

Investigation of a Monocot Caryopsis from the Deccan Intertrappean Beds of Mohgaonkalan, M.P., India

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Abstract: The present paper deals with the study of a fossil unilocular, monocot caryopsis collected from the well-known locality of Mohgaonkalan, Chhindwara district, M.P., India, which is of uppermost Cretaceous to lower Eocene age. The fruit measures 2.78 – 2.89 mm in length and 2.34 – 2.45 mm in breadth. The fruit is unilocular containing single large seed with the aleuron layer inside the fruit. The pericarp measure 260 to 305 μ m thick and multilayered, differentiated into three zones i.e. outer, middle and inner zone. Seed is large and measures 2.00 to 2.12 X 1.89 to 2.00 mm in size. Seed coat is bitegmic in nature. Embryo is monocot type and ill preserved. Placentation is basal. Dehiscence is not seen. Vasculature is not clear. The specimen is compared with living genus of modern families and reported fossil monocot fruits as it resembles more with modern family Graminae it is kept under this family but as a separate genus *Caryopseocarpondeccanensis* gen. et sp. nov..

Keywords: Deccan, Intertrappean, fossil, cherts, monocot, fruit, caryopsis

I. INTRODUCTION

The present paper deals with the study of a fossil unilocular, monocot caryopsis collected from the well-known locality of Mohgaonkalan, Chhindwara district, M.P., India, which is of uppermost Cretaceous to lower Eocene age. From the Deccan Intertrappean beds many fruits have been reported, but these reported fruits large number of reports are of dicot fruits, while the reported monocot fruits are very few. Some reported monocot fruits are – *Nypahindi* (Sahni & Rode, 1937). Species of *Palmcarpon* like *Palmocarpontakliensis* (Sahni et al., 1934; Sahni, 1964); *Palmocarpobracteatum* (Shrivastava & Rao, 1934; Sahni, 1934); *Palmocarponsahni* (Sahni & Rode, 1937); *Palmocarpocompressum* (Rode & Sahni, 1937); *Palmocarpon insigne* (Mahabale, 1950); *Palmocarpomohgaense* (Prakash, 1955); *Palmocarponindicum* (Prakash, 1960); *Palmocarponsulcatum* (Prakash, 1960b); *Palmocarponsplendinum* (Trivedi & Chandra, 1971a); *Palmocarponintertrappea* (Yawle, 1975) & *Palmocarpondeccanii* (Chudiwale, 1990), *Cocussahni* (Kaul, 1951), *Cocusintertrappeansis* (Upadhey, 1979), *Viracarponhexaspernum* (Sahni, 1944), *Musa cardiosperma* (Jain, 1964); *Amocarponsulcatum* (Rode, 1933; Sahni, 1964); *Graminocarponmohgaense* (Chitaley & Sheikh, 1971); *Kremocarponaquatica* (Chitaley & Kate, 1975); *Tricoccitestrigonum* (Rode, 1933a); *Borassoecarponmohgaense* (Wazalwar, 1990) & *Araceocarpondeccanii* (Waghaye, 1995). One more fossil monocot, caryopsis is being described here from the Deccan Intertrappean beds of Mohgaonkalan, M.P., India.

II. MATERIAL AND METHOD

The fossiliferous cherts had been collected from the Deccan Intertrappean beds of Mohgaonkalan, M.P., India. While breaking the cherts the fruit was exposed in longitudinal plane. After etching the specimens with hydrofluoric acid (HF), serial peel sections are taken with Cellulose Acetate Peel Technique. The peels were mounted in DPX mountant and photographed. The camera lucida sketches of the slides are drawn for detailed study of fruit cut in longitudinal plane.

2.1 Description

The longitudinally exposed fruit measures 2.78 – 2.89 mm in length and 2.34 – 2.45 mm in breadth. The fruit is unilocular containing single large seed with the aleuron layer inside the fruit. The pericarp measure 260 to 305 μ m

thick and multi-layered, differentiated into three zones i.e. outer, middle and inner zone. Seed is large and measures 2.00 to 2.12 X 1.89 to 2.00 mm in size. Seed coat is bitegmic in nature. Embryo is monocot type and ill preserved. Placentation is basal. Dehiscence is not seen. Vasculature is not clear. The fruit shows following detailed anatomical characters-

Pericarp:- Pericarp is dry, without any outgrowth measures 260 to 305 μm , multilayered, differentiated into three zones. Outermost zone measures 129 to 135 μm , made up of 1-2 layers of vertically elongated parenchymatous cells, each cell measures 28 to 30 X 75 to 115 μm in size. Middle zone is also thick and measures 115 to 125 μm , made up of 1-2 layers of vertically elongated parenchymatous cells, each cell measures 28 to 30 X 65 to 115 μm in size. Innermost zone is very thin made up of single layer of horizontally elongated parenchymatous cells measures 14 to 16 μm in thickness. Each cell measures 14-16 X 28 to 30 μm in sizes.

Locule:- Locule is single measures 2.20 to 2.34 X 2.00 to 2.12 mm in size, containing only one large seed and aleuron layer. Single locule of fruit indicates the unilocular nature of fruit.

Seed:- The number of seeds in the present fruit is one. The seed is large and occupying the complete space of lumen measures 2.00 to 2.12 X 1.89 to 2.00 mm in sizes. Seed coat is bitegmic, 3-4 layered, measures 25 to 28 μm in thickness. Outer testa is uni layered and made up if rectangular cells measures 8-9 μm in thickness, each cell of testa measures 8-9 X 23-25 μm in size. Inner tegmen is quite thicker measures 14-17 μm in thickness made up of 2-3 layers of thick walled parenchymatous cells measuring 6-7 μm in diameter. Seed shows ill preserved monocot embryo showing monocotyledonous nature of fruit. Endosperm tissue is ill preserved showing parenchymatous patches at places. The seed is attached to the pericarp indicating the caryopsis type of fruit.

Aleuron layer:- One of the most important character found in this fruit is presence of aleuron layer. The aleuron layer is embedded inside the fruit shows column of thick walled parenchymatous cells continuing from pericarp. The cells of aleuron layer are thick walled measures 28-30 μm in diameter and hexagonal in shape. Each cell has contents. The aleuron cells are occurs in several cereals in some genus like *Setaria*, *Zea mays* etc. the aleuron near the placental vascular supply are columnar and shows ingrowths. Since these help in transferring substances from the vascular tissue to the embryo and endosperm proper, these are termed as 'Transfer Aleuron Cells' (TAC). The TAC are absent in Wheat and Rice. The aleuron cells are characterized by presence of thick walled and non vacuolated cells interconnected by plasmodesmata. Inside these aleuron cells aleuron grains are present. The main components of aleuron grains are Protein, Phytin, Phospholipids and some Carbohydrates (Bhojwani&Bhatnagar, 1974).

Placentation:- The seed is attached to the pericarp at the base of fruit indicating the basal placentation of the fruit.

Dehiscence:- The dehiscence zone is not seen in the present specimen indicates its indehiscent nature.

Vasculature:- Vasculature is not clear but some xylem rays could be observed near the basal portion of the fruit near the column of aleuron cells.

III. DISCUSSION

From the above description following important features confirm the identification of present fruit-

- Fruit developed from the monocarpillary, superior ovary.
- Fruit is unilocular containing single large seed.
- Fruit wall is dry, without any outgrowth and multilayered.
- Presence of column of aleuron layer.
- Seed is attached to the pericarp.
- Fruit is indehiscent.
- Placentation is basal type.

From the above features the present fruit is confirmed as unilocular, single seeded, monocotyledonous, indehiscent, caryopsis, showing basal placentation.

Identification:

The present fruit is compared with reported monocot fruits and modern monocot taxa.

**Comparison with fossil genera:**

It is compared with fossil monocot fruits such as- *Nypahindi* (Sahni & Rode, 1937) is a *Nypa* like fruit differs from present fruit in caryopsis type of fruit with aleuron cells. It is compared with the reported species of *Palmocarpon* like *Palmocarpon takliensis* (Sahni et al., 1934; Sahni, 1964); *Palmocarpon bracteatum* (Shrivastva & Rao, 1934; Sahni, 1934); *Palmocarpon sahani* (Sahni & Rode, 1937); *Palmocarpon compressum* (Rode & Sahni, 1937); *Palmocarpon insigne* (Mahabale, 1950); *Palmocarpon mohgaoense* (Prakash, 1955); *Palmocarpon indicum* (Prakash, 1960); *Palmocarpon sulcatum* (Prakash, 1960b); *Palmocarpon splendinum* (Trivedi & Chandra, 1971a); *Palmocarpon intertrappea* (Yawle, 1975) & *Palmocarpon deccanii* (Chudiwale, 1990) all are drupaceous monocot fruits while present fruit is caryopsis. *Cocussahni* (Kaul, 1951) & *Cocus intertrappeensis* (Upadhey, 1979) are also differ with present fruit in having drupaceous nature. *Viracarpon hexaspermum* (Sahni, 1944) differs from the present fruit in multilocular capsular nature of the fruit while present fruit is unilocular caryopsis. *Musa cardiosperma* (Jain, 1964a) is a tricarpyllary berry while present fruit is monocarpyllary caryopsis. *Amomocarpon sulcatum* (Rode, 1933; Sahni, 1964) is capsular in nature while present specimen is caryopsis. *Graminocarpon mohgaoense* (Chitale & Sheikh, 1971) resembles in unilocular one seeded Gramineous fruit but differs in presence of aleuron layer which is present in this specimen while in *Graminocarpon mohgaoense* such character is not seen. *Kremocarpon aquatica* (Chitale & Kate, 1975) is three seeded berry while present specimen is one seeded caryopsis. *Tricoccitetrigonum* (Rode, 1933a) is trilocular three seeded fruit while present fruit is unilocular single seeded. *Borasseocarpon mohgaoense* (Wazalwar, 1990) & *Araceocarpon deccanii* (Waghaye, 1995) are drupaceous hence differs with present caryopsis fruit.

Comparison with modern monocot taxa:-

The present fruit is unilocular caryopsis it could be compared with the modern monocot families with unilocular, one seeded fruits like- Arecaceae (Palmae), Typhaceae, Araceae, Cyperaceae & Graminae (Poaceae). Arecaceae (Palmae), Typhaceae, Araceae are comparable in having unilocular one seeded fruit but differ from the present fruit due to presence of drupaceous fruits while the present fruit is caryopsis type. Cyperaceae is comparable in having unilocular one seeded fruit differs in having nuts. The present fruit resembles more with Graminae (Poaceae) in characters like unilocular, one seeded caryopsis type of fruits having aleuron layer in some genus. So the present specimen is compared with the some genus of Graminae having aleuron layer like *Setaria*, *Zea mays*, *Sorghum*, *Triticum*, *Oryza* etc. *Setaria* is comparable in having column of aleuron layer embedded inside the fruit but differs in having hairy grains and size of grain. *Sorghum*, *Triticum* & *Oryza* are differs in absence of column of aleuron layer embedded inside the fruit. *Zea mays* is comparable in characters like unilocular, one seeded caryopsis with column of aleuron layer embedded inside the fruit but differs in structure of wall

A comparison with known fossil monocot fruits and with modern monocotyledonous taxa indicates that the present specimen is not resembles with any of the reported monocot fruits and with modern monocotyledonous taxa. But as it resembles more with modern family Graminae it is kept under this family but as a separate genus *Caryopseocarpon deccanensis* gen. et sp. nov. Generic name after the type of fruit and specific name after Deccan Intertrappean series.

Diagnosis***Caryopseocarpon* gen. nov.**

It is unilocular, one seeded caryopsis type of monocot fruit with presence of column of aleuron layer embedded inside the fruit.

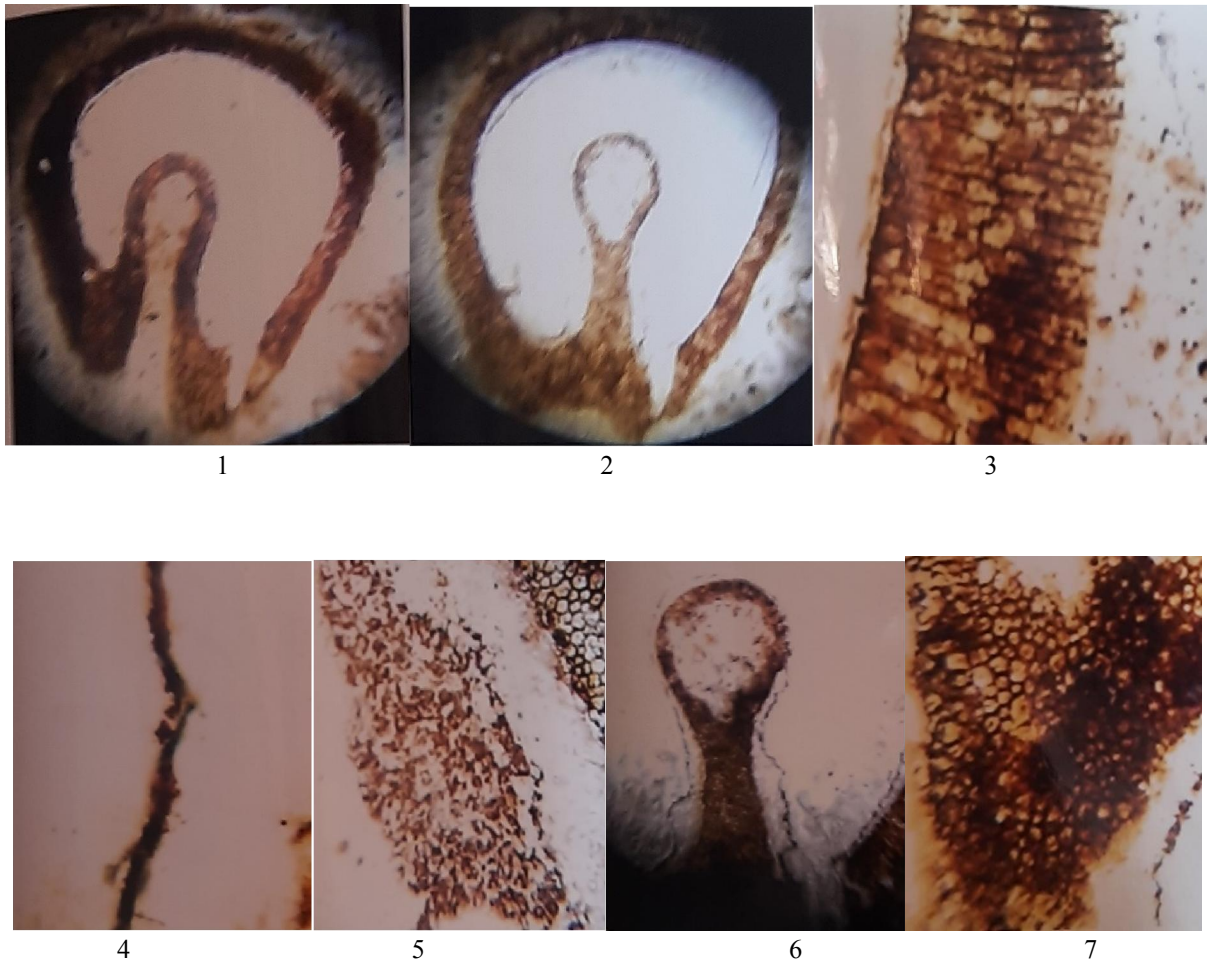
***Caryopseocarpon deccanensis* gen. et sp. nov.**

The fruit measures 2.78 – 2.89 mm in length and 2.34 – 2.45 mm in breadth. The fruit is unilocular containing single large seed with the aleuron layer inside the fruit. The pericarp measure 260 to 305 μ m thick and multi-layered, differentiated into three zones i.e. outer, middle and inner zone. Seed is large and measures 2.00 to 2.12 X 1.89 to 2.00 mm in size. Seed coat is bitegmic in nature. Embryo is monocot type and ill preserved. Placentation is basal. Dehiscence is not seen. Vasculature is not clear.

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Plate Figures



Explanation of Plate Figures :-

Fig.1 & 2- Caryopsis Fruit Complete View in Longitudinal Section (Part &Counter part).

Fig. 3- Pericarp (Fruit Wall) Enlarged view.

Fig.4- Seed Coat showing Testa and Tegmen.

Fig.5- Endosperm Tissue (Magnified).

Fig.6-Aleuron column embedded in seed.

Fig. 7-Aleuron Tissue (Magnified).