



REPORT OF THE DICOTYLEDONOUS UNILOCLAR FRUIT FROM THE DECCAN INTERTRAPPEAN BEDS OF MARAI PATAN, TALUKA-JIWATI, DIST.-CHANDRAPUR, MAHARASHTRA, INDIA

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Communicated :10.12.2022

Revision: 20.01.2023 & 24.01.2023
Accepted: 26.01.2023

Published: 30.01.2023

ABSTRACT:

The present paper deals with the description of a new species of petrified capsular fruit from the Deccan Intertrappean beds of Marai Patan, Tahsil-Jiwati, Dist.-Chandrapur, Maharashtra, India. The fruit is stalked, oblong, dry, dehiscent, capsular, dicot fruit with basal placentation. Fruit is 2.8 mm long and 1.4 mm broad. Fruit wall is 10.13 μm thick. The fruit wall is differentiated into three zones. The outer layer epicarp is 3.68 μm thick. Middle layer mesocarp is 7.30 μm thick and inner layer endocarp is 0.26 μm thick. The seed is large and measures about 2 mm long and 1 mm broad in size. Seed coat is 2-3 layers thick but is not differentiated in to testa and tegmen. It measures about 0.12 μm thick. Embryo is straight. It consists of two large cotyledons. Radicle is seen attached at the base of embryo. A single stalk is seen attached at the base of fruit. It measures about 3.16 μm in length. Finally summing up the comparison and discussion on the described fossil fruit it can be concluded that the present specimen under investigation does not resemble any of the living capsular fruits as well as recorded fossil flora of Intertrappean beds as described earlier except *Geraniocarpon intertrappea* (Dahegaonkar 2002) with minor differences hence it is named as *Geraniocarpon patanii* sp. nov. The generic name is being after the capsular type of fruit *Geraniocarpon intertrappea* (Dahegaonkar 2002) and specific name indicates the name of the locality from where it was collected.

Keywords: - Capsular fruit, Epicarp, cotyledons, Radicle, Embryo.

INTRODUCTION :

A large number of fossil dicotyledonous fruit are known from Deccan Intertrappean beds of Central India. The material for the present study was collected from of Marai Patan (N 19.53' & E 79.12') in Chandrapur, Maharashtra. Some reported dicot, unilocular single seeded fruit has been described so far from the Deccan Intertrappean beds of India. These are *Unispermospinocarpon keriensis* (Kapgata & Paliwal, 2016), *Ranunculaceaeocarpon jamsavlii* (Bonde & Narkhede, 2013), *Tiliaceaeocarpon jamsavlii* (Meshram, Narkhede and Bhowal, 2013), *Compositaeocarpon jamsavlii* (Yadav, 2010), *Tamaricaceocarpon patilii* (Yadav, 2010), *Valvulocarpon chitaleyii* (Yadav, 2010),

Amaranthocarpon mohgaonese (Saxena, 2004), *Amaranthocarpon Intertrappea* (Saxena, 2004), *Spinocarpon intertrappea* (Dahegaonkar, 2002) and *Geraniocarpon intertrappea* (Dahegaonkar, 2002). The Present unilocular fruit is the additional report of unilocular fruit from the Deccan Intertrappean beds of Marai Patan, Taluka-Jiwati, Dist.-Chandrapur, Maharashtra, India.

MATERIAL AND METHOD :

The material was very well preserved in a black chert collected from the Deccan Intertrappean beds of Marai Patan, Taluka-Jiwati, Dist.-Chandrapur, Maharashtra, India. Only part was available and counterpart lost during breaking. It was exposed in longitudinal view. After etching

with hydrofluoric acid and washing with water oblong fruit with single locule was visible to the naked eyes. Serial peel sections were taken along longitudinal plane. The peels were mounted on Canada balsam mountant. Thus the fruit revealed details of morphology & anatomy through examination of fractured surface, serial sectioning and successive peels. Sony Camera (4X) and Capture Pro 4.6.exe software was used for photography and measurement of material.

DESCREPTION:

GENERAL DESCRIPTION:

The fruit is stalked, dicot, oblong, capsule, unilocular, single seeded, dry, dehiscent with basal placentation. Fruit is 2.8 mm long and 1.4 mm broad. It is a petrified fruit with excellent cellular preservation. The fruit is differentiated in to outer pericarp and inner part containing single locule with one seed. The seed is with well preserved dicot embryo (plate I, photo 1-13).

PERICARP: The fruit wall or pericarp is well preserved and moderately thick and measures about 10.13 μm in thickness and is differentiated into outer epicarp, middle mesocarp and inner endocarp (Plate II, photo 15). A parenchymatous gap is seen between fruit wall and seed coat (Plate II, photo 17).

EPICARP: The outer layer epicarp is measures about 3.68 μm thick. It is made up of multicellular thick walled parenchymatous cells. These cells are rectangular in shape (Plate II, photo 15).

MESOCARP: The mesocarp is thick walled and measures about 7.30 μm thick. It is made up of thick walled hexagonal, sclerenchymatous cell with various layers of cells. It is dry wall with line of dehiscence at many places (Plate II, photo 15, 16).

ENDOCARP: The inner endocarp thin walled and measures about 0.26 μm thick with parenchymatous cell (Plate II, photo 15).

LOCULE: The fruit is unilocular. The size of the locule is 2 mm in length and 1 mm in breadth (Plate II, photo 14, 18).

PLACENTA: The seed is attached with their funicle to the placenta indicating basal placentation (Plate II, photo 18).

SEED: The present fossil fruit contain a single seed mesuring 2 mm long and 1 mm broad. The seed is large, dicotyledonous, unitegmic. The embryo is large with two cotyledons are present (Plate II, photo 14, 18).

SEED COAT: Seed coat is 2-3 layers thick but is not differentiated in to testa and tegmen. It measures about 0.12 μm thick (Plate II, photo 17).

EMBYO: Embryo is straight. It consists of two large cotyledons. Radicle is seen attached at the base of embryo (Plate II, photo 18).

STALK: A single stalk is seen attached at the base of fruit. It measures about 3.16 μm in length. A vasculature is seen inside the fruit in continuation of stalk of fruit (Plate II, photo 14).

DISCUSSION AND IDENTIFICATION:

The above described specimen revealed following important details for its identification.

1. Fruit is dicot, oblong, unilocular, dry, dehiscent, stalked, capsular with basal placentation.
2. Fruit wall is differentiated into epicarp, mesocarp and endocarp.
3. Fruit contain single seed in locule.
4. The seed is attached with their funicle to the placenta indicating basal placentation.
5. The seed is large, dicotyledonous, unitegmic.
6. The embryo is large with two cotyledons are present. Radicle is seen attached at the base of embryo.
7. Seed coat is 2-3 layers thick but is not differentiated in to testa and tegmen.
8. A single stalk is seen attached at the base of fruit.

From these characters it is evident that the described fruit was formed from unicarpellary,

unilocular, apocarpous ovary with basal placentation. Nature of the fruit appears to be capsular due to dry, dehiscent fruit wall.

COMPARISON WITH MODERN TAXA:

The fruit is compared with the modern families like, Amaranthaceae, Sapindaceae, Meliaceae, Menispermaceae, Tiliaceae, Burseraceae (Rendle, 1956) with which the fossil fruit shares following affinities.

In Amaranthaceae, the fruits are medium size, unilocular, single seeded with elongated spines but the present fruit is without spines. In Sapindaceae the genus *Nephelium* is an oval single seeded drupe but the present is oblong capsule. In Meliaceae, the fruit is drupe, unilocular, with multi layered fruit wall, single seeded, with endospermic seed and thick cotyledons but the present fruit is capsule. In Tiliaceae the fruit *Microcos antidesmifolia* is ellipsoid, oblong in shape; single seeded drupe but the present fruit is capsule. In the fruit of Menispermaceae, the seed has an embryo with little endosperm, hair or spine like structure. These characters are reflected in the living genera like *Ciassampelos pareira*, *Cocculus hirsutus*, *Tinospora miers* but present fossil fruit such type of hairs or spines are absent. In Burseraceae the fruit as drupaceous dehiscent, single seeded with curved embryo with endosperm the genus *Boswellia serrata*, *Garuga pinnata* show resemblances with fossil fruit but the present fruit is without curved embryo and capsular therefore present fruit is different.

COMPARISON WITH FOSSIL FRUIT:

The previously described fossil unilocular fruits from the Deccan Intertrappean beds of India are different from the present fruit in number of characters *Unispermospinocarpon keriensis* (Kapgade & Paliwal, 2016) is small, capsular, unilocular, single seeded, small stalked, having a spiny outgrowth from mesocarp, dry dehiscent fruit with basal placentation. *Portulacaceocarpon bhuterensis* (Borkar, Nagrale,

Meshram, Korpenwar and Ramteke, 2016) is unilocular, multiseeded, dehiscent capsule. *Ranunculaceaeocarpon jamsavlii* (Bonde & Narkhede, 2013) is unilocular, indehiscent capsule, with hook, pericarp is differentiated into three zones, epicarp with parenchymatous cells, mesocarp sclerenchymatous and endocarp parenchymatous. Seed elongated, unitegmic, seed encloses dicot embryo. *Tiliaceaeocarpon jamsavlii* (Meshram, Narkhede and Bhowal, 2013) is capsular, unilocular, indehiscent, hexagonal with multi-layered pericarp thin walled parenchymatous cells, single seeded. Unitegmic embryo with endospermic tissue is present. *Portulacaceocarpon jamsavlii* (Bhowal, Narkhede and Meshram, 2011) is unilocular, multilocular and dehiscent. *Compositaeocarpon jamsavlii* (Yadav, 2010) is unilocular, indehiscent cypsela, stalked with hook. Seed is unitegmic, seed encloses dicot embryo. *Tamaricaceocarpon patilii* (Yadav, 2010) is dicotyledonous, unilocular capsule, seed coat differentiated into testa and tegmen. The outer epidermis of the outer integument persists with hair like projection. *Valvulocarpon chitaleyii* (Yadav, 2010) is unilocular single seeded capsule, seed bitegmic in nature. The embryo is not preserved. *Spinocarpon intertrappea* (Dahegaonkar 2002) is dicotyledonous, indehiscent, unilocular, spiny, single seed in a locule. *Geraniocarpon intertrappea* (Dahegaonkar 2002) is dicotyledonous, capsular, unilocular, single seeded, loculicidal dehiscence. *Cyperceocarpon sahnii* (Dutta & Ambwani, 2005) is a nut like achene, trigonally-oval, small, pericarp apparently granulate, ridges and furrows present, cells compact, verrucate, interlocked. *Achenocarpon mohgaonii* (Gedam, 2004), fruit obovoid in shape with uneven pericarp, dicotyledonous, single seeded, unilocular, dry, indehiscent, achene with basal placentation. Seed is bitegmic, orthotropous, pyriform with prominent stalked, seed coat two

layered, embryo apical, endosperm uniform. *Boeluneria intertrappea* (Ambwani, Kar, Srivastava & Dutta, 2004) is an indehiscent achene, more or less circular to oval. *Amaranthocarpon mohgaonese* and *Amaranthocarpon Intertrappea* (Saxena, 2004) is unilocular, indehiscent, spines on entire epicarp, with single large seed, seed coat bitegmic with ill preserved embryo, pericarp multi-layered and differentiated into epicarp, mesocarp and endocarp. *Prakashocarpon mohgaonse* (Dahegaonkar, 2002) is dicotyledonous, one smaller and other larger in size and shape. Each fruit is having an independent stalk. Each containing a single seed, embryo is elongated and straight. *Ceratocarpon spinosa* (Adhao, 1986) is simple one locular, one seeded achene, fruit wall multicellular, spiny with persistent style, seed ovoid filling fruit cavity, embryo small, endosperm present. *Monimiocarpon mohgaonse* (Lanjewar, 1986) is simple, unilocular single seeded achene, oval, fruit wall multiple, pericarp is differentiated in to epicarp, mesocarp and endocarp. Seed restricted to upper half of the fruit, oblong. The embryo is dicotyledons, flat and globular.

Finally summing up the comparison and discussion on the described fossil fruit it can be concluded that the present specimen under investigation does not resemble any of the living capsular fruits as well as recorded fossil flora of Intertrappean beds as described earlier except *Geraniocarpon intertrappea* (Dahegaonkar 2002) with minor differences hence it is named as *Geraniocarpon patanii* sp. nov. The generic name is being after the capsular type of fruit *Geraniocarpon intertrappea* (Dahegaonkar 2002) and specific name indicates the name of the locality from where it was collected.

DIAGNOSIS:

***Geraniocarpon patanii* sp. nov.**

The fruit is stalked, oblong, dry, dehiscent, capsular, dicot fruit with basal placentation. Fruit is 2.8 mm long and 1.4 mm broad. Fruit wall is 10.13 μm thick. The fruit wall is differentiated into three zones. The outer layer epicarp is 3.68 μm thick. Middle layer mesocarp is 7.30 μm thick and inner layer endocarp is 0.26 μm thick. The seed is large and measures about 2 mm long and 1 mm broad in size. Seed coat is 2-3 layers thick but is not differentiated in to testa and tegmen. It measures about 0.12 μm thick. Embryo is straight. It consists of two large cotyledons. Radicle is seen attached at the base of embryo. A single stalk is seen attached at the base of fruit. It measures about 3.16 μm in length.

Holotype : SWP/Ang. Fruit/Deposited in Department of Botany, Dr. Ambedkar College, Chandrapur.

Horizon : Deccan Intertrappean beds.

Locality : Marai Patan, Tahasil- Jiwati, Dist. Chandrapur, Maharashtra, India.

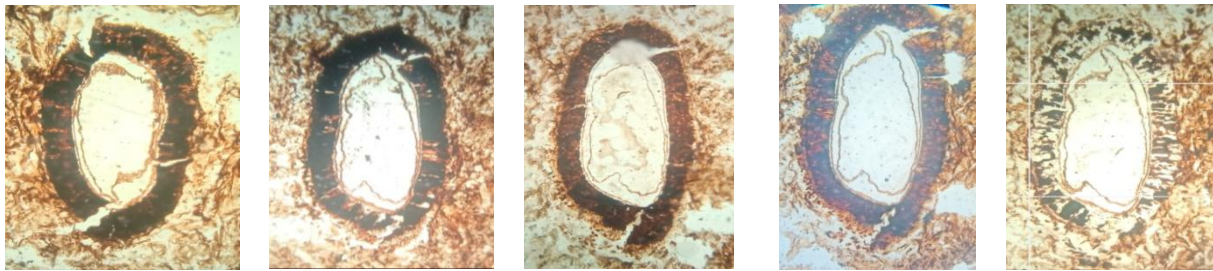
Age : ? Uppermost Cretaceous.

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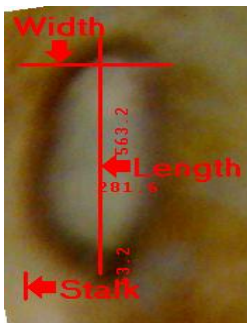
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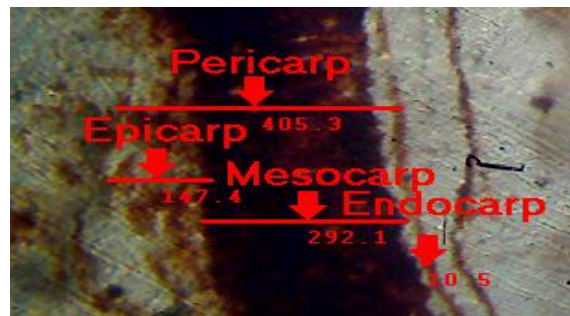
PLATE I PHOTO 1 – 10



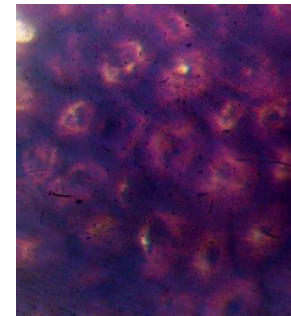
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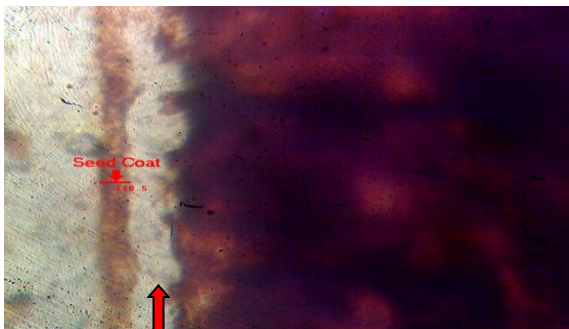
6 (Fruit-X20)



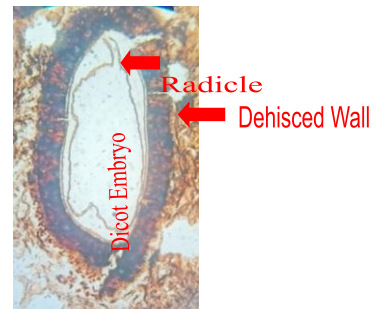
7 (Pricarp- X40)



8 (Mesocarp-X900)



Parenchymatous Gap
 9 (Seed Coat-X900)



10 (Dicot Embryo-X20)

Explanation of Plate Photo 1 to 10

Photo 1-2. A typical capsular fruit in L.S. showing single locule increasing in size with increasing size of embryo, dehisced fruit wall and two cotyledons.....X20.

Photo 3-5. A typical capsular fruit in L.S. showing appearance of stalk and embryo showing radicle.....X20.

Photo 6. L. S. of stalked fruit showing length and width of fruit and locules.X20.

Photo 7. L. S. of Pericarp showing epicarp, mesocarp and endocarp.X40.

Photo 8. Sclerenchymatous, hexagonal cells of mesocarp.X900.

Photo 9. Two to three layered seed coat.X900

Photo 10. Dicot embryo showing two cotyledons and radicle.X400