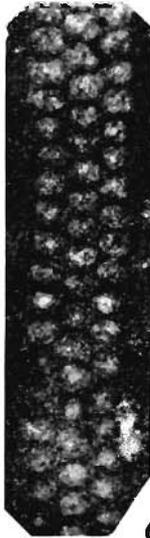
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6



7



8

4. Longitudinal radial section through the pith, protoxylem and primary xylem. $\times 100$.
5. Longitudinal tangential section showing round, bordered pits on the tangential wall of the tracheids. $\times 400$.
6. Part of radial section enlarged, showing triseriate, alternate, circular pits in spring wood tracheids. $\times 400$.
7. Another tracheid in radial section showing biseriate, opposite, separate and circular pits. $\times 400$.
8. Radial longitudinal section showing field pitting and tracheid pitting. $\times 400$.