

ORIGINAL ARTICLE

***Tamaricaceocarpon mohgaonse* gen.et sp.nov. From The Deccan Intertrappean Beds of Mohgaonkalan, M.P., India**

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ABSTRACT

Present investigation deals with a unilocular capsular fruit *Tamaricaceocarpon mohgaonse* from the Deccan Intertrappean beds of Mohgaonkalan (Lat 22°, 1'N: long 79°, 1'E), Madhya Pradesh, India. Fruit is long, elongated in shape with two prominent lateral projections. Fruit is indehiscent but it shows ruptured pericarp. Pericarp differentiated into epicarp, mesocarp with aerenchyma cells and endocarp. Seed bitegmic and hairy. On comparison it shows close affinities with the characters of living family Tamaricaceae and its genera *Tamarix*.

**Keywords:** Tamaricaceae, Intertrappean, Mohgaonkalan, Projection, Bitegmic.

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**INTRODUCTION**

Several localities have been explored to study the vast flora from Deccan Intertrappean beds. The outcrop of this study gives a brief idea about the morphological, anatomical, embryological and ecological aspects of the flora. The present chapter deals with a detailed investigation of a fossil dicotyledonous capsular fruit from the Deccan Intertrappean beds of Mohgaonkalan of Uppermost Cretaceous age. From this locality several fruits have been reported and studied by many workers. Some of them are, *Enigmocarpon parijai* [13], *Indocarpa intertrapea* [9], *Harrisocarpon sahnii* [4], *Sahnioocarpon harisii* [5], *Daberoocarpon gerhardii* [6], *Deccanocarpon arnoldii* [10], *Mohgaoncarpon eyedi* [16], *Centrospermocarpon chitaleyii* [14] and *Trapa mohgaensis* [11]. The *Schizocarpon aliformii* [2] and *Bicarpelarocarpon singhpurii* [3] is discovered from Deccan Intertrappean beds of Singhpur. Thus, the present investigation gives an additional information to the knowledge of capsular fruits from the Deccan Intertrappean flora of Mohgaonkalan, M.P., India.

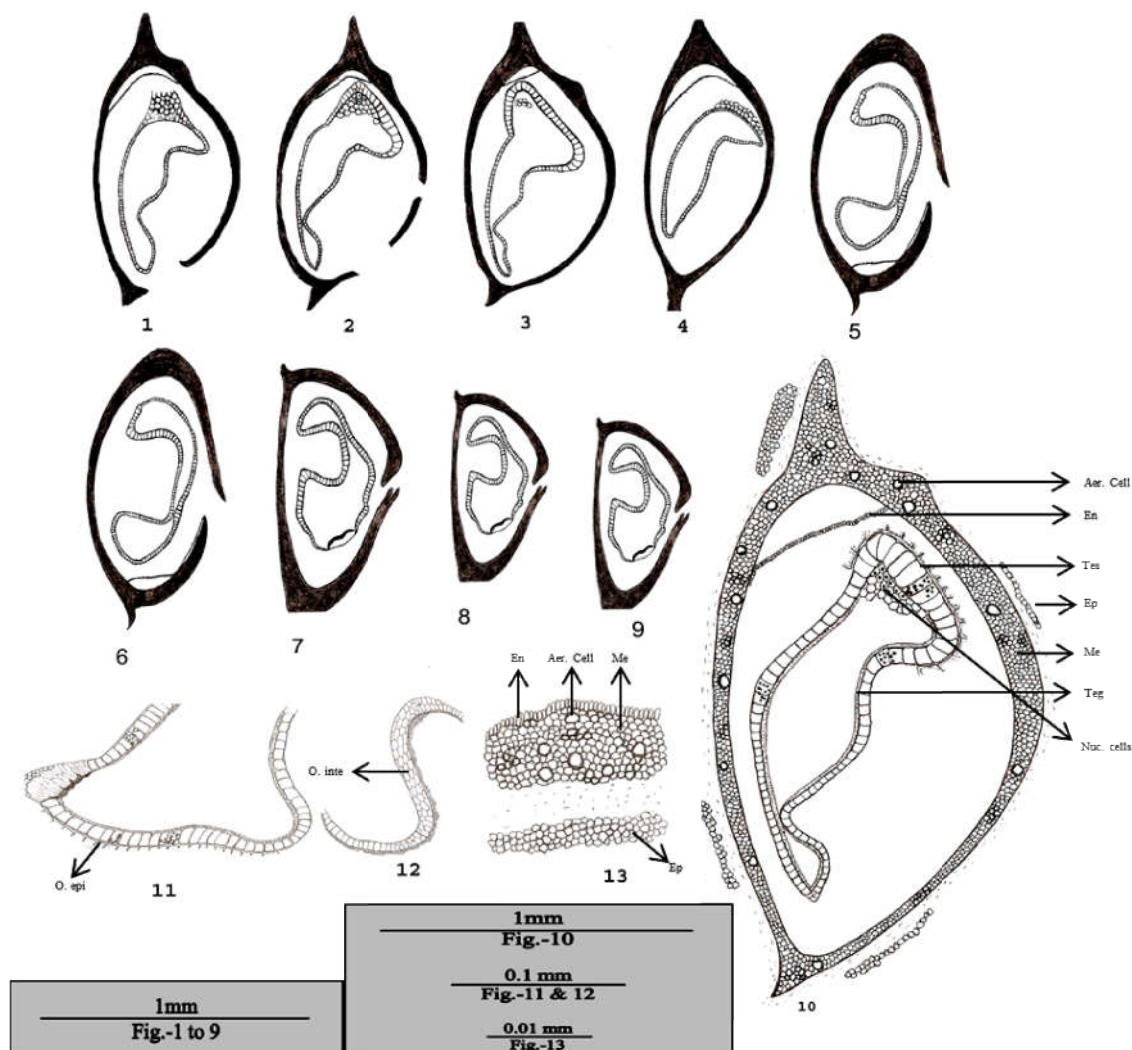
**MATERIAL AND METHOD**

A petrified fruit described in this chapter was found in a piece of chert. The chert was collected from the locality of Mohgaonkalan, Dist. Chhindwara in M.P. On breaking the chert the fruit was exposed in transverse section. Chert was etched with hydrofluoric acid and peels were prepared. Anatomical details were studied, camera lucida sketches drawn and important anatomical stages were photographed. Unfortunately counterpart is missing.

**DESCRIPTION**

**Fruit Morphology:** The petrified fruit exposed in transverse plane is unilocular, long and elongated with two prominent lateral projection of the fruit wall, sessile (without stalk), single seeded and indehiscent. Seed is well preserved. The entire unilocular fruit measures 804µm in length and 282µm in diameter. (Plate Fig.1to6 & Text Fig.1to4, 10)

**Fruit Anatomy:** Anatomically unilocular fruit shows following characters.



#### Explanation of Text Figures

**1-9.** Serial section of the fruit showing different stages of the fruit cut transversely. **10.** Enlarged unilocular fruit showing bitegmic seed. **11.** Outer epidermis (O. epi) of the outer integument (O. inte) shows hair like projection in the testa (Tes) and tegmen (Teg) ill preserved. **12.** Outer integument (O. inte) shows elongated radially cells. **13.** Showing tissue of pericarp differentiated into epicarp (Ep), mesocarp (Me) with aerenchyma cells (Aer. cells) & endocarp (En).

**Pericarp:** The pericarp or the fruit wall is distinct but the cells are not preserved entirely. The width of the pericarp shows variations  $36\mu\text{m}$  to  $66\mu\text{m}$ . Though the cell differentiation is not very clear, still three zones of this layer are well demarcated. (Plate Fig.9 & Text Fig.10, 13)

**Epicarp:** The outer most layer of the pericarp is epicarp. It is not present in a continuous manner, it is broken. The cells are thin walled and parenchymatous, two to four layered. Cell shape is not very clear. It measures about  $18\mu\text{m}$  in width. (Plate Fig.9 & Text Fig.13)

**Mesocarp:** It is the middle layer, well preserved, measures about  $42\mu\text{m}$  in width. It is multilayered and there are few enlarged cells which may be interpreted as aerenchyma cells. The aerenchyma cells are covered by thick layers, cells of the layers are filled with a dark brown colored unknown content. Their composition, thickness and deposition indicate the possibility of being their sclerenchymatous in nature. Shapes of the cells are pentagonal to polygonal. (Plate Fig.9 & Text Fig.13)

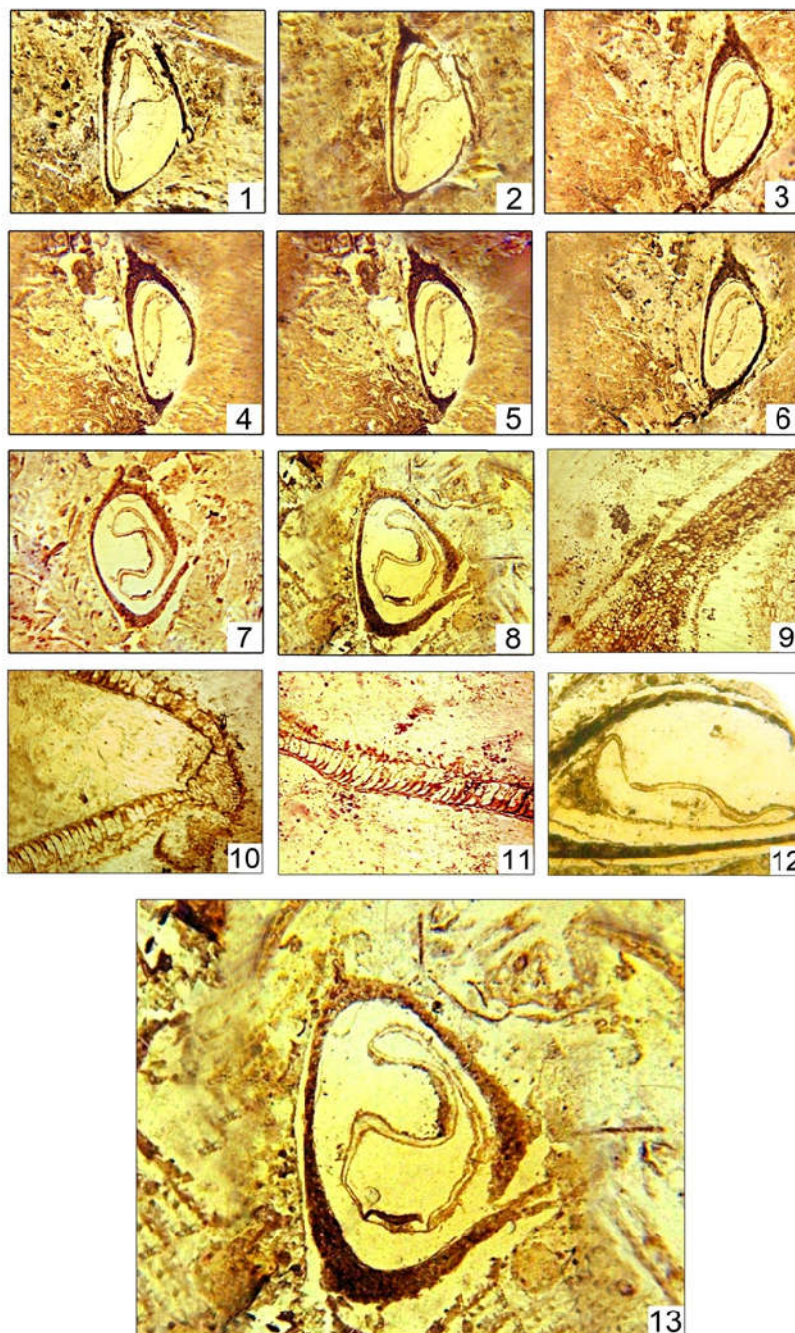
**Endocarp:** This is the innermost layer of the pericarp measures  $6\mu\text{m}$  in width; it is made up of the row of elongated thin walled parenchymatous cells. It is somewhat obliquely cut. (Plate Fig.9 & Text Fig.10, 13)

**Seed:** It is well preserved. It measures about  $426\mu\text{m}$  in length and  $72\mu\text{m}$  in width. It is differentiated into testa and tegmen. (Plate Fig.12 & Text Fig.10)

**Testa:** Ovule seems to be bitegmic with outer and inner integument. Outer integument consist of 3 to 4 layered of cells, the outer epidermis of the outer integument persist with hair like projection. The middle

2 to 3 layers degenerate, the inner epidermis of outer integument elongate radially and forms the main part of the testa. The cells contain tannin (dark content in globular form). (Plate Fig.10, 11 & Text Fig.11, 12)

**Tegmen:** The inner integument seems to be 2 to 3 layered and develop into thin papery layer called tegmen. It is without any cellular differentiation. Persisting nucellar cells are seen at one end of the seed (Plate Fig.10, 11, 12 & Text Fig.1, 2, 10, 11, 12).



#### Explanation of Plate Figures

**1-8.** Serial section of the fruit showing different stages of the fruit cut transversely (35X). **9.** Showing tissues of pericarp differentiated into epicarp, mesocarp with aerenchyma cells & endocarp (100X). **10.** Outer epidermis of the outer integument shows hair like projection in the testa and tegmen (100X). **11.** Outer integument shows elongated radially cells (100X). **12.** Showing persisting nucellar cells at one end of the seed (100X). **13.** Showing hypostage like structure in the form of inverted cup and ruptured pericarp (100X).



In some of the section a hypostage like structure is seen which is in the form of a inverted cup like structure, and consist of sclerenchymatous cells, which look dark coloured in section (Plate Fig.7, 8, 13 & Text Fig.8, 9). As the embryo is not seen in this region, it can be considered as the nutritive zone, may be nucellus or the endosperm. No tissue is seen here, probably due to its ill preservation or absorption during the development of the embryo.

**Dehiscence:** The fruit is unilocular capsule showing rupture along the pericarp (Plate Fig.7, 8 & Text Fig.7, 8, 9).

## RESULTS AND DISCUSSION

The present fossil fruit is a dicotyledonous and unilocular indehiscent capsule. It is sessile with ruptured pericarp. Pericarp differentiated into epicarp, mesocarp with aerenchyma cells and endocarp. Seed coat differentiated into testa and tegmen. The outer epidermis of the outer integument persists with hair like projection. At one end, seed shows persisting nucellar cells. Hypostage seen in the form of inverted cup like structure.

The fruit is compared with the modern (living) unilocular families like, Pittosporaceae, Hydrostachyaceae, Flacourtiaceae, Turneraceae, Bixaceae, Violaceae, Cistaceae and Tamaricaceae [1, 7, 8, 12, 15].

In the family Pittosporaceae, fruits are one to several chambered, ovules numerous and inserted in two rows, fruit capsule or berry. Fruit of Hydrostachyaceae are unilocular capsules, but differ in having numerous seeds and unitegmic seed coat. Fruits of Flacourtiaceae, Turneraceae and Bixaceae show unilocular ovary, ovules numerous, loculicidal capsule with bitegmic seed coat but present petrified fruit have only one ovule.

Fruit of family Violaceae agree with present petrified fruit in having unilocular ovary, ovules one, two or numerous on each placenta, seed coat bitegmic but differs in having loculicidal capsule and berry type fruit. Cistaceae have unilocular ovary or falsely five to ten loculed due to intrusion of placentae, ovules two too many on each placenta, fruit leathery or woody capsule with loculicidal dehiscence hence was not compared.

Family Tamaricaceae bears close resemblance with the present petrified fruit like ovary unilocular, fruit capsule, seeds hairy all over or may be at distal end, seed coat bitegmic but difference encountered is in respect of ovules two to many on each placenta [12]. One more remarkable character of petrified fruit is, it shows presence of aerenchyma cells in the pericarp region, which indicates that plant may have been from a wet marsh land. The Tribe Tamariceae comprises of genus Tamarix, which shows unilocular ovary with hairy seed and capsular fruit. Genus Tamarix includes species like *T. gallica*, *T. dioica*, *T. ericoides*, *T. articulata* and *T. stricta*. [7, 15].

Apart from this, the species *T. gallica* and *T. ericoides* shows presence of hairy seeds and plants frequently grow along the banks of rivers. All above characters are found in the family Tamaricaceae. So, there is a probable chance of the present petrified fruit of being from the family Tamaricaceae.

To trace the affinities, the present fossil fruit is first compared with the already reported fossil fruits. *Enigmocarpon parijai* [13] is 2-3 cm long as 1.5-2 cm broad and showing loculicidal dehiscence. It is 12 locular with two rows of seeds on each locules while present fruit is unilocular. The fruit *Indocarpa intertrapea* (9) is four locular septifragal capsule. *Harrisocarpon sahnii* [4] and *Sahnioocarpon harisii* [5] fruits are pentalocular. Both are loculicidally dehiscing capsules while present fossil fruit is indehiscent. The *Daberocarpon gerhardii* [6] is a ten locular fruit showing ridges and furrows which is not seen in present fossil fruit. *Deccanocarpon arnoldii* (10) shows dissimilarities in having eight locular capsule with single root of seed in each loculus. *Trapa mohgaensis* [11] is a dicotyledonous single drupaceous fruit while present fruit is capsule. *Schizocarpon aliformii* [2] is different in having irregular eye shaped bilocular fruit with two fertile chambers and a middle empty space. *Bicarpelarocarpon singhpurii* [3] vary in having empty air chamber in the septa.

Now the present fossil fruit is compared with the reported unilocular fruits like *Mohgaoncarpon eyedi* [16] and *Centrospermocarpon chitaleyii* [14] which are different in being unilocular multiseeded berries. Thus, the fossil under study does not bear any resemblances with the earlier described unilocular fossil fruits from the Deccan trap.

Thus from the above discussion it can be concluded that though the present fruit shows a number of similar characters with the family, Tamaricaceae and its living genera Tamarix. Hence, it can be placed under the family Tamaricaceae and named as *Tamaricaceocarpon mohgaonse* gen.et sp.nov. The generic name is after the family Tamaricaceae to which it shows close affinities and specific name is given after locality Mohgaonkalan.

## DIAGNOSIS

***Tamaricaceocarpon* gen.nov.**

Fruit dicotyledonous, unilocular capsule, sessile with ruptured pericarp. Pericarp differentiated into epicarp, mesocarp with aerenchyma cells and endocarp. Seed coat differentiated into testa and tegmen. The outer epidermis of the outer integument persists with hair like projection. At one end, seed shows persisting nucellar cells. Hypostage seen in the form of inverted cup like structure.

***Tamaricaceocarpon mohgaonse gen.et sp.nov.***

Fruit unilocular capsule, sessile, long elongated in shape with two prominent lateral projection of fruit wall, measures about 804 µm in height and 282 µm in thickness. Fruit shows ruptured pericarp. Pericarp differentiated into three zones epicarp, mesocarp and endocarp. Epicarp consists of thin walled parenchymatous cell measures about 18 µm in width. Mesocarp is sclerenchymatous in nature; it is multilayered with aerenchyma cells, measuring about 42 µm in width. Endocarp single layered measures about 6µm in width. Seed dicot and well preserved measures about 426µm in length and 72 µm in width. Seed coat differentiated into testa and tegmen. The outer epidermis of the outer integument persists with hair like projection. Tegmen without any cellular differentiation. At one end, seed shows persisting nucellar cells. Hypostage seen in the form of inverted cup like structure.

**Holotype** : **AMY. / Fruit-1. Department of Botany, Institute of Science Nagpur.**  
**Locality** : **Mohgaonkalan, M.P., India.**  
**Horizon** : **Deccan Intertrappean Series of India.**  
**Age** : **? Upper Cretaceous.**

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