

PALMOXYLON MOHGAONENSIS, A NEW SPECIES OF PETRIFIED PALM STEMS FROM THE DECCAN INTERTRAPPEAN SERIES OF INDIA

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ABSTRACT

The paper describes in detail a fossil palm wood *Palmoxylon mohgaonensis* from the Deccan Intertrappean series of India. The distinguishing characters of the present species are the oval shape of the dermal bundles. Fibrous bundles are present without stegmata. Leaf traces are absent in the dermal region. Ground parenchyma is made up of round cells, elongated cells are absent. Fibrous and medullary bundles are absent in the roots. It is comparable to *P. surangei* Lakhanpal and *P. cordatum* Trivedi and Surange (in press) in the sub-group cordata of petrified palm stems.

INTRODUCTION

IN December 1965 one of us (B.S.T.) paid a visit to Mohgaon Kalan Distt. Chhindwara, Madhya Pradesh, and collected a large number of petrified plant specimens, quite a few of these are palms; some of them are well preserved. This collection has many species which appear to be distinct from those already known from this locality. We have already described *P. cordatum* sp. nov. (in press), another new species *P. mohgaonensis* is being described here.

DESCRIPTION

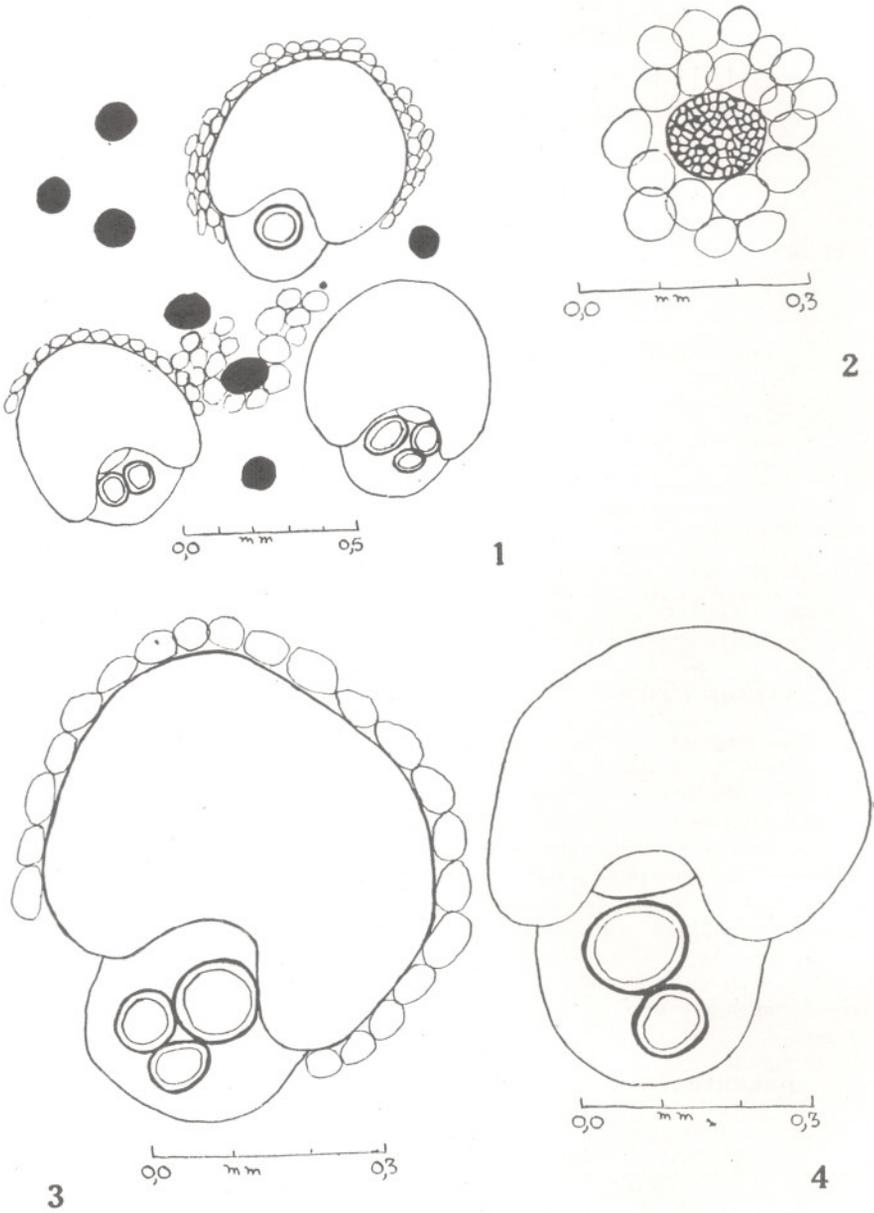
In the main the terminology used here is the same as suggested by Sahni (1943, 1964).

External Characters — The specimen is a small stump, which before sectioning measured 5.5 cm. in length and 5 cm. in diameter at the base. A thick mantle of adventitious roots surrounded the stump. The specimen consists mostly of roots with a little dermal region. Cortical zone is crushed, subdermal and central zones are missing from the specimen.

Dermal Zone — (TEXT-FIGS. 1-4). It extends to about 1.5 mm. radially. There are 60-65 bundles per cm.². The fibrovas-

cular bundles are oval with lunate dorsal caps. They measure $712\mu \times 436\mu$. The F/v ratio of an average bundle is about 5.5/1. Sclerenchyma is angular, and the tabular parenchyma is present. The phloem is poorly preserved and is mostly disorganized. The xylem usually consists of 2-3 vessels which are excluded. Leaf traces are not seen. Fibrous bundles few ($256\mu \times 210\mu$), these occur scattered here and there (TEXT-FIGS. 1-2). Stegmata are absent. Ground parenchyma is made up of big oval-round cells. Elongated cell are absent.

Roots — (TEXT-FIGS. 5-7). The roots are closely packed and get deformed by close crowding. They are about 3-4 mm. in diameter as seen in cross section. In roots the hypodermis is 6-10 layered and is sclerenchymatous. Next to this is cortex which can be distinguished into 3 parts — outer, middle and inner (TEXT-FIGS. 5, 6, *oc, mc, ic*). The outer cortex is about 3-4 layered and is made up of round parenchymatous cells; the middle cortex is quite broad and is made up of thick, round parenchyma cells with air cavities regularly distributed in it. The inner cortex is compact and cannot be clearly made out. Fibre bundles are absent from the cortex. Both the endodermis and pericycle are single layered. The vascular cylinder is made up of about 18-20 bundles with xylem and phloem alternating and both arranged in a circle. Each xylem bundle usually contains one big vessel surrounded by conjunctive parenchyma. The vessels are oval in cross section and measure $148\mu \times 112\mu$. Phloem bundles are not well preserved and occur as small patches. Conjunctive parenchyma is made up of thick, polygonal cells covering the bundles. Small pith is present in the centre without medullary bundles.



TEXT-FIGS. 1-4—1. Cross-section of stem showing dermal zone. Note the presence of fibre bundles. 2. A fibrous bundle in cross section. 3, 4. Two fibro-vascular bundles from the dermal zone.

DISCUSSION

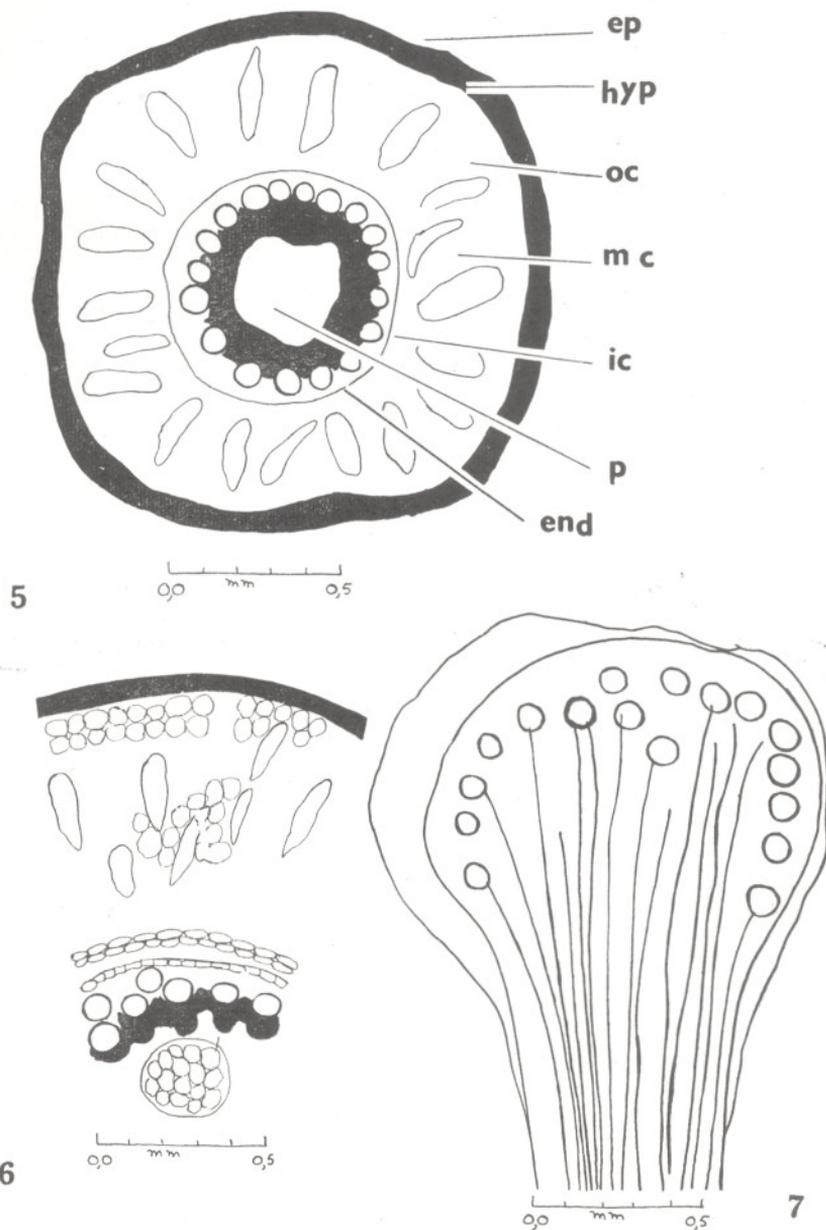
Petrified palm stems are all grouped under the form genus *Palmoxylon*. Kaul in 1935 tentatively suggested that these could be split up into various genera on the basis

of the structure of their ground tissue but as no detailed treatment of this nature is available, we are unable to utilize this character in the study of palm anatomy. For generic identification, therefore, the only course open is to classify the genus

TABLE 1 — SHOWING THE CHARACTERS OF THE VARIOUS SPECIES OF PALMOXYLON WITHIN THE SUBGROUP CORDATA

Name of the species	Parts available	Fibre bundles and stigmata	F/v ratio	Median sinus	Auricular sinuses; lobes	Vascular parts of F.v.b. and their number	Distribution of fibrovascular bundles per cm ²	Ground tissue			Locality and horizon
								General parenchyma	Tabular parenchyma	Radiate parenchyma	
<i>Palmoxylon mohgaonensis</i> sp. nov.	Dermal region of stem with roots attached	Present without stigmata	5·5/1 dermal region	Cordate	: lobes round	Excluded, usually 2-3 vessels	60-65 dermal region	Round cells	Present	Absent	Mohgaon Kalan. Deccan Intertrappean series
* <i>P. cordatum</i> Trivedi & Surange	Complete specimen with roots attached	Both present	5/1 outer dermal region 8/1 inner dermal region 5/1 to 6/1 subdermal region 3/1 to 4·5/1 central region	Cordate	obtuse; lobes round	Excluded, usually 2-3 large vessels	80-90 outer dermal region 55-60 inner dermal region 45-50 subdermal region 18-20 central region	Compact cells round to elongated	Present round the fibrovascular bundles	Present on ventral side of fibrovascular bundles	Mohgaon Kalan. Deccan Intertrappean series
<i>P. surangei</i> Lakhanpal	Complete specimen with roots attached	Both present	7/8 outer dermal region 7/1 inner dermal region 5/1 to 6/1 subdermal region 4/1 central region	Rounded cordate	Obtuse; lobes round	Excluded, 1-4 normally 2-3 vessels	140 outer dermal region 90-95 inner dermal region 45-50 subdermal region 25 central region	Isodiametric to rectangular	Present	Present	Keria, Chhindwara District, M.P. Deccan Intertrappean series
<i>P. sclerodermum</i> Sahni	Dermal and part of subdermal	Present, no stigmata	12/1 to 15/1 dermal region	Obtuse-angled	: lobes broadly rounded	Scarcely exerted; one large vessel	108 or 192-200 crowded dermal region 55-60 less crowded dermal region	Compact	Absent	Absent	Seoni, M.P. Deccan Intertrappean series
<i>P. prismaticum</i> Sahni	Dermal, sub-dermal and central regions with roots attached	Present with stigmata	5 to 6/1 dermal region 4·5/1 to 5/1 central region	Sinus small, angular or slightly rounded	Absent, lobes rounded	Exserted, usually 2 large vessels	71-85 dermal region 37-41 subdermal region 30-34 central region	Compact in dermal region, palisade like in subdermal, irregular in central	2-3 layers round the entire bundles in dermal region	Present round the xylem and subdermal bundles	Unknown
<i>P. intertrappeum</i> Sahni	Complete basal part of trunk, with leaf scars but not roots	Present without stigmata	32 to 16/1 dermal region 9 to 10/1 subdermal region	Sinus small, angular	: lobes rounded	Univessel in dermal, bivessel in subdermal	140 dermal region 19-21 subdermal region	Compact in dermal region, lacunar in subdermal with rod like to variously shaped cells.	—	—	Sindhi Vihira, Wardha District, M.P. Deccan Intertrappean series

*MS. in press.



TEXT-FIGS. 5-7—5. Cross-section of root showing epiblema—*ep*, hypodermis—*hyp*, outer cortex—*oc*, middle cortex with air spaces—*mc*, inner cortex—*ic*, endodermis—*end*, and pith—*p*. 6. Sector of root magnified showing the same. 7. Root cut in L.S. showing the origin of root traces.

artificially. For this purpose Professor Sahni's scheme (1943 pp. 218-219) based essentially on the classifications of Von Mohl (1845) and Stenzel (1904) is adopted as it is both convenient and useful. Ac-

cording to this scheme *P. mohgaonensis* falls under the sub-group cordata.

Of the already described *Palmoxylo* from India, only *P. surangei* Laxhanpal, *P. sclerodermum* Sahni & Shukla, *P. prismaticum*

Sahni, *P. intertrappeum* Sahni, *P. compactum* Sahni and *P. geometricum* Sahni come under the sub-group cordata. As the present species possesses only the dermal zone, it may not be worth while to compare it with *P. compactum* and *P. geometricum* because in the former only the subdermal and in the latter the central zone is preserved. As *P. mohgaonensis* closely resembles *P. surangei* and *P. cordatum* (in press) it is, therefore, compared with them in detail.

P. surangei (LAKHANPAL, 1955) resembles *P. mohgaonensis* in (1) the general appearance, orientation and distribution of fibrovascular bundles, (2) presence of fibre bundles and (3) in the number of metaxylem elements (about 2.3 vessels are present in both the species). However, in many other characters the two species are quite distinct; these are mentioned below.

Fibrovascular bundles are densely crowded at the periphery and are less crowded towards the centre in the dermal zone of *P. surangei* while they are evenly distributed in the dermal zone of *P. mohgaonensis*. The distribution of bundles per cm.² is more in *P. surangei* (about 90-95 per cm.² in the less crowded and 140 in the crowded dermal regions) whereas in *P. mohgaonensis* it is 60-65 bundles per cm.². Fibrovascular bundles are elongated at periphery and oval in the centre of the dermal zone of *P. surangei* whereas they are oval in *P. mohgaonensis*. F/v ratio of dermal bundles in *P. surangei* is 7/8 in exterior and 7/1 in interior regions whereas in *P. mohgaonensis* it is 5.5/1. Stegmata are present in the fibre bundles of *P. surangei* while they are absent in *P. mohgaonensis*. The ground parenchyma round the bundles is radially elongated in *P. surangei* whereas it consists of round cells in *P. mohgaonensis*.

In the roots of *P. surangei* fibrous bundles are present in the middle cortex whereas no such bundles occur in the roots of *P. mohgaonensis*. Another important difference is the presence of medullary bundles in the pith region of *P. surangei*. Such bundles have not been recorded in *P. mohgaonensis*.

P. cordatum Trivedi & Surange (in press) resembles *P. mohgaonensis* in the general shape of the bundles, presence of fibre bundles and also in the general structure and presence of roots but in other characters the two species are quite distinct.

The distribution of bundles per cm.² in *P. cordatum* is 80-90 in outer and 55-60 in inner dermal regions whereas it is 60-65 per cm.² in *P. mohgaonensis*. The F/v ratio of dermal bundles is 5/1 in outer region and increases to 8/1 in the inner region of *P. cordatum* whereas it is 5.5/1 in *P. mohgaonensis*. Fibrous bundles with stigmata are present in *P. cordatum* while in *P. mohgaonensis* fibrous bundles are present without stigmata. In *P. cordatum* ground tissue consists of elongated parenchyma cells whereas in *P. mohgaonensis* no elongated cells are present. Leaf trace bundles occur in *P. cordatum* whereas they are not seen in *P. mohgaonensis*.

The rest of the species have been compared briefly and the comparison is shown in a tabular form.

DIAGNOSIS

Genus — *Palmoxylon*
Sub-group — *Cordata*

Palmoxylon mohgaonensis sp. nov.

Plate I, Text-figs. 1-7

Stem in type specimen 5 cm. in diameter, cortex present but disorganized, the fibrovascular bundles in dermal zone 60-65 per cm.² F/v ratio 5.5/1. Sclerenchyma angular, tabular parenchyma present. Xylem with 2-3 vessels excluded. Presence of fibrous bundles without stigmata. Ground parenchyma of only round-oval cells, there being no elongated tissue.

Roots 3-4 mm. in diameter. Cortex made up of three zones, outer, middle and inner, middle cortex with air cavities. Pith present without medullary bundles.

Locality — Mohgaon Kalan.

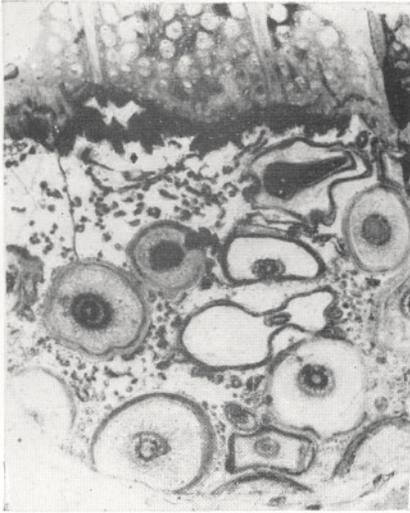
Horizon — Deccan Intertrappean series.

Collection — B. S. Trivedi. Specimen no. 12 with the author.

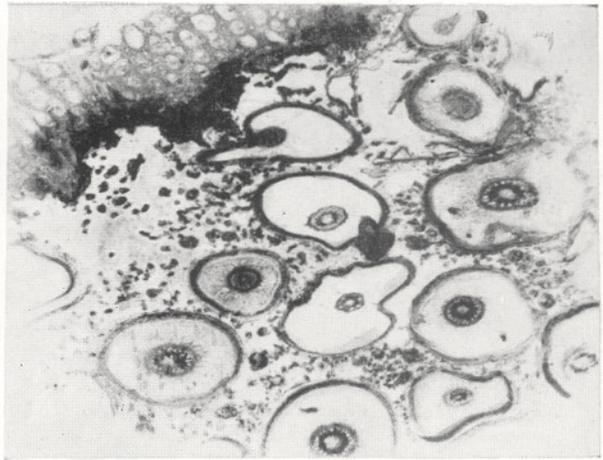
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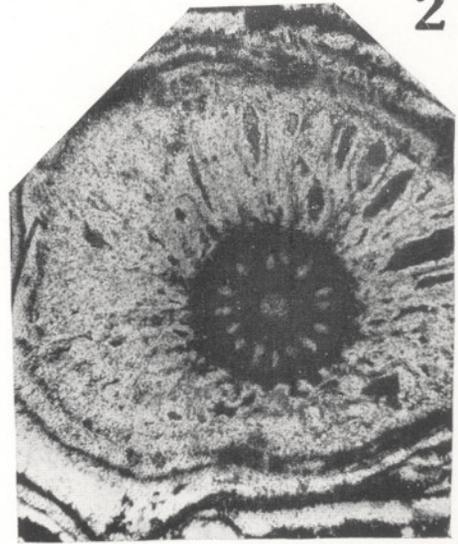
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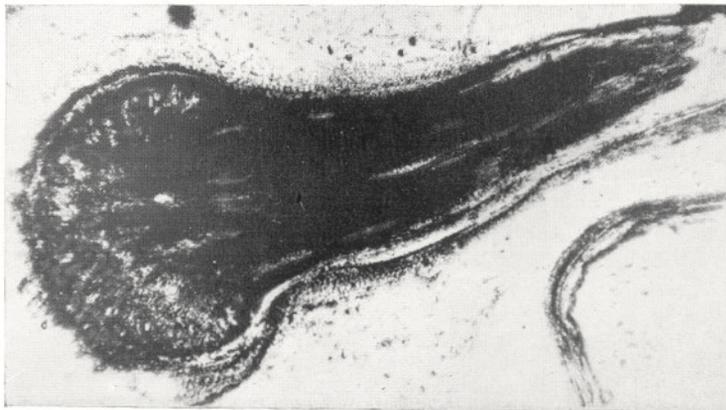
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EXPLANATION OF PLATE 1

Palmoxylon mohgaonensis sp. nov.

1. Part of cross section of stem showing dermal vascular zone and roots in varying stages of development $\times 4$.
2. The same $\times 4$.
3. Cross section of stem showing dermal zone enlarged $\times 290$.
4. One complete root in cross section. Note cortex and stele $\times 290$.
5. A root in cross section showing the origin of a rootlet from the stele $\times 290$.