Arecoidocarpon kulkarnii gen. et sp. nov., an arecoid palm fruit from Mohgaon Kalan, Madhya Pradesh

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The paper describes a petrified palm fruit embedded in a chert from Mohgaon Kalan, District Chhindwada, Madhya Pradesh. It is a single-seeded, ovoid drupe, whose wall is characterized by a thin epicarp, fibrous mesocarp and hard endocarp. Fibre-fibrovascular bundles and brachysclereides are restricted to the inner layers of the pericarp. Endosperm is homogeneous, covered with two-layered seed coat, the outer one with reduced vascular strands and inner with tanniniferous material. Embryo is apical and a shallow chalazal groove is protruding in the seed. Its affinity is suggested with non-ruminant arecoid palms.

**Key-words**—Megafossil, Palm fruit, Deccan Intertrappean beds (India).

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PALM fruits from India have been described by Bande et al. (1982), Chitaley (1960, 1960a), Chitaley and Nambudiri (1969), Kaul (1951), Lakanpal (1952), Mahabale (1950), Mehrotra (1987), Nambudiri (1966), Patil and Upadhye (1983), Prakash (1954, 1960), Rode (1933), Sahni (1937), Shete and Kulkarni (1985) and Trivedi and Chandra (1971). They have been assigned to *Cocos, Hyphaeneocarpon, Nypa (Nipa, Nipadites)* showing affinities with extant genera *Cocos, Hyphaene* and *Nypa*, respectively. However, a large number of fruit specimens, whose affinities are not clearly understood, are assigned to form genus *Palmocarpon* Miquel.

A single specimen found embedded in a reddish brown chert in the Intertrappean Bed at Mohgaon Kalan, district Chhindwada, Madhya Pradesh, has been studied. The specimen was examined by usual thin-ground method. The preservation was found to be excellent showing all the essential anatomical characters, enabling its identification.

**SYSTEMATIC DESCRIPTION**

Family—*Palmae (Areaceae)*

Genus—*Arecoidocarpon* gen. nov.

Diagnosis—Drupe unilocular, single seeded; pericarp thick, characterised by thin epicarp, fibrous mesocarp and hard endocarp; fibre-fibrovascular bundles and brachysclereides restricted to inner fruit wall layers; seed solitary, seed-coat two-zoned.
**Text-figure 1—Arecoidocarpon kulkarnii gen. et sp. nov.—A longitudinal section of the fruit showing EPI-epicarp, MES-mesocarp, ENDP-endocarp, OSC-outer seed coat, ISC-inner seed coat, ESP-endosperm, and CHG-chalazal groove × 1.5.**

outer with reduced vascular strands, inner with tanniniferous material; endosperm homogeneous or ruminate; chalazal groove shallow, irregular.

Type species—Arecoidocarpon kulkarnii sp. nov.

Arecoidocarpon kulkarnii gen. et sp. nov.
Pl. 1, figs 1-4; Text-figs 1, 2

**Diagnosis**—A unilocular single-seeded, oviod drupe; pericarp thick, divisible into epicarp, mesocarp and endocarp; epicarp 90-180 µm thick. Epidermis single-layered, made up of rectangular to cubical cells; hypodermis 4-6 layered with squarish to rectangular compact cells. Mesocarp thick, with fibre-fibrovascular bundles and brachysclereides. Ground tissue parenchymatous with rectangular cells. Endocarp hard, with 5-6 rows of compact arrangement of fibre-fibrovascular bundles and brachysclereides with intermittent islets of thick-walled parenchyma. Locular epidermis made up of sclerotic-palisade cells. Seed solitary. Seed coat two-layered; outer 63-76 µm wide, made up of thick-walled, rectangular, pitted cells traversed by a ring of reduced vascular strands; inner seed coat 63-85 µm wide, made up of thick-walled, rectangular cells filled with tanniniferous material. Endosperm homogeneous. Embryo cylindrical, apical. Shallow groove present at chalazal region.

**Description**—Fruit single seeded, oviod drupe with rounded apex (Text fig. 1; Pl. 1, figs 1, 2). 1.65 cm long and 1.2 cm wide. Persistent structures like perianth not observed at the base. Fruit wall 1'520-2'170 µm thick, 5'580 µm thick at the chalazal region; differentiated into thin epicarp, fibrous mesocarp and hard endocarp. Epicarp 90-180 µm thick, comprising a single layered epidermis made up of rectangular to cubical (13 × 17 µm) cells, covered with a thick cuticular layer and a 4-6 layered hypodermis. Hypodermal cells squarish to rectangular and compactly arranged. Mesocarp 900-1'200 µm thick, composed of fibre bundles, fibrovascular bundles, brachysclereides in the thin-walled rectangular, parenchymatous cells. Fibre bundles 108 × 126-162 × 198 µm in size and rounded to elongated in shape. Fibrovascular bundles 198 × 234-288 × 396 µm, elongated to spindle-shaped with reduced vascular elements. Stigmata abundant. Endocarp very hard, 625-800 µm thick consisting of 5-6 rows of compactly arranged fibre-fibrovascular bundles and brachysclereides. Islets of thick-walled ground parenchyma cells present intermittently in this layer. Locular epidermis made up of sclerotic-palisade cells. Tanniniferous cells and raphide sacs present in all the three layers of the fruit wall (Text figs 1, 2; Pl. 1, figs 1-3). Seed elongated, 11 × 9 mm, occupying entire fruit cavity except basal region; completely filled with endosperm tissue and covered with two-layered seed coat (Text fig. 2; Pl. 1, figs 3-4). Outer seed coat layer 63-76 µm thick, consisting of compactly arranged thick-walled, rectangular, pitted cells, traversed by a ring of reduced vascular strands (Pl. 1, fig. 4). Inner seed coat as thick as the outer layer, 63-85 µm, with
compact arrangement of thick-walled, rectangular cells filled with tanniniferous material. Endosperm homogeneous (non-ruminate), having 1-2 layers of outer squarish to rectangular cells. Radial files of inner cells converging into the centre of the seed (Pl. 1, figs 1-2). Cells thick-walled, reserve food material obscure. Embryo cylindrical, \(1875 \times 1000\) \(\mu\)m in size with oval to elongated \(12.6 \times 21\) \(\mu\)m cells, being present at the apical region of the seed (Pl. 1, fig. 2). A shallow groove present at the chalazal region (Text-fig. 1; Pl. 1, fig. 1).

**Holotype**—Pl. 1, fig. 1; Slide nos. MK-26, MK-27, MK-28, Department of Botany, M.A.C.S. Research Institute, Pune.

**Type locality**—Mohgaonkalan, district Chhindwada, Madhya Pradesh, India.

**Type horizon**—Deccan Intertrappean beds.

**Age**—Early Eocene.

**DISCUSSION**

The important characters of the present fruit are, (i) single seeded ovoid drupe, (ii) fruit wall differentiated into thin epicarp, fibrous mesocarp and hard endocarp, (iii) fibre-fibrovascular bundles and brachysclereides restricted to mesocarp and endocarp layers, (iv) locular epidermis made up of tangentially elongated sclerotic cells, (v) two-layered seed coat, outer with pitted cells and reduced vascular strands and inner with tanniniferous cells, (vi) homogeneous endosperm, and (vii) shallow chalazal groove. These characters suggest its affinity with Arecoid group of palms.

**Comparison with living palms**—Guerin (1949), Murray (1973), Essig (1977), Essig and Young (1979), Padmanabhan and Regupathy (1981), Kulkarni and Pande (1983) and Reddy and Kulkarni (1985), have studied the anatomy of extant Arecoid palm fruits. There are 760 species belonging to 88 genera in the Arecoid palms (Moore, 1973). Fibrovascular bundles with thick fibrous sheath, hard endocarp composed of fibre bundles and brachysclereides, irregular shallow chalazal groove and homogeneous endosperm suggest the affinity of presently described fruit with non-ruminate Arecoid palms, like Areca triandra, Chrysalidocarpus, Rhopalostylis, Veitchia and Ptychosperma. Areca triandra and Chrysalidocarpus species possess a sclerotic cylinder in the mesocarp formed by sclereides and brachysclereides. In Rhopalostylis, fibre bundles in the mesocarp are arranged in 2-3 concentric rows and the outer seed coat is massive. Veitchia and Ptychosperma differ from the fossil in having fibre bundles in the epicarp. Moreover, the seed in Ptychosperma is angular.

**Comparison with fossil palms**—The only palm fruit so far considered to bear any resemblance with the extant genus Areca or Arecoid palms is Palmocarpus arecoides Mehrotra 1987, however, the structure of seed coat, an important character to decide affinity with Areca, or with any other Arecoid palm, is not observed in the latter. Moreover, it does not show compact arrangement of fibre-fibrovascular bundles constituting hard endocarp. Beside this, nothing is known about the endosperm in P. arecoides. Therefore, P. arecoides cannot be considered to be a fruit of Areca or even any other Arecoid palm.

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**REFERENCES**


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