PALMOXYLON EOCENUM SP. NOV. FROM THE DECCAN INTERTRAPPEAN BEDS OF MAHURZARI

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ABSTRACT

A new species of petrified palm stems, *Palmoxylon eocenum*, is described here from the Deccan Intertrappean beds of Mahurzari. Only a few fossil plants are so far known from this locality.

INTRODUCTION

THE present paper deals with a new species of petrified palm stems, *Palmoxylon eocenum*, from Mahurzari in the Deccan Intertrappean Series of Maharashtra State. So far only flowers of *Sahnipushpam* (PRAKASH, 1955) and dicot woods of *Glochidioxylon sahnii* (PRAKASH, 1959), *Barringtonioxylon deccanense* (SHALLOM, 1960) and *Ailanthoxylon mahurzarii* (SHALLOM, 1961) are known from Mahurzari.

DESCRIPTION

Monocotyledoneae

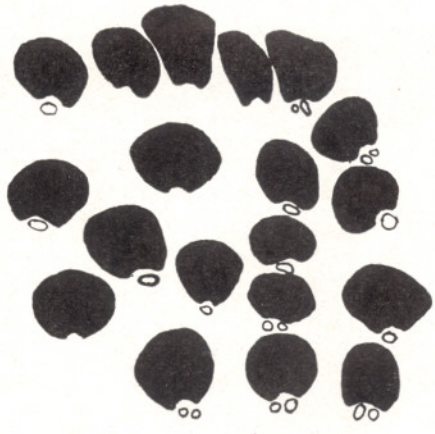
Palmae

Palmoxylon eocenum SP. NOV.

The present species is represented by two petrified pieces of wood which measure about 12 cm. in diameter. One of them represents only the central region, while the other represents both the dermal and subdermal regions. Unfortunately the cortical region is not preserved. The preservation of the wood is quite good so as to reveal all the anatomical details.

Dermal Zone — The preservation of this region is not very satisfactory. In cross-section the fibrovascular bundles are crowded and normally oriented (PL. 1, FIG. 3; TEXT-FIG. 1). They are small, 288-560 μ in size and possess 1-2 vessels (PL. 1, FIG. 6; TEXT-FIG. 1). The auricular lobes of the fibrovascular bundles are round to bluntly pointed. The bundles are 300 to 366 per cm.^{2} and their f/v ratio is 6·5 : 1 to 10·5 : 1. No stegmata or tabular parenchyma is to be seen in association with the fibrovascular bundles. Purely fibrous bundles are also not seen. The ground tissue is badly preserved and it is rather difficult to say anything definite about its nature.

Subdermal Zone — The fibrovascular bundles (PL. 1, FIGS. 3, 5) are usually normally oriented and more distantly placed, being 66 to 132 per cm.^{2}. The neighbouring bundles are only 0·15-1·2 mm. apart. They are usually orbicular to obovate in shape (PL. 1, FIGS. 3, 5). However, the elliptical bundles are also often present. The bundles are 528-944 μ in size and their f/v ratio is 3 : 1 to 6 : 1. A few small fibrovascular bundles, 240-400 μ in size, are irregularly oriented among the bigger bundles. A peculiar bundle showing vessels on both the dorsal and ventral sides of the fibrous part is also seen in this region (PL. 1, FIG. 7). It seems that the two neighbouring bundles have fused here by their dorsal sclerenchyma. The vascular part of the fibrovascular bundles



TEXT-FIG. 1 — Distribution of the fibrovascular bundles in the dermal zone. Sclerenchyma solid black, xylem parenchyma and phloem patch left unshaded. ×20.

consists mostly of two big, round to oval vessels which lie side by side (PL. 1, FIG. 5) and in general completely excluded. The auricular lobes of the bundles are round to bluntly pointed and the median sinus is concave (PL. 1, FIGS. 3, 5). Xylem parenchyma is well preserved but the phloem tissue is rarely preserved in small patches. Radiating parenchyma is present in a number of bundles. The tabular parenchyma is also seen round the fibrous part of a number of bundles, and it is only one cell thick. There are no purely fibrous bundles and the leaf-traces are sporadic. Stegmata are also absent.

The ground tissue (PL. 1, FIG. 5) is quite distinct and shows lacunate condition due to the formation of intercellular spaces.

Central Zone — The cross-section (PL. 1, FIGS. 1, 4) shows large number of rather widely scattered fibrovascular bundles with irregular orientation in a well-preserved lacunate ground tissue. The fibrovascular bundles (PL. 1, FIGS. 1, 2, 4) are orbicular, often somewhat reniform in shape and 600-1072 μ in size. A small bundle, measuring 400×272 μ, is also seen among the big bundles. The bundles are 30 to 60 per cm.^{2} and 0·3-3·2 mm. apart. Mostly they possess two big, oval or circular vessels (PL. 1, FIGS. 1, 2) placed side by side and partly included or wholly excluded. The auricular lobes are round to bluntly pointed and the median sinus is concave (PL. 1, FIGS. 1, 2). F/v ratio is mostly 2·5 : 1 to 3·5 : 1. Xylem parenchyma is well preserved while the phloem is not at all preserved. The radiating parenchyma is present round the vascular part of the bundles (PL. 1, FIGS. 1, 2) but tabular parenchyma is only sometimes seen. The fibrous bundles and the stegmata are also not seen.

The ground tissue consists of narrow more or less rectangular to Y-shaped cells forming loose meshes with conspicuous intercellular spaces, big enough to be visible to the naked eye (0·016-0·35 mm.). Very rarely the cells between the neighbouring bundles are quite rectangular and closely arranged, leaving very small and narrow lacunae. In longitudinal sections (PL. 1, FIG. 8), the cells of the ground tissue are small, spherical or tangentially elongated with somewhat rounded ends. They are usually arranged in tiers.

The pitting of the protoxylem vessels is of spiral type, and that of the metaxylem vessels is of scalariform type.

The leaf-traces are frequent and show both the dorsal and ventral patches of sclerenchyma with a number of small vessels in addition to big ones in a more or less protruded xylem region (PL. 1 FIG. 1).

DISCUSSION

Various artificial schemes for the classification of Palmoxyla are known, but the one put forth by Professor Sahni in 1943 is based jointly on the classifications of Von Mohl (1849) and Stenzel (1904). According to this scheme, *Palmoxylon eocenum* falls under the subgroup *Reniformia*.

Comparison with the Indian Palmoxyla — *Palmoxylon chhindwarense* (PRAKASH, 1960), also described from the Deccan Intertrappean Series, resembles our fossil in (i) the orientation, distribution and general appearance of the fibrovascular bundles especially of the central zone; (ii) the general form of the leaf-trace bundles; (iii) the f/v ratio of the bundles; and (iv) the type of the lacunar ground tissue. The two species, however, differ from each other in a number of important features. The distinguishing characters are: the absence of radiating parenchyma and the presence of well-developed tabular parenchyma in association with the fibrovascular bundles in *P. chhindwarense*; the comparatively high frequency (297-625; 156-250; 60-130 per cm.^{2}) of the fibrovascular bundles in *P. chhindwarense*; and orbicular to obovate shape of the fibrovascular bundles of the subdermal zone in *P. eocenum* as opposed to variously shaped bundles often with one or more flat sides, in the corresponding region of *P. chhindwarense*.

With *P. arcotense* Ramanujam (1953) also the Mahurzari palm wood shows some resemblances in (i) the orientation, distribution and slightly in the general form of the fibrovascular bundles; (ii) the general form of the leaf-trace bundles; and (iii) the nature of the ground tissue. However, *P. arcotense* differs from *P. eocenum* in the presence of very small (50-100 μ; 175 μ; 100-200 μ) fibrovascular bundles with elliptical to circular vessels, in the low frequency of the bundles (110; 50-65; 20-25 per cm.^{2}), in the high f/v ratio of the bundles (15: 1; 8: 1 to 5: 1; 3: 1 to 2: 1), and in the absence of radiating parenchyma round the vascular part of the fibrovascular bundles.

The palm woods, *Palmoxylon sclerodermum* (SAHNI, 1943; SHUKLA, 1946) and *P. surangei* (LAKHANPAL, 1955), also known from the Deccan Intertrappean beds and belonging to subgroup *Cordata*, differ from our fossil in a number of characters, particularly in the absence of lacunar ground tissue which is a characteristic feature of Mahurzari palm.

Comparison with Foreign Palmoxyla — Of the foreign species *Palmoxylon remotum* (STENZEL, 1904) and *P. ligerinum* Crie redescribed by Stockmans and Williere (1943) can, to some extent, be compared with the Intertrappean species.

In the general form of the lacunar ground parenchyma our fossil resembles *Palmoxylon remotum*. However, in *P. remotum* the median sinus is flat (*Complanata-type*), the vascular part shows a number of vessels closely packed together and some punctate cells are present in the ground tissue.

Palmoxylon ligerinum agrees slightly with our fossil in the nature of the ground tissue. Both the species, in their longitudinal sections, show spherical and tangentially elongated cells. However, the important differences are: (i) the presence of purely fibrous bundles in *P. ligerinum*; (ii) the shape of the bundles in *P. ligerinum*, the fibrous part being hemispherical with a typically flat median sinus (*Complanata-type*); and (iii) the presence of 1-3 layers of tabular parenchyma round the fibrous part of the bundles in *P. ligerinum*. However, in *P. eocenum* there is also a single layer of tabular parenchyma round the fibrous part of some of the bundles in subdermal zone.

DIAGNOSIS

Genus—*Palmoxylon* Schenk
Subgroup—*Reniformia*

Palmoxylon eocenum SP. NOV.

Fibrovascular bundles in the dermal zone normally oriented, crowded; usually oval, 288-560 μ in size and 300-366 per cm.^{2}; f/v ratio 6·5 : 1 to 10·5 : 1; 1-2 vessels in each bundle; purely fibrous bundles and stegmata absent; nature of ground tissue not known due to bad preservation.

Fibrovascular bundles in the subdermal zone slightly sparse, 66-132 per cm.^{2}; normally oriented, 528-944 μ in size, generally orbicular to obovate, although elliptical bundles also frequently present; f/v ratio 3 : 1 to 6 : 1; both radiating and tabular parenchyma present in some of the bundles, tabular parenchyma usually one-layered; ground tissue lacunar; leaf-traces sporadic; purely fibrous bundles and stegmata absent.

Fibrovascular bundles in the central zone 30-60 per cm.^{2}; 600-1072 μ in size, irregularly oriented, orbicular to reniform; f/v ratio 2·5 : 1 to 3·5 : 1; radiating parenchyma well-developed; tabular parenchyma occasionally present; ground tissue highly lacunate with lacunae (up to 0·35 mm.) formed by a network of narrow, more or less rectangular to Y-shaped cells; leaf-traces present; fibrous bundles and stegmata absent.

Locality — Mahurzari (21°14'N.; 79°1'E.) in Nagpur district of Maharashtra State.

Horizon — Deccan Intertrappean Series.

Age — Early Tertiary (probably Eocene).

Syntypes — B.S.I.P. Museum Nos. 10482, 31581.

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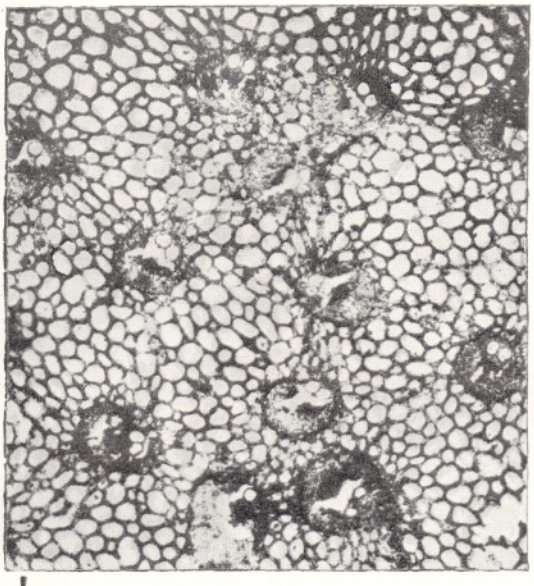

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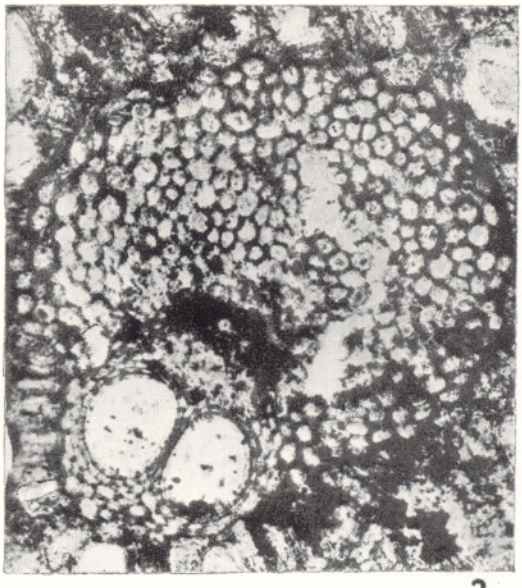

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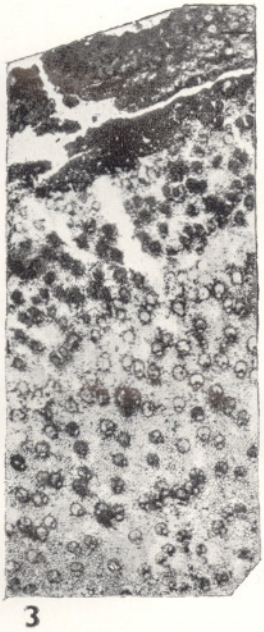

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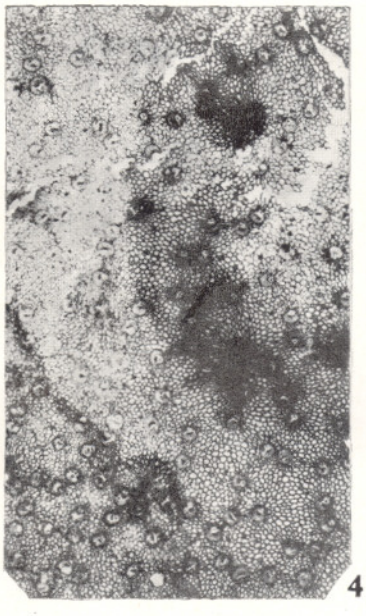

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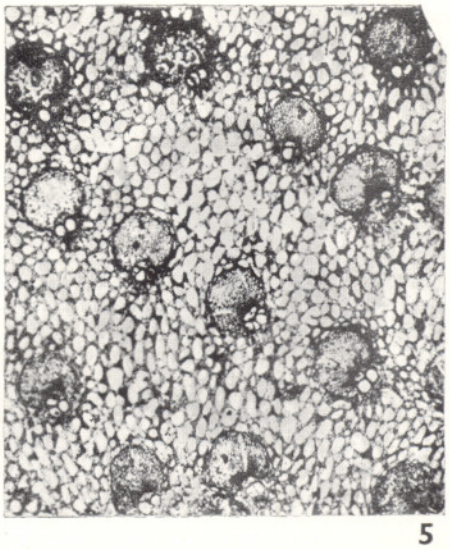

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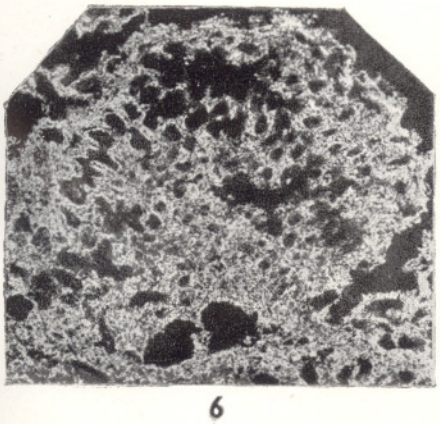

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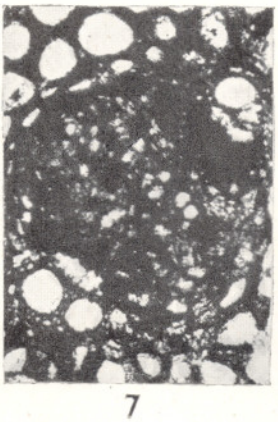

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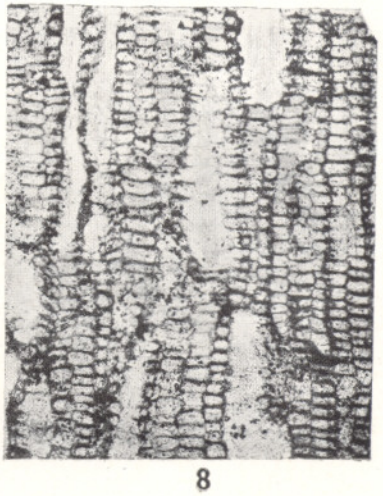

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EXPLANATION OF PLATE 1

Palmoxylon eocenum sp. nov.

1. Central region enlarged. × 10.
2. A fibrovascular bundle from the central region. × 75.
3. Cross-section of the palm stem showing dermal and subdermal regions. × 2.
4. Cross-section of the central region showing irregular distribution of the fibrovascular bundles. × 2·5.
5. Subdermal region enlarged. × 10.
6. A fibrovascular bundle from the dermal region. × 90.
7. A fibrovascular bundle from the subdermal region showing vessels on both dorsal and ventral sides. × 35.
8. Longitudinal section of the wood in low power. × 26.