

## REPORT OF A NEW PETRIFIED ACHENAL FRUIT FROM THE DECCAN INTERTRAPPEAN BEDS OF PUDIYAL MOHADA OF CHANDRAPUR DISTRICT, MAHARASHTRA STATE, INDIA.

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### ABSTRACT :

The present paper deals with the description of a new genus of petrified achenal fruit from the Deccan Intertrappean beds of Pudiyaal Mohada, Tahsil-Jiwati, Dist.-Chandrapur, Maharashtra, India. The fruit is elongated, cylindrical in shape, stalked, unilocular, single seeded. The fruit wall or pericarp shows three zones. The outer zone is 2 to 3 layered structures of thick walled parenchymatous cells. It shows two pointed bulging or spiny outgrowths on its wall which are made up of 2-3 layers of thick walled parenchymatous cells. Middle zone is single layered structure of thick walled parenchymatous cells and inner zone is multi layered structure of thin walled elongated cells. The seed coat is bitegmic structure with testa and tegmen. The testa is made up of from single layer of thick walled cells and tegmen is made up of from 2-3 layers of thick walled cells. Embryo is not preserved while endospermic cells are well preserved. As this fruit show no resemblance to any of the reported fossil fruit and also with the living families except the modern dicot family Petiveriaceae with genus *Petiveria alliacea* L. but it is not match exactly with genus *Petiveria alliacea* because it has four or six spines on its apical portion but our fruit have two spines at the middle portion of the fruit wall but it shows all the characters of family Petiveriaceae as unilocarpellary, unilocular ovary with single seed in locule. Hence the fossil fruit is named as *Petiveriocarpon pudiyalii* gen. et sp. nov. The generic name is being after resemblance of this fruit with modern family petiveriaceae whereas specific name indicates the locality from where the specimen was collected.

**Keywords :** Achenal fruit, Bitegmic, Deccan Intertrappean, Unilocarpellary, Unilocular

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### Introduction :

The present specimen incorporates the detailed morphological and anatomical description of a unilocular fruit from the Deccan Intertrappean beds of Pudiyaal Mohada, Tahsil-Jiwati, Dist.-Chandrapur, Maharashtra, India. From the Deccan Intertrappean beds many unilocular fruits have been reported, such as *kremocarpon aquatica* (Chitale and Kate, 1975), *Kremocarpon indicum* (upadhye, 1979), *Juglandiocarpon agashii* (Adhao, 1986), *Ceratocarpon spinosa* (Adhao, 1986), *Wingospermocarpon mohgaonse* (Sheikh & Kapgate, 1984), *Mahabaleocarpon deccanii* (Chawhan, 1987), *Paradkarocarpon indicum* (Wazalwar, 1990), *Spinocarpon intertrappea* (Dahegaonkar R.R., 2002), *Boehmeria intertrappea* (Ambawani et al., 2004), *Achenocarpon sharmaii* (Kapgate D.K., et al.), *Uniloculocarpon singhpurii* (Qureshi S Parveen, 2016), *Unispermospinocarpon keriensis* (Kapgate D.K. and Paliwal Pratibha A., 2016). The Present unilocular fruit is the additional report of the unilocular achenal fruit from the Deccan Intertrappean beds of Pudiyaal Mohada, Tahsil -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 Pudiyal Mohada, Tahsil-Jiwati, Dist.-Chandrapur, Maharashtra, India. It was exposed in longitudinal view. After etching with hydrofluoric acid and washing with water elongated, cylindrical fruit, multilayered fruit wall with central cavity 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 and 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.

## Description:

**General Description :** The spiny petrified fruit exposed in longitudinal plane. The fruit is elongated, cylindrical in shape, stalked which measures about 6.8 mm in length and is 2.4 mm in width. It is unilocular, single seeded spiny fruit. Embryo is not preserved while endospermic cells are well preserved. It has well preserved pericarp and differentiated into three zones outer, middle and inner (plate I, photo 6). The following anatomical characters are seen in the above fruit.

**Fruit Wall (Pericarp) :** The fruit wall or pericarp is well preserved and moderately thick and shows pointed bulging of spiny outgrowths on its wall. It measures about 1.25 mm in thickness and is differentiated into three zones outer, middle and inner (Plate I, photo 6).

The outer zone is made up of from 2 to 3 layers of thick walled parenchymatous cell and measures about 493  $\mu$ m in thickness (Plate I, photo 6). It shows pointed bulging of spiny outgrowths on its wall which are measures about 1.07 mm in thickness, made up of 3-4 layered thick walled parenchymatous cells (Plate I, photo 10). Middle zone is measures about 95  $\mu$ m in thickness. It consists of single layer of thick walled parenchymatous cells (Plate I, photo 6). Inner zone is measures about 661  $\mu$ m in thickness. It is made up of from multilayers of thin walled elongated cells (Plate I, photo 6, 8).

**Locule :** In longitudinal section single locule with well preserved single seed is seen (Plate I, photo 9). The diameter of locule is 3.26 x 1.43 mm in size (Plate I, photo 9).

**Seed :** The present fossil fruit contain a single seed which measures about 3.20 mm long and 1.40 mm broad (Plate I, photo 9). The seed coat is multicellular and differentiated into testa and tegmen (Plate I, photo 7). The embryo is not preserved while endospermic cells are well preserved (Plate I, photo 11).

**Seed Coat :** The seed coat is bitegmic. The outer seed coat is testa and the inner seed coat is tegmen. The testa is made up of from single layer of thick walled cells and measures about 57  $\mu$ m in thickness. The tegmen is made up of from 2-3 layers of thick walled cells and measures about 215  $\mu$ m in thickness (Plate II, photo 7).

**Embryo :** The embryo is not preserved.

**Stalk :** A single stalk is seen attached to fruit at its base and is measures about 394  $\mu\text{m}$  in length (Plate I, photo 1-4, 9).

### Discussion And Identification :

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

1. The fruit is unilocular, single seeded, spiny.
2. It is elongated, cylindrical in shape and stalked.
3. Fruit wall is differentiated in to outer, middle and inner zone.
4. Endocarp is multi layered structure of thin walled elongated cells.
5. Seed coat is thick and differentiated into testa and tegmen.
6. Embryo is not preserved while endospermic cells are well preserved.

From these characters it is evident that the described fruit was formed from unilocarpellary, unilocular, apocarpous ovary. Nature of the fruit appears to be achene due to single seed, fruit wall free from seed coat and indehiscent nature of fruit.

### Comparison With Fossil Fruit :

The studied fossils fruit shows great variation from the previously described unilocular fossil fruits in number of characters. *Kremocarpon aquatica* (Kate, 1974) and *Kremocarpon indicum* (Upadhye, 1979) are unilocular fibrous berries with papillate projections on the tough epicarp in the later. The present fruit differ from it in having only two spiny projection and achene type of fruit. *Ceratocarpon spinosa* (Adhao, 1986) achenial with one locular, one seeded fruit with spines all over the surface while the present fruit is only with two spiny projections on fruit wall. *Juglandiocarpon agashii* (Adhao, 1986) is unilocular, single seeded fruit with feathery wings. Fruit wall shows epicarp with air chamber, fibrous mesocarp and stony endocarp such type of feathery wings, epicarp with air chamber, fibrous mesocarp and stony endocarp are absent in present fruit. *Wingospermocarpon mohgaonse* (Sheikh & Kapgate, 1984) is unilocular, capsular, winged seed, free central placentation of the seed. The present fruit is achene type, without winged seed and free central placentation. *Mahabaleocarpon deccanii* (Chawhan, 1987) is unilocular, single seeded, pulpy, indehiscent, baccate fruit. The present fruit is without pulp and having achene type of fruit. *Paradkarocarpon indicum* (Wazalwar, 1990) is unilocular, seed coat soft with arenchyma and made up of parenchymatous cell such type of arenchymatous coat is absent in present fruit. *Spinocarpon intertrappea* (Dahegaonkar R.R., 2002) fruit is dicotyledonous, indehiscent, unilocular, many spines on fruit wall, single seed in a locule while the present fruit is stalked, with two spines on fruit wall and achene type. *Boehmeria intertrappea* (Ambwani, et al., 2004) is an indehiscent achene, more or less circular to oval while the present fruit is spiny, elongated, and cylindrical in shape. *Achenocarpon sharmaii* (Kapgate D.K., et al.) is unilocular, single seeded, indehiscent with acute apex while the present fruit is stalked, with two spines on fruit wall and without acute apex. *Uniloculocarpon singhpurii* (Qureshi S Parveen, 2016) is simple elongated, oval in shape, sessile, unilocular, single seeded capsular fruit, loculicidal dehiscence while the present fruit is stalked, spiny and achene type. *Unispermospinocarpon keriensis* (Kapgate D.K. and Paliwal Pratibha A., 2016) is small, elliptical, unilocular, single seeded, dehiscent, capsular, stalked and spines are found all over the fruit while the present fruit is indehiscent, achene type with only two spines on fruit wall.

### Comparison With Modern Taxa :

For assigning the fossil fruit to proper family, it was also compared with living genera of modern families. Such a fruit is compared with the modern families having spiny fruits (Gamble, 1957; Cooke, 1958; Hooker, 1961; Saldanha & Nicolson, 1978; Mathew, 1981, Udulutsch et al. 2007). Presence of unilocular, single seeded, spiny fruit made it easier to trace its affinities with nearest living families like Rubiaceae, Ceratophyllaceae, Elaeocarpaceae, Caprifoliaceae, Asteraceae, Zygophyllaceae, Nyctaginaceae, Petiveriaceae.

In family Rubiaceae (*Cephalanthus occidentals*) and family Ceratophyllaceae (*Ceratophyllum*); is differs in having moderately long spine and so many in number while the present fruit is with two small sized spines. Comparison also made with family Elaeocarpaceae (*Sloanea*) it is differs in having many seeded spiny fruit while present is single seeded spiny fruit. Family Caprifoliaceae (*Kolkwitzia*) is differs in having fruit with persistent calyx and spines are long and many in number while present fruit is without persistent calyx and with two small sized spines. Family Asteraceae (*Glagenophora*) is compared in having spiny fruit, pappus absent with unequal size of spines while present fruit is with two equal sizes of spines. It is also compared with family Zygophyllaceae (*Seetzenia*) is differs in having the seeds, testa thick, with three skins, the outer membranous, the middle one cellular and mucous and the inner coriaceous while such structures are absent in present fruit. In family Nyctaginaceae, single carpel, superior, unilocular ovary, fruit is achene type, single seeded and enclosed by parianth base while the present fruit differ from it by having spines on fruit wall and fruit is not enclosed by parianth base. In *Petiveria alliacea* L. of family Petiveriaceae, gynoeceum is monocarpellary, laterally compressed, tomentose with four or six apical bristles. The fruit is achene type with a coriaceous pericarp adhered to the seed and is erect, linear and laterally compressed, with a membranous coat (Udulutsch et al. 2007). The fossil fruit though comparable with the modern families in some ways but differ in many aspects. It shows more resemblances to modern genus *Petiveria alliacea* L. of family petiveriaceae.

The above discussion point out that this fruit shows no resemblance to any of the reported fossil fruit and also with the living families except the modern dicot family Petiveriaceae with genus *Petiveria alliacea* L. but it is not match exactly with genus *Petiveria alliacea* because it has four or six spines on its apical portion but our fruit have two spines at the middle portion of the fruit wall but it shows all the characters of family Petiveriaceae as unicarpellary, unilocular ovary with single seed in locule. Hence the fossil fruit is named as *Petiveriocarpon pudiyalii* gen. et sp. nov. The generic name is being after resemblance of this fruit with modern family petiveriaceae whereas specific name indicates the locality from where the specimen was collected.

### Diagnosis :

***Petiveriocarpon* gen. nov.**

The fruit is dicotylednous, oval in shape, stalked, unicarpellary, unilocular, apocarpous, single seeded.

***Petiveriocarpon pudiyalii* gen. et sp. nov.**

The fruit is simple, elongated, cylindrical in shape, stalked, unilocular, single seeded, achene type. The pericarp or fruit wall is with three zones. The outer zone is 2 to 3 layered

structure of thick walled parenchymatous cells and measure about 493  $\mu\text{m}$  in thickness. It shows pointed bulging or spiny outgrowths on its wall which are measures about 1.07 mm in thickness which is made up of 2-3 layers of thick walled parenchymatous cells. Middle zone is single layered structure of thick walled parenchymatous cells and measures about 95  $\mu\text{m}$  in thickness. Inner zone is multi layered structure of thin walled elongated cells and measures about 661  $\mu\text{m}$  in thickness. Seed coat is bitegmic with testa and tegmen. The testa is made up of from single layer of thick walled cells and measures about 57  $\mu\text{m}$  in thickness. The tegmen is made up of from 2-3 layers of thick walled cells and measures about 215  $\mu\text{m}$  in thickness. Embryo is not preserved while endospermic cells are well preserved.

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

**Horizon** : Deccan Intertrappean beds.

**Locality** : Pudiyal Mohada, Tahsil- Jiwati, Dist. Chandrapur, Maharashtra, India.

**Age** :? Uppermost Cretaceous.

#### Acknowledgements :

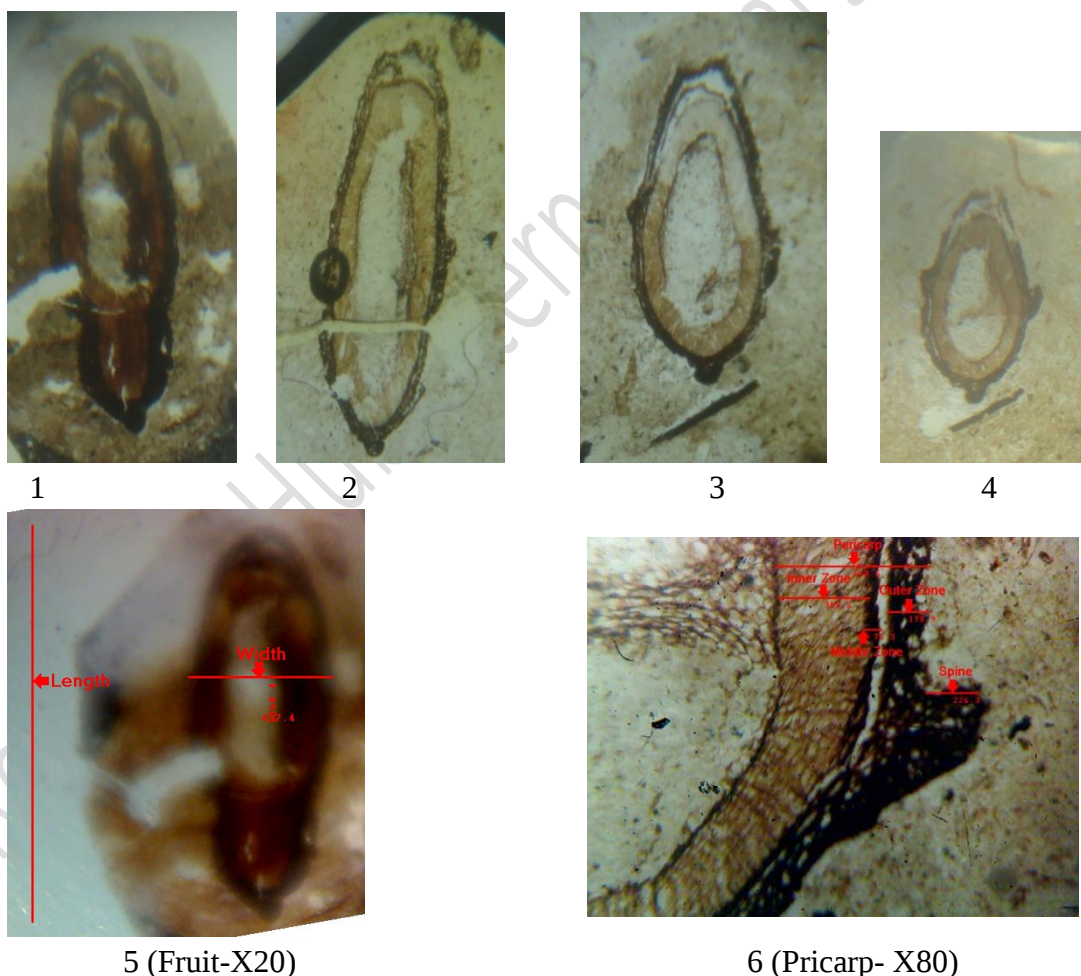
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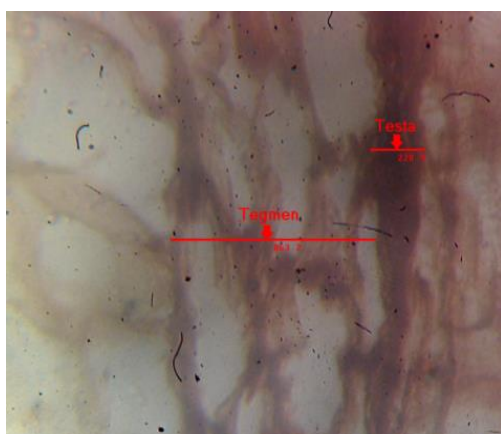
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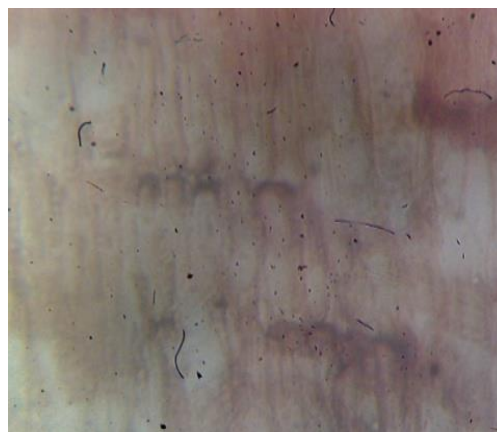
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PLATE I PHOTO 1 - 11

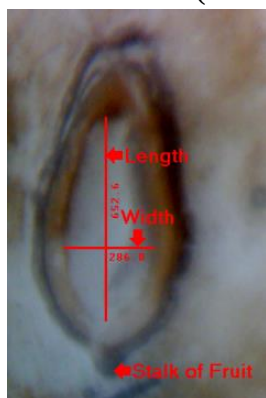




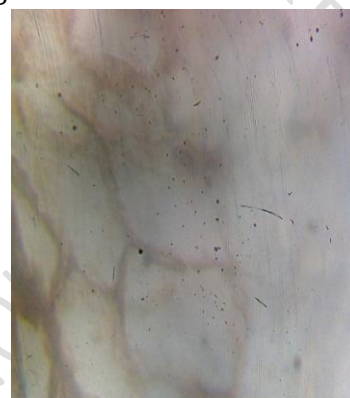
7 (Seed Coat-X400)



8 (Elongated cells of Inner zone- X400)



9 (Locule & Seed size-X20) 10 (Spiny outgrowth-X40)



11 (Endosperm cells-X400)

Explanation of Plate Photo 1 to 11

- Photo 1-2. A typical fruit in L.S. showing elongated, cylindrical in shape, unilocular, stalked with central cavity.....X20.
- Photo 3. A typical fruit in L.S showing size of fruit decreasing and appearance of spiny outgrowth on right side of fruit wall.....X20.
- Photo 4. A typical fruit in L.S. showing size of fruit decreasing and appearance of spiny outgrowth on both side of fruit wall with branch like stucture near the base of fruit.....X20.
- Photo 5. L. S. of Fruit showing length and width of fruit. ....X20.
- Photo 6. L. S. of Pericarp showing Outer, Middle and Inner zone .....X80.
- Photo 7. L. S. of Seed coat showing Testa and Tegmen. ....X400
- Photo 8. Elongated cells of Inner zone..... X400
- Photo 9. Locule & Seed size. ....X20
- Photo 10. Spiny outgrowth on pericarp. ....X40
- Photo 11. The endosperm cells. ....X400

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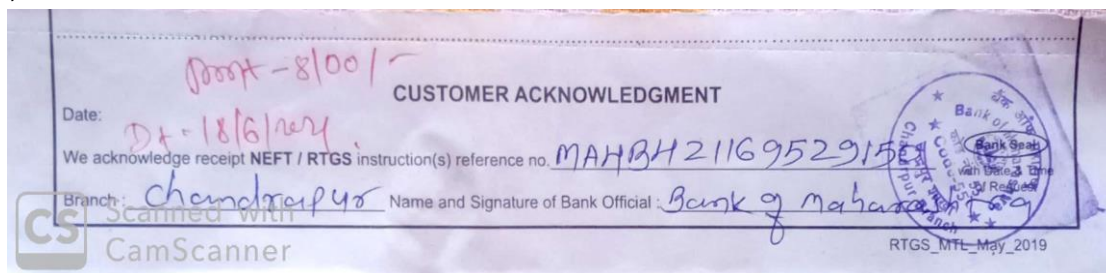
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