

Hyphaeneocarpon deccanense sp. nov. from the Deccan Intertrappean Beds of Wardha District, Maharashtra, India

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ABSTRACT

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A new species of *Hyphaeneocarpon* Bande et al. 1982, viz. *H. deccanense* sp. nov. (palm fruit), is described here. The fossil fruit specimen was collected from the Deccan Intertrappean Beds of Nawargaon-Maragsur area in Wardha District, Maharashtra. The new species shows close resemblance with the modern fruits of *Hyphaene* Garten.

Key-words: *Hyphaeneocarpon deccanense* sp. nov., Arecaceae, borassoid group, Deccan Intertrappean Beds, Wardha District, Maharashtra, India.

INTRODUCTION

Shete and Kulkarni (1985) described a palm fruit *Palmocarpon coryphoidium* from Deccan Intertrappean Beds of Nawargaon-Maragsur area in Wardha District, Maharashtra. Another palm fruit, collected from the Intertrappean Beds of the same area, is being described here as a new species of *Hyphaeneocarpon* (*H. deccanense* sp. nov.). In addition, a palm petiole *Palmocaulon hyphaeneoides*, showing close resemblance with that of *Hyphaene*, was described from the same locality by Shete and Kulkarni (1980).

MATERIAL AND METHOD

A piece of chert, embodying several fruits, was collected from Deccan Intertrappean Beds of Nawargaon-Maragsur area in Wardha District, Maharashtra. While taking sections of the chert, the fruits were cut in longitudinal plane. These

sections were prepared by usual method and studied under transmitted light and photographed under reflected light. Preservation of the material was found to be exceptionally good.

DESCRIPTION

Family: Arecaceae

Sub-family: Borassoidae

Tribe: Borassae

Genus: *Hyphaeneocarpon* Bande et al. 1982
Hyphaeneocarpon deccanense Datar sp. nov.

Plate 1, figures 1-6, Plate 2, figures 1-4

Gross features: The fossil fruit is a typical 2-3 seeded drupe (Plate 1, figures 1-3), lying adjacent to the monocot axis. It is yellowish in colour and measures 3 mm in length and about 1 mm in diameter. It is oval in shape and bilocular in longitudinal section (Plate 1, figures 2-4).

Fruit wall is well preserved, 1476 μm thick, and complete on one side. Epicarp is smooth and unevenly preserved. Mesocarp is massive, consisting of radially arranged fibres (Plate 1, figure 6, Plate 2, figure 1). Endocarp is thick and fibrous (Plate 1, figures 2-3). Parenchymatous cells are seen between endocarp and seed. Single fibrous endospermous seed is preserved in one locule (Plate 1, figures 2-5). The seed is oblong in shape, 640 μm long and 208 μm wide. Endosperm is homogeneous, embryonal cavity is lying towards the micropylar end.

Anatomy: Epicarp is smooth and 162 μm thick. It is made up of rectangular sclerenchymatous cells (Plate 1, figure 1). Mesocarp is massive, 1170 μm in radial extent and is mostly composed of highly lignified radially running fibrous strands distributed in the parenchymatous ground tissue (Plate 1, figures 5-6, Plate 2, figure 1). Some of the fibre strands appear to radiate from the endocarp. Parenchyma cells, forming the ground tissue, are thin walled, variously shaped and 48-272 μm in size. The mesocarp is highly infected with deuteromycetes fungus (*Trimmatostroma intertrappea* Patil & Datar (2002, Plate 2, figures 3, 4). Endocarp is situated below the mesocarp and measures about 144 μm in radial thickness. It is made up of interwoven fibrous strands and consists of a cylinder of tangentially and vertically traversing fibrous strands which are haphazardly arranged (Plate 1, figures 3, 5-6) enclosing the islets of parenchyma (Plate 2, figure 2). Individual fibres are highly lignified. Parenchyma islets are made up of thick walled, circular to angular cells, about 12-20 μm in size, Deuteromycetous fungal infection is predominant. Endocarp encloses, towards its inner side, a zone of parenchymatous tissue. Seed is developed from pendulous, anatropous ovule and is present in one locule only (Plate 1, figures 3-5), while seed in the second locule is incompletely preserved. Funicle and hilum are well preserved. The seed is 640 x 208 μm in size. Seed coat is 72 μm thick and is

made up of compactly arranged thick walled cells. Embryo is represented by embryonal cavity (Plate 1, figures 4-5) placed at micropylar end. It is about 240 μm in diameter. Endosperm is homogeneous and thin walled with brown contents. It is 320 μm long and 208 μm wide.

COMPARISON WITH EXTANT FRUITS

The important features of the present fossil fruit indicate that it belongs to the family Arecaceae. The outstanding contributions on this subject are those of Guerin (1949) and Murray (1973). During the investigation of palm fruits and seeds, Biradar and Mahabale (1969), Mahabale and Kulkarni (1975) and Robertson (1977) studied the endocarp structure in *Phoenix*, *Livistona* and *Jubaeopsis*, respectively. These studies indicate that in case of palm fruits, the structure of the endocarp is significant in dividing this large family into small groups on the basis of its fruit anatomy. Kulkarni and Pandey (1983) grouped the endocarp of palm fruits into six major types. Of the endocarp types recognized by Kulkarni and Pandey (1983), the endocarp type occurring in the present fossil palm fruit has been grouped into 3rd type, i.e. endocarp is situated in the middle of the fruit wall consisting mostly of fibrous strands enclosing islets of parenchyma. This endocarp type is characteristic of all the borassoid palms. However, this type of endocarp has also been described in *Nypa* and *Eugeissona* by Guerin (1949). But *Nypa* fruit is quadrangular with prominent ridges and a well defined umbo. It also differs from present fossil fruit in possessing a distinctly grooved seed. *Eugeissona* fruits are deeply grooved unlike the present fossil. Both *Eugeissona* and *Nypa* fruits are one seeded drupes, and not 2-3 seeded as seen in the present fossil. This comparison reveals that the fossil fruit has undoubted affinity with borassoid palm. Moore (1973) included 7 genera and 56 species under the borassoid palms. These have been grouped into the following two distinct alliances, 1. *Borassus* alliance (including *Borassodendron*, *Latania*,

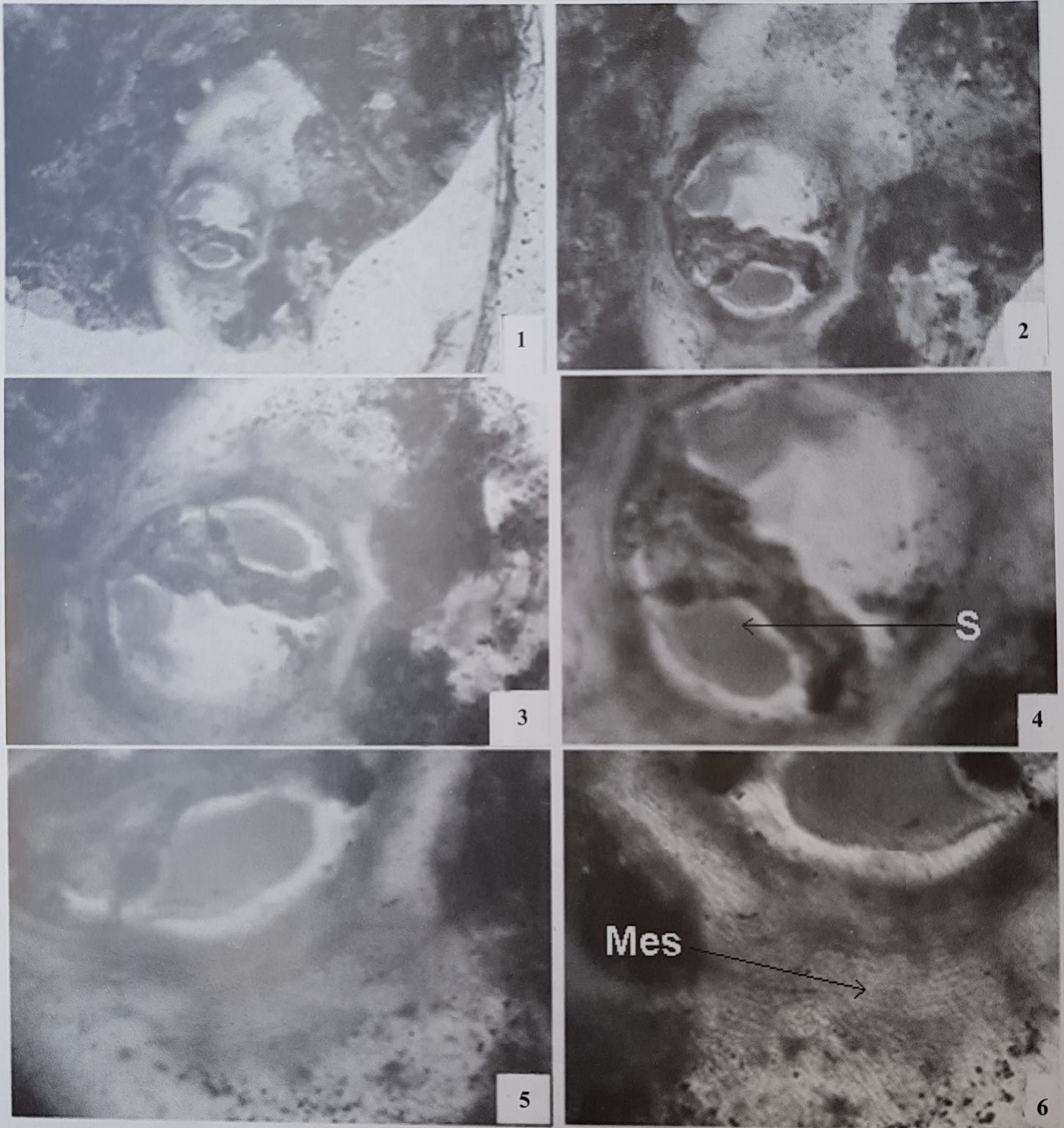


Plate 1

1-6. *Hyphaeneocarpon deccanense* sp. nov. 1. Longitudinal section of the fruit, x20. 2. Same magnified showing the epicarp, mesocarp, and endocarp and single seed in one locule, x40. 3. Same magnified, x100. 4. Single pendulous seed (S) in one locule, x100. 5. Single pendulous seed with endocarp and mesocarp, x100. 6. Mesocarp (Mes) of the fruit with fungal mycelium, x100.

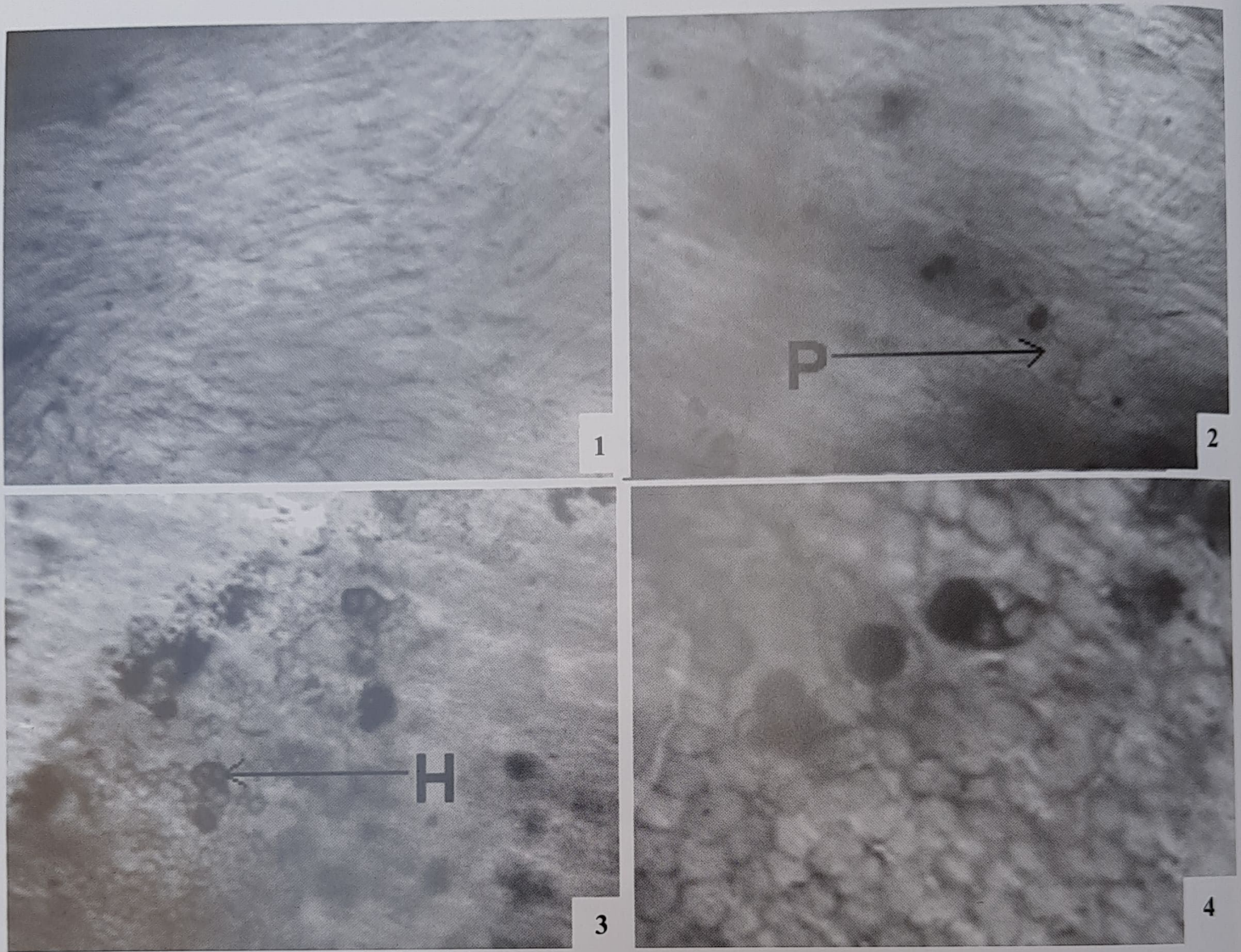


Plate 2

1-4. *Hyphaeneocarpon deccanense* sp. nov. 1. Mesocarp of the fruit, x400. 2. Islets of parenchyma (P), x400. 3. Mesocarp of the fruit showing fungal hyphae (H) with fructification, x400. 4. Same magnified, x400.

Borassus and *Lodoicea*); and 2. *Hyphaene* alliance (including *Hyphaene*, *Medemia* and *Bismarckia*).

Studies on the fruit anatomy of all these genera (Guerin 1949, Murray 1973) indicate that in the genera included under *Borassus* alliance, the mesocarp is made up of vertically running fibres whereas in the genera placed under *Hyphaene* alliance, the mesocarp is made up of radiating strands of fibres distributed in the parenchymatous ground tissue. *Hyphaene* type of mesocarp is seen in the present fossil fruit. So it

shows resemblance with the genera *Hyphaene*, *Medemia* and *Bismarckia*, which are included under *Hyphaene* alliance. Guerin (1949) stated that in *Bismarckia nobilis*, the only species of the genus *Bismarckia*, fruit is usually trilocular and the seeds are ruminating. No ruminations are present in the fossil seeds. *Medemia* is a monotypic genus, with only one species (*M. abiadensis*), restricted to Africa and Arabia but literature regarding the fruit morphology and anatomy of this genus is not available. For this reason, it was not possible

to compare present fossil fruit with the extant ones. Slides and description of fruits of two species of *Hyphaene*, viz. *Hyphaene indica* and *H. buscii*, were available for comparison. The detailed comparison shows that present fossil fruit resembles with the extant species in its anatomical details except the size of fruits, which is bigger in the extant species. So it can be concluded that the present fossil fruit belongs to the *Hyphaene* alliance of the borassoid group of palms and shows a very close resemblance with the modern fruits of the *Hyphaene*. In *Hyphaene*, normally one of the 3 carpels of the gynoeceium develops in fruit and others are aborted. In the fossil also, of the two locules exposed, healthy seed development is seen only in one locule.

COMPARISON WITH FOSSIL FRUITS

The present fossil fruit shows maximum resemblance with *Hyphaeneocarpon indicum* Bande et al. (1982) with minor differences, e.g. 1. Epicarp is 200-250 μm thick in *H. indicum* whereas it is 162 μm thick in present species; 2. Mesocarp is 3 mm in radial extent in *H. indicum* whereas it is 1.17 mm in present species; 3. Endocarp is 700-800 μm thick in *H. indicum* but it is much thinner (144 μm) in present species; 4. Fruit is unilocular in *H. indicum* whereas it is bilocular in present species; 5. A single, circular seed is present in *H. indicum* whereas in *H. deccanense*, there is a single, oblong seed in each locule (but one of them is abortive and incompletely preserved); and 6. Embryo is represented by embryonal cavity facing towards the micropylar end. Because of these reasons, the present fossil fruit has been assigned to a new species of the genus *Hyphaeneocarpon* (*H. deccanense* sp. nov.). This indicates the existence of *Hyphaene* in the Deccan Intertrappean flora and also that it enjoyed far wider distributional range than that of modern *Hyphaene indica*, which is distributed in sandy sea coast from Goa to Gujarat.

SPECIFIC DIAGNOSIS

Hyphaeneocarpon deccanense sp. nov.

2-3 seeded young drupe closely associated with the monocot axis. Fruit wall 1476 μm thick, bilocular, one of the locules contains fertile seed. Epicarp sclerenchymatous, 162 μm thick. Mesocarp massive, 1170 μm in radial extent, made up of radiating strands of fibres distributed in the parenchymatous ground tissue. Endocarp 148 μm thick, consists of interwoven fibrous strands and islets of parenchyma, situated in the middle of the fruit wall. Seed 640 x 208 μm , developed from pendulous anatropous ovule. Endosperm 320 x 208 μm , homogeneous, made up of thin walled cells. Embryo 240 μm long, represented by embryonal cavity, faces towards the micropylar region.

Holotype: Museum No. FWN 198, Department of Botany, Smt. K. W. College, Sangli, India.

Locality: Nawargaon-Maragsur, Wardha District, Maharashtra, India.

Horizon and age: Deccan Intertrappean Beds; Maastrichtian-Danian (Late Cretaceous).

Etymology: Specific epithet refers to Deccan Intertrappean bed from where the fossil fruit was collected.

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