



REPORT OF A PALM FRUIT FROM THE DECCAN INTERTRAPPEAN SERIES OF MARAIPATAN, CHANDRAPUR DISTRICT (M.S.)

S. P. Patil¹, S. K. Zilpe² and D. K. Kapgate³

¹Dept. of Botany, Bhagwanrao Arts and Science College, Etapalli- 442704

²Dept. of Botany, Janata College, Chandrapur - 442404

³Dept. of Botany, J. M. Patel College- Bhandara

patilsharadkumar@gmail.com

Abstract:

The present paper deals with a monocot palm fruit reported from the Deccan Intertrappean Series of Maraipatan of Chandrapur District (M.S.). It is a sessile, circular to oval, unilocular, drupe with single seed in a locule. It measures 5.5mm in diameter. Fruit wall differs into three zones. Seed is oval, bitegmic, endospermous with central cavity. It shows close resemblance with living fruit of *Livistona* of family *Palmae* but not in *Toto*. Hence it is kept in the same form genus *Palmocarpon* (Miquel, 1853) and a new species is created to accommodate this fruit as ***Palmocarpon patnii* sp. nov.**

Keywords: – Fossil, Fruit, *Palmocarpon*, Deccan, Intertrapps, Maraipatan.

Introduction

The megafossil flora of angiosperms are very well known from the Deccan Intertrappean series of India. But the present specimen is collected from a very new Deccan Intertrappean locality Maraipatan ((N 19° 32.166; E 079° 07.521)), of Jivati Taluka in Chandrapur district (M. S.). It is about 80 km. from Chandrapur in the south on Gadchandur-Patan road (Plate fig. 6). So far only *Nautiyalocarpon patanii* (Dahegaonkar, 2002), *Marsilea patanii* (Patil et al. 2014), *Selaginella homophyllii* (Kapgate and Wanjari, 2014) are reported from this locality.

So far few fossil palm fruits have been reported from the Deccan Intertrappean series. Palm fruits occur quite commonly from the Deccan Intertrappean series of India. Few forms which compared with modern taxa are *Cocos* (Kaul, 1951), *Nipa* (Sahni and Rode, 1937; Lakhanpal, 1952; Chitale, 1960; Chitale and Nambudiri, 1969). The Palm fruits are usually placed under genus *Palmocarpon* (Miquel, 1853) as the fossil fruits of *Palmae*. These reported fruits are *Palmocarpon takliensis*, *P. bractiatum* (Sahni et al., 1934), *P. compressum* (Sahni and Rode, 1937; Sahni, 1964), *P. insigne* (Mahabale, 1950), *P. mohgaoneanse* (Prakash, 1954), *P. indicum* and *P. sulcatum* (Prakash, 1960), *P. splendendum* (Trivedi and Chandra, 1971), *P. coryphodium* (Shete and Kulkarni, 1985), *P. arecoides* and *P. cocoides* (Mehrotra, 1987), *P. rodei* (Kapgate et al., 2011), *Hyphaenocarpon indicum* (Bande et al., 1982), *Arecoidocarpon kulkarni* (Bonde, 1990), *A. prismaticum* (Agarwal et al., 2007).

Material and Method

The specimen described here is a petrified fossil exposed in transverse plane in fossiliferous chert, collected from Maraipatan of Chandrapur district (M.S.). After etching the material with Hydrofluoric acid, peels are taken from its part and counterpart. The peels are mounted on slide and observed under microscope. Photographs are also taken for detail study. The present fossil fruit shows similarities with living date Palm fruit (Plate Fig. 1).

Description

The detailed description of fossil petrified fruit under consideration of present work is as below. The fruit measures 5.5mm in diameter. It is a sessile, circular to oval, unilocular, drupe with single seed in a locule. Fruit wall differs into three zones.

Pericarp (Fruit Wall)

It is well preserved and differs into thin epicarp, a semifibrous mesocarp and hard endocarp. Thickness varies from top to base and ranges from 0.52mm to 0.56mm. It is more thickened at lower side (Plate figs. 2 & 3).

Epicarp- It is the outermost thin layer of 1 to 2 cells in thickness consist of more or less rectangular, compactly arranged parenchymatous cells. It measures 42 to 45 μm in thickness. Each cell measures 23 to 30 μm in size. Epicarp is somewhat wavy in outline.

Mesocarp- It is massive, about 408 to 442 μm and 10 to 12 cells in thickness. It contains sclerenchyma and parenchyma with fibrous bundles. Mesocarp contains cavities at intervals where there are ridges and measures 90 to 95 μm in diameter. Fibrous bundles are more or less oval and measures 45 to 52 μm in size with

frequency of 5 per mm². Fibrovascular bundles are conjoint, collateral and closed.

Endocarp- It is 3 to 4 layered, hard sclerenchymatous forming hard coating around the seed coat. It measures 73 to 78µm in thickness. Endocarp is separable from mesocarp showing number of canals.

Seed :-

It is a single large oval in shape. It is attached to the basal placenta by stalk. Seed occupies maximum lumen of the fruit. Size of seed measures 5.14mm to 4.90mm. The seed stalk is short. It is well preserved with central hollow cavity called endosperm cavity. Seed coat is about 145 to 148 µm thick, consisting testa and tegmen. Testa is 3 to 4 layers in thickness. Tegmen consist of angular cells of 4-5 layers merged with endosperm tissue (Plate figs. 4&5).

Endosperm :-

It is surrounded by definite layer of seed coat. Endosperm is massive with embryo and endospermous cavity. It is albuminous and solid nearest to the endospermous cavity. Cells in endospermous cavity are irregular loosely arranged confirming fluidy nature. Endosperm is 4.4mm x 3.6mm in size. Endosperm cavity is variable in size.

Embryo :-

It is not clearly preserved in the present specimen but at some places few cells shows embryonic nature.

Identification and Discussion

The characters considered for the identification of the fruit are-

- a) Fruit is unilocular single seeded circular to oval in shape.
- b) Fruit wall is wavy, massive where seed is attached by short stalk.
- c) Pericarp differentiated into three zones i.e. Epicarp, Mesocarp and Endocarp.
- d) Epicarp is thin, Mesocarp is thick and massive containing fibres and fibrovascular bundle and Endocarp is Sclerenchymatous and hard.
- e) Seed is oval in shape, bitegmic containing endosperm with endosperm cavity.
- f) Embryo could not been observed but might be one.

From these characters the present fruit represents indehiscent monocot drupaceous fruit containing single large seed. It is compared with reported fossils and fruits of modern plant of monocot families.

Comparison with Modern Taxa :-

The classification suggested by (Rendle, 1963; Hutchinson, 1959; Bentham and Hooker, 1961; Englar and Prantle, 1898) are referred and it is

concluded that the present fruit belongs to monocot family. Further, it is compared with unilocular, single large seeded indehiscent fruit of Palmae (Cook, 1958; Uhl and Drasfield, 1987). The family includes genera like- *Phoenix*, *Arenga*, *Caryota*, *Borassus*, *Areca*, *Cocos*, *Calamus*, *Nannorrhops* and *Corypha*. The genera *Caryota*, *Arenga* resembles with the present fossil specimen on account of Drupaceous, fibrous fruit but differ due to trigonous structure, three celled ovary and compressed seed structure. The fossil specimen also comparable with fruit of *Phoenix* but differ in oblong seed, fleshy pericarp and membranous endocarp. The present fruit is also compared with *Nannorrhops* and resembles in having small drupe, globose or oblong, one seeded fruit with hollowed, uniform albumen but differ in having trigonous ovary. The genus *Calamus* closely resembles but differ in thin pericarp, three celled ovary. Some non-indigenous palms are studied and compared with fossil specimen. It is nearly comparable to fruit of *Livistona chinensis*, a garden fan palm where the fruit is drupe, tricarpellary with marking of furrows.

Comparison with Fossil Plants :-

The present fruit is compared with known species of *Palmocarpon*. On comparison it does not show close resemblance to any known species of *Palmocarpon*. *P. compressum* (Sahni and Rode, 1937; Sahni, 1964), differs in size of the fruit and seed, in absence of aborted carpels. *Palmocarpon insigne* (Mahabale, 1950), another palm fruit also differs considerably from the present fossil in size and shape and presence of stellet fibres. In the *Palmocarpon sulcatum* (Prakash, 1960), fruit is quadrangular with a slight groove, membranous epicarp and are not comparable with the present fossil fruit. In *Palmocarpon indicum* (Prakash, 1960), fruit is ovate with 4-6 longitudinal ridges on surface, hard endocarp. These characters are not seen in the present fossil fruit. *Palmocarpon takliensis* (Sahni, 1964), is known from the Takli, Nagpur, differs from the present fruit in the shape of the fruit and the presence of numerous very fine ribs on the surface radiating from the apical umbo. *Palmocarpon bracteatum* (Sahni, 1964), differs in the shape of the fruit i.e. sub-spherical and attachment on an axis bearing short, thick, broad, rounded, longitudinal ribbed bracts. *Palmocarpon mohgaoense* (Prakash, 1954), is different in trigonous shape with four longitudinal ridges on the surface of fruit. *Palmocarpon splendidum* (Trivedi and Chandra, 1973), is also different from the present fruit. The differences are in having a

slight groove from the anterior to posterior end and without fibre zone in mesocarp. *Nypa sahnii* (Lakhanpal, 1952) having a typical umbo on the fruit cannot be compared with present fruit. In *Cocos intertrappeansis* (Patil and Upadhye, 1984) the size of fruit and surface mark of three distinct blunt projections of carpels are not comparable with present fossil fruit. *Arecoidocarpon* (Bonde, 1990; Agarwal *et al.*, 2007) also differs from the present fruit in having canals in endosperm, endocarp differentiated in three zones and presence of stigmata. *Palmocarpon rodei* (Kapgate *et al.*, 2011), differs from present specimen in having apical opening which is not found in present specimen.

Since the present fossil fruit does not show affinities with any of the fossil but nearly resemble with living fruit of *Livistona* of family Palmae with some differences. Hence, it is kept in the same form genus *Palmocarpon* (Miquel, 1853) and named as ***Palmocarpon patanii*** sp. nov. The specific name is after a locality Maraipatan from where it is collected.

SYSTEMATIC POSITION

Angiosperms

Monocotyledons

Palmae (Areaceae)

Palmocarpon (Miquel, 1853)

Palmocarpon patanii sp. nov.

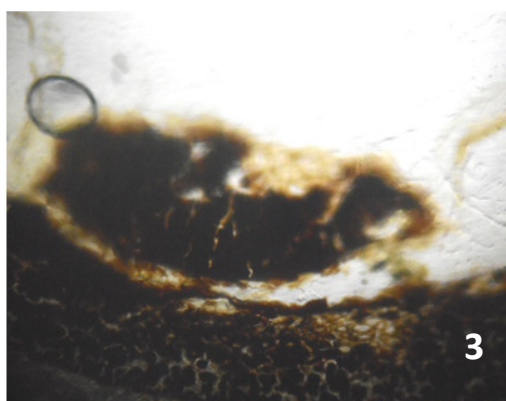
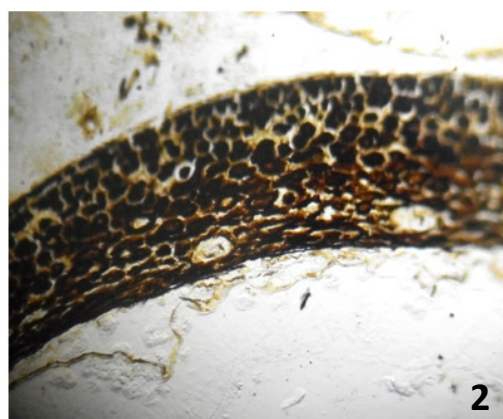
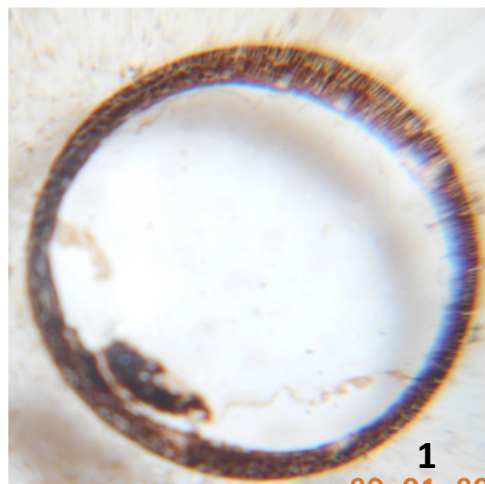
Monocot palm fruit, unilocular single seeded drupe; fruit size 5.5 mm in diameter; fruit wall measure 0.52 mm to 0.56mm in thickness and divided into thin epicarp, massive mesocarp and thick endocarp; epicarp 42- 45 μ m thick, parenchymatous; mesocarp fibrous; fibrovascular and with stalk vascular bundles; mesocarp measured 408 to 442 μ m in the thickness, sclerenchymatous; endocarp measured 73-78 μ m thick contains sclerenchymatous tissue; endosperm solid measured 4.4mm x 3.6mm with central endospermous cavity, endosperm cavity is variable in size and fluidy in nature; seed covers with bitegmic seed coat measuring 145 to 148 μ m thick; size of the seed 5.14mm to 4.90mm in diameter; Embryo is not clearly observed.

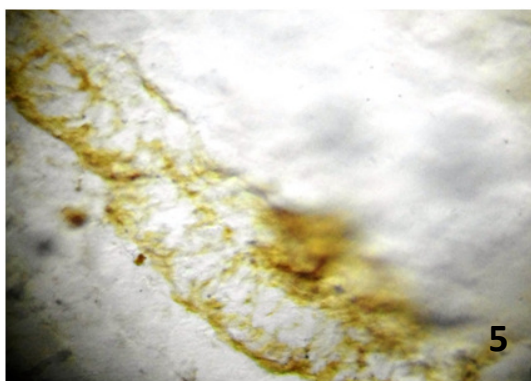
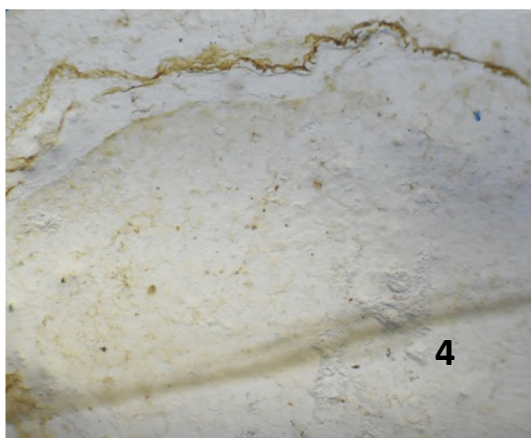
Holotype : Department of Botany, Bhagwantrao Arts & Science College, Etapalli.

Locality : Marai Patan, Jiwati taluka, District – Chandrapur M.S., India

Horizon : Deccan Intertrappean Bed.

Age : Late Cretaceous





Explanation of PLATE Figures 1 to 6.

1. Complete view of fruit in Transverse Plane. 2. Pericarp showing three zones i. e. epicarp, mesocarp & endocarp and cavities. 3. Attachment of seed to pericarp. 4. Bitegmic seed coat and endosperm. 5. Seed coat emlarged. 6 Google map of the Locality.

References

Agarwal, A., Ambawani, K., Debi Dutta and Verma, C.L. (2007). A silicified palm fruit, *Arecoidocarpon prismaticum* sp. nov. from the Deccan Intertrappean Beds of Mohgaonkalan, Chhindwara district, Madhya Pradesh, India. *Jour. Appl. Biosci*, 33(1): 32 -35

Bonde, S.D. (1990). *Arecoidocarpon kulkarnii* gen. et sp. nov. arecoid palm fruit from Mohgaonkalan, M.P. *Palaeobotanists*, 38: 212 – 216

Bande, M.B., Prakash, U. and Ambawani, K. (1982). A fossil palm fruit *Hyphaeocarpon indicum* gen et sp. nov. from Deccan Intertrappean beds of India. *Palaeobotanists*,30(3): 303– 309

Bentham, G. and Hooker, J. D. (1961). The flora of British India, II and III. L. *Recev. and co. England* : 409 – 417

Chitale, S.D. and Nambudiri, E.M.V. (1969). Anatomical studies of *Nypa* fruit Reviewed from New specimens from the Deccan Intertrappean flora of India. *Birbal Sahni Centenary*: 83 – 94.

Cook, C.I.E. (1958). The flora of the presidency of Bombay, Botanical Survey of India, Calcutta (Reprint 1967), vol. I, II and III.

Dahegaonkar R.R. (2002). Investigation of fossil flora from the Deccan Intertrappean Beds of Chhindwara (M.P.) and Yeotmal District (M.S.). Ph.D. Thesis, *Nagpur University- Nagpur*.

Engler, A. and Prantle, K. (1898). *Naturalichen Pflanzen Familien*. 2(30):1 – 93. Leipzig.

Hutchinson, J. (1959). The families of flowering plants (third edition) *Koeniqstein*, Vol. I & II.

Kapgate, D.K., Kolhe, P.D. and Gedam, Y.B. (2011). Fossil Drupe *Palmocarpon rodei* from Deccan Intertrappean Beds of Mohgaonkalan, M. P., India. *Gond. Geol. Mag.*, 26(1): 67-72.

Kapgate D.K. and Wanjari M.H. (2014) *Selaginella* Remains from the Deccan Intertrappean Beds of Patan, Chandrapur District (M.S.) India. *Int. jour. of Researches in Biosciences, Agriculture & Technology*: 43-48.

Lakhanpal, R.N. (1952). *Nipa sahnii*, A palm fruit in the Tertiary of Assam. *Palaeobotanists* I: 289-294.

Mahabale, T. S. (1950). Some new fossil plants from the Deccan Intertrappeans, *Palaeobotany in India. Jour. Ind. Bot. Soc.* 29(1): 1-46

Mehrotra, R. C. (1987). Some new palm fruits from the Deccan Intertrappean Beds of Mandla distt. M. P. *Geophytology* 17(2): 204–208.

Miquel, F.A.W. (1853). De fossiele Planten van het Krijat in het Hertogdom, *Geol. Kaari Nederlandsche, Verh.* : 35-56.

- Patil, G.V. and Upadhye, E.V. (1984). *Cocos* like fruit from Mohgaonkalan and its significance towards the stratigraphy of Intertrappean beds in. A.K. Sharma et.al.(Eds.), Evolutionary and Biostratigraphy (A. K. Ghosh Comm. Vol.) Calcutta :541-554.
- Patil S.P., Kapgate D.K. and Zilpe S.K. (2014). Report of a fossil *Marsilea* petiole from the Deccan Intertrappean Beds of Maraipatan, Chandrapur District (M.S.). *Pteridological research* 3(2):10-14.
- Prakash, U. (1955). *Palmocarpon mohgaonse* sp. nov. A palm fruit from the Deccan Intertrappean series of India. *Palaeobotanist*, 3:91-96.
- Prakash, U. (1960). On the two palm fruits from the Deccan Intertrappean beds of Mohgaonkalan. *Curr. Sci* 29: 20-21
- Prakash, U. (1960). Survey of Deccan Intertrappean flora of India. *Jour. Palaeontol.* 34: 1027-1040
- Rendle, A.B. (1963). Classification of flowering plants. *Cambridge University Press*, Cambridge.
- Rode, K.P. (1933). Petrified palms from the Deccan Intertrappean Bed, Part I. *Quat. Jour. Geol. Min. Metall. Soc. Ind.* 5(2): 75-83.
- Sahni, B. (1964). Revision of Indian fossil plants. Monocotyledons, Monograph , *B.S.I.P. Lucknow*: Sahni, B. and Rode, K.P. (1937). Fossil plants from the Intertrappean beds of Mohgaonkalan, in Deccan with a sketch of geology of Chhindwara district. *Proc. nat Acad. sci. India* 7930: 165-174.
- Sahni, B., Shrivastav, B.P. and Rao, H.S. (1934). A silicified flora of the Deccan Intertrappean series. Part. III, *Proc. 21th Ind. Sci Congr.*: 318.
- Shete, R.H. and Kulkarni, A.R. (1985). *Palmocarpon coryphodium* sp nov. a coryphoid palm fruit from Deccan Intertrappean beds of Wardha district, Maharashtra. *Jour. Ind. Bot. Soc.* 64: 45-50.
- Trivedi, B.S. and Chandra (1973). *Palmocarpon splendidum* sp. nov. from the Deccan Intertrappean beds of Mohgaonkalan M.P., India. *Palaeobotanist* 20: 339-343.
- Tripathi, R.P., Mishra S.N. and Sharma, B.D. (1999). *Cocos nucifera* like petrified fruit from the Tertiary of Amarkantak, M. P. , India. *Palaeobotanist*, 48: 251-255.
- Uhl, N.W. and Dransfield, J. (1987). Genera Palmarum. Allen Press, Lawrence , Kansas.