A NEW SPECIES OF PETRIFIED PALM STEM *PALMOXYLON KERIENSE* Sp. Nov. FROM KERIA, DECCAN INTERTRAPPEAN BEDS OF M.P., INDIA

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A new species of petrified palm stem *Palmoxylon keriense* from Keria, M.P., is described here. The species is characterized by the possession of 2–6 metaxylem elements, porous ground tissue and less lignified dorsal sclerenchyma, it is probably a Cocoslike palm belonging to the tribe Cocoideae.

INTRODUCTION

The specimen described here was collected by us in December 1968 from Keria, a village about 3 km from Mohgaon Kalan in Chhindwara district, M.P. This locality is very rich in fossil woods, where dicots preponderate over the monocots. The present specimen presumably represents the central region of the stem, because the fibrovascular bundles are irregularly distributed. The preservation of the specimen is excellent.

DESCRIPTION

MONOCOTYLEDONEAE

PALMAE

COCOIDEAE

Palmoxylon keriense sp. nov.

The specimen is quite large. Before sectioning, it was 4 cm thick and 9 cm in diameter. Fibrovascular bundles are quite large and can be seen by the naked eye; they are distributed irregularly.

Anatomy

Fibrovascular bundles and fibrous bundles, in cross-sections of the specimen, are distributed irregularly throughout the ground tissue (Fig. 1). Fibrovascular bundles are quite large, round to oval, and sometimes broadly elongate. They measure 2·75–3·5 mm in diameter. The average frequency of the bundle is 35–40 per cm^2 and their f/v ratio is 1 : 1–3 : 2. Dorsal sclerenchyma is variable, generally reniform. Auricular lobes are not well developed; median sinus is generally round, rarely concave; metaxylem vessels are two to six in number, placed side by side (Figs. 6–8; Pl. II, figs. 5, 6);

vessels are round to oval; phloem is well preserved in a single mass (not bilobed) and clearly visible (Figs. 7, 8; Plate II, fig. 5); radiating and tabular parenchyma both absent.

The cells of the dorsal sclerenchyma are hexagonal or polygonal and compact. These cells show very little lignification on their walls (Fig. 12) and appear like prosclerenchymatous cells. Sahni (1946) observed that in *P. sundaram* these cells are only partially lignified.

Purely fibrous bundles are present throughout the stem. Stegmata have been observed both on fibrous bundles as also on the outer margin of the fibrous parts of the fibrovascular bundles (Plate II, fig. 4). Leaf-trace bundles are also present throughout the zone (Fig. 2).

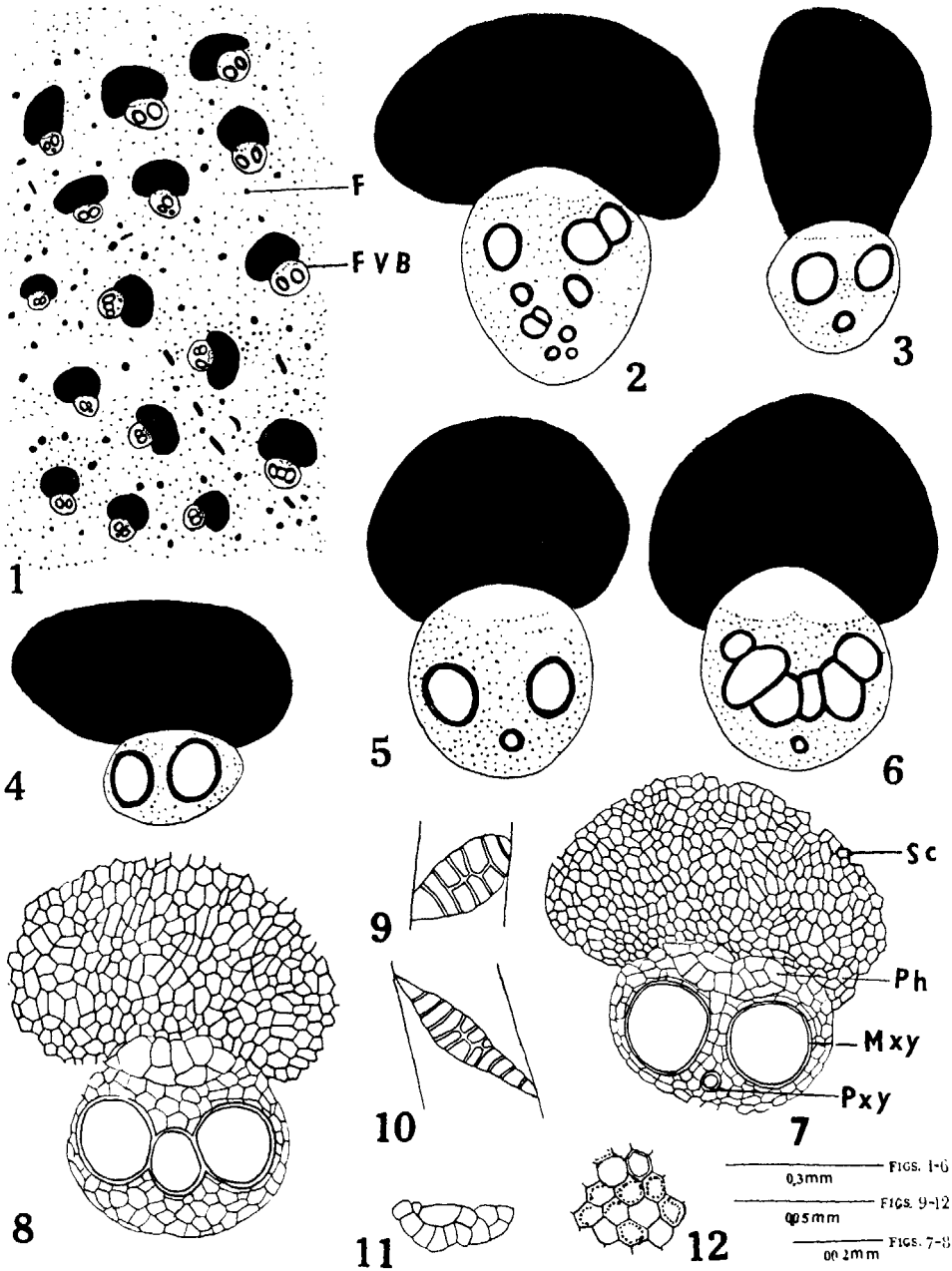
Ground tissue is lacunar; cells are polygonal, round, big and approximately uniform. In longitudinal section these cells are arranged in tiers.

The pitting of metaxylem vessels is multiseriate scalariform. The perforated end walls are obliquely placed and show series of parallel bars of thickening (Figs. 9, 10; Plate II, fig. 4); vertical communications are also quite frequent. Protoxylem elements show spiral thickening.

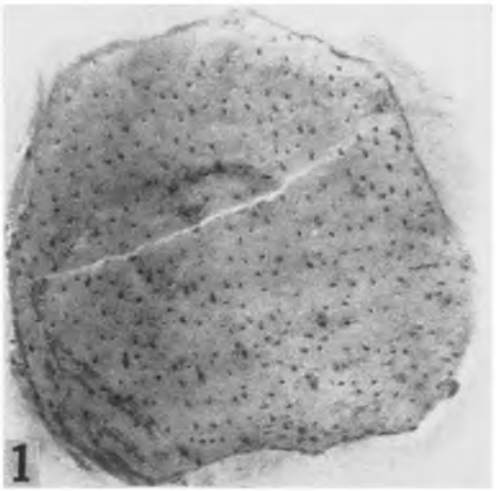
Discussion

Many species of the artificial genus *Palmoxylon* have been described from India and abroad (Lakhanpal 1954; Mohl 1845, 1849; Prakash 1958, 1961; Ramanujam 1953; Rao and Menon 1963, 1964; Rao and Achuthan 1969; Rode 1933; Sahni 1931, 1943, 1964; Schenk 1882; Shukla 1939; Stanzel 1904). Most of the species have lacunar ground tissue while few have compact ground tissue. The present species is characterized by the presence of porous or lacunar ground tissue. After a detailed comparison with all the known species of *Palmoxylon*, which have lacunar ground tissue, we found that our specimen is comparable to *Palmoxylon sundaram* Sahni (1946) and *P. sundaram* var. *vidarbhai* Rao and Menon (1964). A detailed comparison with these forms is given in Table I. Apart from this our specimen is characterized by the following: (i) Frequency and f/v ratio of the bundles; (ii) Larger size of the fibrovascular bundles; (iii) Form of dorsal sclerenchyma which is less lignified; (iv) Larger number of metaxylem vessels; (v) Presence of phloem cells as a single mass (not becoming bilobed); and (vi) Presence of fibrous bundles and stegmata, both on the outer margin of the fibrous part of the fibrovascular bundles and also on purely fibrous bundles.

The present specimen shows some similarity with *P. sundaram* in the general appearance and arrangement of the bundles, presence of fibrous bundles and stegmata on the outer surface of the fibrovascular bundles, absence of radiating and tabular parenchyma; but *P. keriense* differs from it in the larger size of its fibrovascular bundles (2·7 mm–3·5 mm), larger number of metaxylem vessels, presence of a single mass of phloem (not bilobed), absence



FIGS. 1–12. 1, a part of the central zone showing fibrovascular bundles and fibrous bundles; 2, leaf-trace bundle; 3–6, different kinds of fibrovascular bundles; 7–8, fibrovascular bundles showing all the tissues; 9–10, vessels placed obliquely showing parallel bars of thickening with vertical communications; 11, phloem cells enlarged; 12, few cells of dorsal sclerenchyma showing little lignification on their walls. (*F*, fibrous bundle; *FVB*, fibrovascular bundles; *Mxy*, metaxylem elements; *Ph*, phloem; *Pxy*, protoxylem; *Sc*, dorsal sclerenchyma).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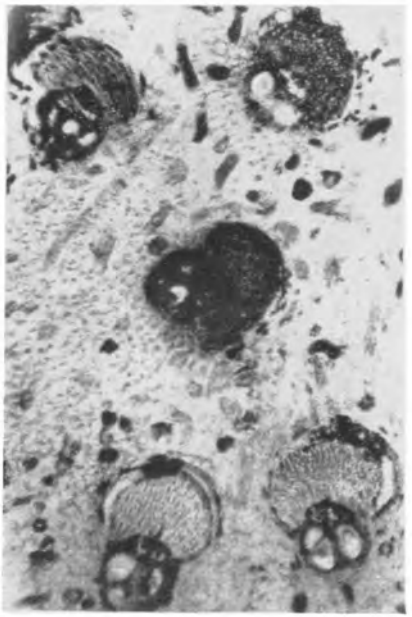
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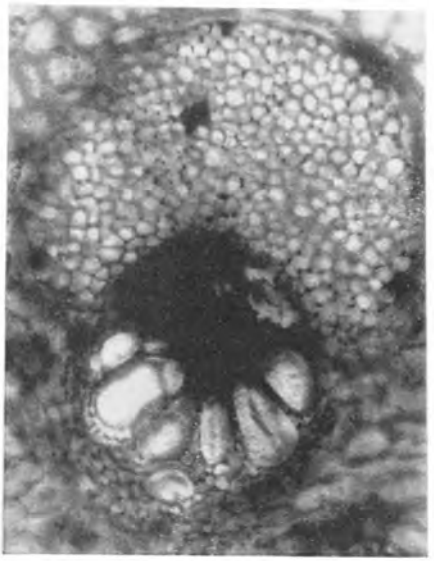
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of posterior sclerenchyma, presence of stegmata on the fibrous bundles and, lastly, in the absence of diminutive fibrovascular bundles.

TABLE I

Characters	*P.* (Cocos) *sundaram* Sahni (1946)	*P. sundaram* var. *vidarbhai* Rao and Menon (1964)	*P. keriense* sp. nov.
Parts	Different fragments of various zones are found	Probably subdermal or central	Central zone only
Frequency of fibrovascular bundles	35 per cm^2	80–100 per cm^2	35–40 per cm^2
f/v ratio of the bundles	1 : 1	1 : 2–1 : 1	1 : 1–3 : 2
Ground tissue:			
(i) General parenchyma	Extremely lacunar	Lacunar	Less lacunar
(ii) Radiating parenchyma	Absent	Absent	Absent
(iii) Tabular parenchyma	Absent	Absent	Absent
Size of the bundle	0·5–1 mm	0·25–0·6 mm	2·75–3·5 mm
Xylem vessels	2 only	2 only	2 but 5 to 6 vessels placed side by side are also common.
Phloem	Not preserved, bilobed	Preserved in few bundles, not bilobed	Very well preserved, not bilobed in any bundle
Posterior	Present only in leaf-trace bundles	Absent	Absent
Fibrous bundle and stegmata	Fibrous bundles present, stegmata are found only on the outer margin of the fibrous part of fibrovascular bundles	Fibrous bundles and stegmata both are absent	Fibrous bundles are present, stegmata are present both on the outer margin of fibrous part of the bundle and also on the fibrous bundles

Our specimen to some extent can be compared to *P. sundaram* var. *vidarbhai* in the general form of fibrovascular bundles, form of phloem cells, absence of posterior sclerenchyma; but the present species differs from it in

PL. II, FIGS. 1–6. 1, specimen of petrified palm wood before sectioning. ×0·5; 2, part of cross-section of central zone showing the distribution of fibrovascular bundles and fibrous bundles. ×8; 3, part of longitudinal section through vessel showing multiseriate scalariform type of thickening. ×42; 4, a part of purely fibrous bundles in L.S. showing stegmata (st.). ×42; 5, fibrovascular bundle enlarged to show the phloem cells. ×60; 6, fibrovascular bundle enlarged to show the cells of the dorsal sclerenchyma and six metaxylem vessels. ×60.

the frequency and size of fibrovascular bundles, presence of fibrous bundles and stegmata and, lastly, in the larger number of metaxylem vessels.

Most of the anatomical features present in the fossil palm are limited to only tribe Cocoideae of the modern palms; these are: silica bodies spherical, phloem undivided, less expanded ground tissue (Lacunar ground tissue), form of dorsal sclerenchyma and partial lignification of sclerenchymatous tissue (Tomlinson 1961). Except in one character, i.e. larger number of metaxylem elements in the present species, all other characters are similar to Cocoslike palms.

After a detailed investigation and comparison it has been found that the present species is neither identical to *P. sundaram* nor to *P. sundaram* var. *vidarbhai*. It is also not identical with any other species described so far from India or outside which has porous ground tissue, hence it is treated as a new species, viz. *Palmoxylon keriense*.

Diagnosis

Fibrovascular bundles and fibrous bundles irregularly distributed, size 2·75–3·5 mm, 35–40 per cm^2, f/v ratio 1 : 1–3 : 2, dorsal sclerenchyma reniform, auricular lobes not well developed, median sinus round, metaxylem vessels 2–6, phloem well preserved, dorsal sclerenchyma less lignified, fibrous bundles and stegmata present, leaf-trace bundles present, ground tissue lacunar.

Locality—Keria, a village about 3 km south of the Mohgaon Kalan, Chhindwara district, M.P.

Horizon and Age—Deccan Intertrappean series, Tertiary (Eocene).

Collection—Specimen No. K/85 (with Dr. B. S. Trivedi), Botany Department, Lucknow University.

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* Not seen in original.