

A new petrified unilocular fruit from the Deccan Intertrappean Beds of Jamsavli M.P. India

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ABSTRACT

A well preserved dicot fruit was collected from Jamsavli (Lat 21°, 30' to 22°, 55'N and Long 78°, 15 to 79°, 20 E) in Chhindwara District, M.P. The fruit is hexagonal shape, without stalk. The fossil fruit is unilocular and is characterized by presence of uniitegmic seed. The fruit is capsular and indehiscent. The fruit though shows some characters of the present day families like Amaranthaceae, Sapindaceae, Meliaceae, Menispermaceae, Tiliaceae, Burseraceae. It has close affinities with the members of the family Tiliaceae. It could not conclusively be traced to any particular genus but it broadly placed under Tiliaceae.

KEYWORDS

Dicot fruit,
Indehiscent,
unitegmic,
Tiliaceae
Deccan
Intertrappean,
M.P. India.

INTRODUCTION

A large number of angiospermic fruits with seeds have been reported from various localities of Central India. However the angiosperms dominate the flora and are represented by plant parts viz. roots, stems, leaves, flowers and fruits.

Many fruits were reported from the Deccan Intertrappean beds of Chhindwara district, Madhya Pradesh, India. Mehrotra et al., (1983) reported *Euphorbiocarpon drypetoids*, *Euphorbiocarpon singhpurii* (Bhowal and Sheikh, 2006), *Bicarpelocarpon singhpurii* (Bhowal and Sheikh, 2008), *Portulacaceaeocarpon jamsavlii* (Meshram et al. 2011), (Kapgate, 2013) *Spinocarpon mohgaoense*, (Kokate, 2013) *Lagerstroemiocarpon harrisii*.

The present account will add to our knowledge regarding capsular fossil fruits from Jamsavli, India. This locality is in Madhya Pradesh. It lies at Lat 21°, 30' to 22°, 55' N and Long 78°,15 to 79, 20° E. It is 2 to 3 km far away from Sausar (Map 1).

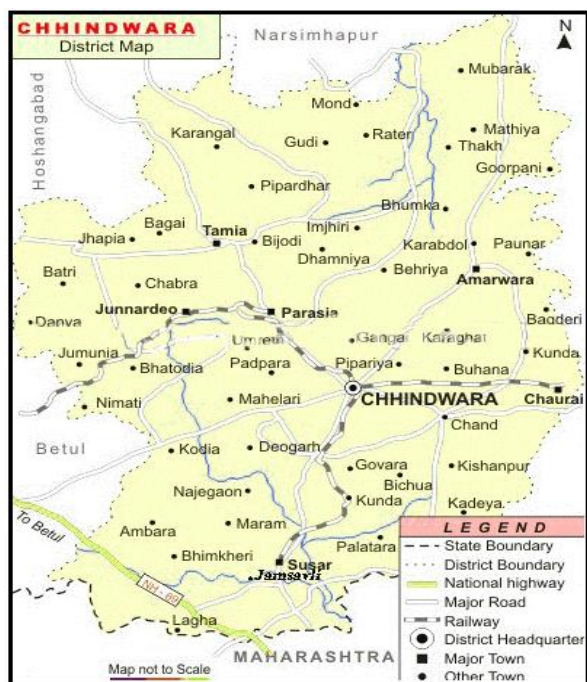
MATERIALS AND METHODS

An almost hexagonal fruit with a laterally tapered end was found embedded in the fossiliferous chert collected from Jamsavli. The fruit was exposed in obliquely transverse plane on a small piece of chert. The anatomical details were studied by taking several peels without grinding the chert and etching it with 70% Hydrofluoric acid. The study encompasses peels both from part and counterpart, camera lucida sketches of the fruit in series were also drawn and the slides photographed.

Morphology of Fruit:

The hexagonal, ovate indehiscent fruit shows a single seed. Fruit Measure about 3 mm in length and 4 mm in breadth. Seed is attached to the fruit wall showing parietal placentation. Seed measure about 2mm in length and 110µm in breadth. It is endospermic in nature. Some hard and woody projections are seen on the wall of fruit (Plate 1, Fig. 1&2).

Anatomical character of the fruit: Anatomically the fruit wall is differentiated into epicarp, mesocarp and endocarp.



Map 1:

Pericarp: The fruit has thick pericarp; it varies between 90 μm to 180 μm with very well defined zones of tissue (Text fig. 4, Plate 1 Figs. 5). It is demarcated as under.

Epicarp: This is the outermost layer of the fruit wall which is a thin layer of parenchymatous cells. The cells towards inner side contain dark unknown contents (Text fig. 4). The cells measure 2 μm across its diameter (Plate 1, Fig. 5).

Mesocarp: Below the epicarp lies the middle layer i.e mesocarp. The width of this region varies a lot between 40 μm to 50 μm . Mesocarp with few layers of cells. The cells are compactly arranged parenchymatous walled and are well preserved. On the basis of the cell type of mesocarp, the fruit nature appears to be capsule (Esau, 1953, 1965 and Fahn 1989) (Text fig.4, Plate 1, Fig.5). Cells are polygonal in shape measuring about 3 μm at its diameter.



Fig.1

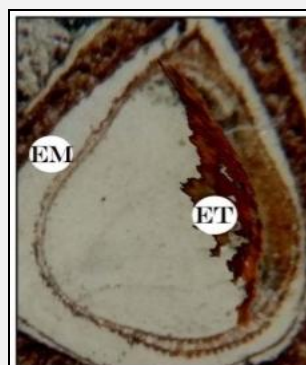


Fig. 2:

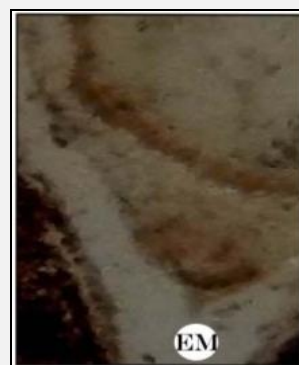


Fig.4

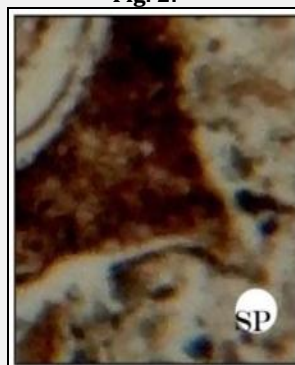


Fig. 3

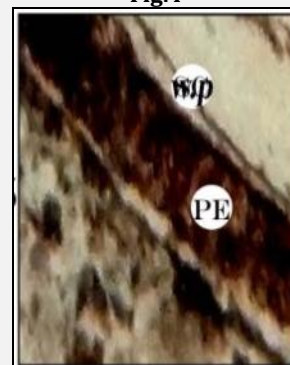


Fig.5

Plate 1: Fig. 1-5:

Fig. 1 : Enlarged unilocular fruit with seed. 450X

Fig. 2 : Single seed with embryo 450X;

Fig. 3 :Pericarp shows woody projections on fruit wall.450X

Fig. 4 : Details of Embryo (EM). 450X

Fig 5 : Pericarp (Pe) differentiated into epicarp, mesocarp, and endocarp and Seed coat (S.C) 450X

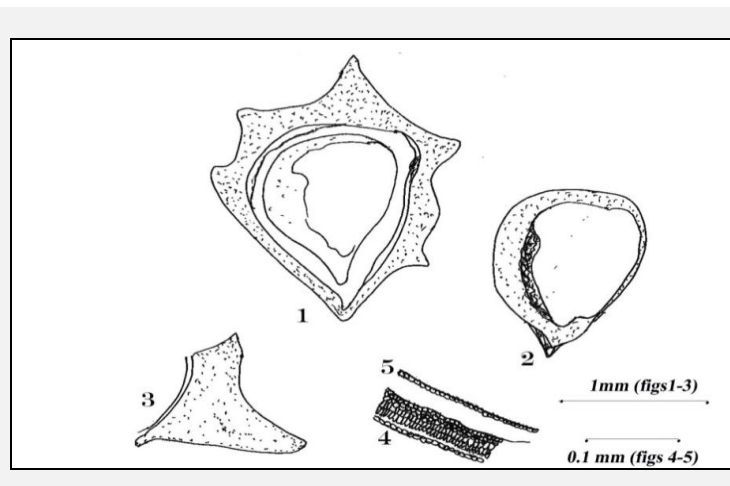


Plate 2. Text Fig. 1-3

Explanation of Text fig. 1-5

Fig. 1: Enlarged unilocular fruit which shows seed.

Fig. 2: Enlarged Structure of seed

Fig. 3: Pericarp woody projections on fruit wall.

Fig 4: Fruit wall shows cellular differentiation as epicarp, mesocarp and endocarp.

Fig 5: Seed coat with undifferentiated testa (TS) and tegmen (TG).

Table 1:

Amaranthaceae	Menispermaceae	Sapindaceae	Meliaceae	Tiliaceae,	Burseraceae	Present fruit
Fruit medium size	Fruit large	Fruit large	Fruit medium small	Fruit medium	Fruit medium small	Fruit small
Dry,utrical	Fleshy fruit	Fleshy drupe	Drupe	Sometimes capsular	Sometimes capsular	Present fruit is capsular
Indehiscent	Indehiscent	Indehiscent	Indehiscent	Indehiscent	dehiscent	Indehiscent
Simple fruit	Winged fruit	Winged fruit	Simple fruit	Simple fruit	Simple fruit	Simple fruit
Single Seed present	Seed exendospermic Curved embryo	Seed exendospermic Curved embryo	Seed sometimes unitegmic Thick cotyledons.	Seed With flat or thick plano convex cotyledon and no endosperm	Seed sometimes unitegmic Thick cotyledons.	Seed unitegmic, embryo preserved endosperm absent.

Endocarp: The innermost layer of the fruit is endocarp. The width of this region varies between 22µm to 30µm. Endocarp is dark in nature. Endocarp cells are compactly arranged and thick walled parenchymatous. They are square to polygonal in shape and measures about 1.5µm across its diameter (Text fig.4, Plate 1, Fig.5).

Seed: Morphologically the seed is elliptical to ovate, unitegmic in nature; seed coat is in single layered. It is ill preserved. Seed measures about 2mm in length and 1.1mm in breadth (Text fig.5, Plate1 Fig.5).

Seed coat: Seed is unitegmic, testa and tegmen undifferentiated only single layered cells are observed in some peel sections (Text fig.5, Plate 1, Fig.5). Seed coat measures about 3µm in width. Dimensions of cells are 2µm.

Embryo: Embryo is well preserved but endospermous cell are not well preserved therefore seed may be nonendospermic (Text fig.2, Plate1, Fig.2).

Dehiscence: The fruit is indehiscent capsule; it does not show any dehiscence.

Woody Projections: Present on fruit wall.

Identification

The above description of the specimen reveals following important details for its identification.

1. Fruit is unilocular, monocarpellary.
2. Single seeded fruit.
3. The fruit wall shows epicarp, mesocarps and endocarp.
4. Seed coat unitegmic and single layered.
5. Fruit capsular in nature.
6. Indehiscent fruit.
7. Hard and woody projections present on fruit wall.

The fossil specimen is compared with the recorded fossil fruits,

DISCUSSION

Mehrota et al., (1983) reported *Euphorbiocarpon drypetoids*, the trilocular single seeded indehiscent fruit while the present fruit is a unilocular single seeded capsular fruit. *Euphorbiocarpon singhpurii* (Bhowal and Sheikh, 2006) described multilocular fruit with hairs but present fruit is unilocular with hard and woody

projections on fruit wall, therefore it is different. *Bicarpelocarpon singhpurii* (Bhowal and Sheikh, 2008) fruit is bilocular but present fruit is unilocular hexagonal shape, *Portulacaceaeocarpon jamsavlii* (Meshram et al., 2011) fruit also unilocular triangular in shaped, multiseeded, seed bitegmic and endospermic but present fruit lack of endosperm without bitegmic seed therefore it is totally different. In *Spinocarpon mohgaoense* (Kapgade, 2013), fruit spiny showing two locules with two erect mucronate beaks but present fruit unilocular hexagonal and single seeded therefore it is totally different. Kokate (2013) reported *Lagerstroemiocarpon harrisii* in this fossil fruit, fruit hexagonal having each locule single seed with axile placentation but present fruit different because fruit unilocular single seeded with woody projection on fruit wall.

It is clear from the above characters, that the specimen is different from all the fossil fruit previously reported from Chhindwara district, hence 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 present fossil shows woody projection on fruit wall therefore it is different.

In Sapindaceae the fruits are large, dry. There are also schizocarpic fruits and are frequently winged. The seed is exendospermic containing only the curved embryo. The genus *Sapindus* and *Nephelium* show same characters but present fossil fruit is wingless and without curved embryo and is smaller in size than the living genera. Therefore the present fruit is different from above family (Rendle, 1956; Corner, 1976; Eams and Mac Daniels, 1972)

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 having woody projection on fruit wall therefore studied fossil fruit different.

Menispermaceae, (Roy et al., 1992) the fruit; 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 is without endosperm and hard woody projection on fruit wall therefore it is different.

Burseraceae (Roy et al., 1992) described the fruit as drupaceous dehiscent, single seeded with curved embryo with endosperm the genus *Boswellia serrata*, *Garuga pinnata* show resemblances with fossil fruit but present fruit is without curved embryo and indehiscent and capsular therefore present fruit is different (Rendle 1956).

Tiliaceae (Roy et al., 1992) described the fruit. It is ellipsoid oblong in shape; seed has an embryo and endosperm, spines like structures are present. These characters are reflected in the living genera like *Grewia helicterifolia*, *Grewia hirsute* *Grewia rothii*, *Grewia subinaequalis*, *Grewia tiliifolia*.

From the above comparisons it is clear that the present fossil fruit though does not show any resemblance with the earlier fossil specimen, but it shows maximum resemblances with the living families which are as under.

From the above table 1, It is clear that the present fossil fruit show maximum resemblances with the living families Tiliaceae with regards of the fruit wall nature, seed anatomy and spine (woody projection) like projection on fruit wall. The affinities are more towards family Tiliaceae. Hence it is named as *Tiliaceaeocarpon jamsavlii* gen etc sp. nov. The generic name is after the family under which the fossil fruit has been placed and the specific name comes from the new locality Jamsavli.

DIAGNOSIS:

Tiliaceaeocarpon jamsavlii gen. nov

Fruit capsular, unilocular, indehiscent, hexagonal with multilayered pericarp thin walled parenchymatous cells. Epicarp made up of thin wall parenchymatous cells, pentagonal to hexagonal in shape. Mesocarp is made up very thin walled parenchymatous cells. Endocarp compactly arranged polygonal cells. Single seeded unitegmic. Embryo present and endospermic tissue absent.

Tiliaceaeocarpon jamsavlii gen. et sp. nov

Fruit capsular, unilocular measuring about 3mm in length and 1.5 mm in breadth. It is enclosed

a single seed in the locule. Locule measure about 2mm in length and 1mm in breadth. Fruit wall measures about 90 µm to 180µm it thick. Epicarp made up of thin wall parenchymatous cells, pentagonal to hexagonal in shape. Mesocarp is made up very thin walled parenchymatous cells. Endocarp compactly arranged polygonal cells. eliptrical to ovate, unitegmic in nature, seed coat is in single layered. It is ill preserved. Seed measures about 2mm in length and 1.1mm in breadth.

Holotype : S.M.M/ANGF/Deposited at Department of Botany Institute of science, Nagpur.

Horizon : Deccan Intertappean beds of India.

Locality : Jamsavli M.P. India

Age : ? Upper cretaceous

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