# *Enigmocarpon chandrapurensis*, a silicified fruit from the Deccan Intertrappean exposure at Pudiyalmohada in Jivati taluka of Chandrapur district, M. S.

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## ABSTRACT

The present paper deals with the study of dicotyledonous fruit collected from a new exposed near village Pudiyalmohada of Jivati taluka of Chandrapur District. The locality (N19034.269', E079001.866') shows well preserved fossil flora belongs to Deccan Intertrappean Beds of India (65-70 million age). It spared along the road side, in the field and nearby foot of hill. It is belonging to uppermost Cretaceous period. It is an eight locular petrified dicotyledonous, loculicidal capsule. The fruit is small, globular, with six to eight seeds horizontally packed back-to-back in alternating rows in each locule and showing stalked glandular outgrowths on the septae and the inner wall of the fruit. The placenta, raphe and the fruit wall are spongy. It is compared with living and fossil fruits of Lythraceae. It shows close resemblances with *Enigmocarpon* fruits and hence named as *Enigmocarpon chandrapurensis* sp. nov.

**Keywords**:, Deccan Intertrappean Beds, Dicot, *Enigmocarpon.*

## INTRODUCTION

Present capsular fruit was collected from a new locality exposed near village Pudiyalmohada on Gadchandur-Patan Road and 25 km away from Gadchandur of Jivati taluka, Chandrapur District. The locality (N19034.269' E079001.866') shows well preserved fossil flora of all plant groups belongs to Deccan Intertrappean Beds of India of uppermost Cretaceous (Danian) to lower Eocene (Kapgate et al, 2016). The fruit genus *Enigmocarpon* (Sahni, 1943, Chitaley, 1964) and its flower *Sahnianthus* (Shukla, 1944) have been outstanding discoveries in the history of fossil angiosperms. Numerous specimens of both these forms have been discovered from the Tertiary beds of Mohgaon Kalan, Chhindwara District (M.P.) and some specimens have also been found at Pudiyalmohada, Chandrapur District (MH).

## MATERIAL AND METHOD

fossiliferous cherts were collected from the recently discovered Deccan Intertrappean beds in Pudiyalmohada, M.S., India. Upon breaking the cherts, well preserved fruits were revealed in transverse and longitudinal planes. Both part and counterpart are available. Followed by etching with hydrofluoric acid (HF),

sequential peel sections were obtained using the Cellulose Acetate peel Technique (Darrah, 1936). The peels from both part and counter parts were prepared for the studies. These peels were then mounted in DPX and photographed.

**DESCRIPTION**

The *Enigmocarpon* fruit under investigation is globular, 9 mm long and 11 mm broad, without any stalk. It is eight locular with axile cylindrical placenta, which is 3.5 mm thick with a central lysigenous canal and a peripheral lacunar zone (Plate fig. 1). This zone is continuous with lacunar tissues of the septa. It is multilocular, multi-seeded capsular fruit. Seeds are developed on the placenta arranged in two rows in each locule. Out of eight loculi, six have six seeds each and the remaining two have eight seeds each. These are horizontally packed back-to-back in two alternating rows. Seeds are obovate triangular, 1.5-2 mm long. The chalaza of the seed is obliquely placed with the micropyle curved towards the short thick funicle. The epidermal cells of the Integument are polygonal, with sinuous side walls. The outer wall of each has a central hyaline papilla. Below the epidermis there are several layers of fibrous cells placed longitudinally. The seed cavity is lined with very narrow, elongated thick-walled cells placed lengthwise. The raphe is very thick, even a little thicker than the seed body and it is expanded distally, partially embracing it. Spongy tissues of the raphe consist of thin-walled spherical cells. Hypostase is crescent-shaped and made up of small, thick-walled polygonal cells and it is seated directly upon the chalazal pad. The margin of the hypostase is continued into the nucellar epidermis of polygonal cells which are distally placed in longitudinal rows and converging to an indurated conical cut (epistase) which is produced into a style-like process. The vascular supply from the funicle, enclosed in a raphe canal lined with fibres, at first runs close to the posterior surface of the raphe, then bends in an ascending sigmoid curve in the median plane, through the spongy tissues, to reach the obliquely placed chalazal pad, itself enclosed in a jacket of fibres. The seed is exalbuminous with an embryo of two cotyledons.

The fruit is chambered by eight septae which are attached to the central axile placenta forming a star in the centre. The placenta is differentiated into two zones: the outer and the inner. The inner zone has a lysigenous cavity inside, with a sausage-shaped patch of tissue filled with parenchymatous cells (Plate fig. 2). The inner compact zone of parenchyma forms an inner cortex with a ring of 24 vascular bundles. The outer cortex is not so lacunar and has 16 vascular bundles. The fruit wall is externally smooth and is 2 mm thick. The epidermal cells are thin-walled and barrel-shaped, each one measuring 10 µm tangentially. Inside the epidermis there are six to eight layers of thick-walled, rectangular to squarish cells. These are filled with brown to black contents. Under this zone there are four to five layers of thin-walled compact cells. Inside these layers there are many layers of thin-walled parenchymatous cells forming a spongy tissue. Between these two zones the vascular supply is clearly seen all over the fruit wall. Inside the spongy tissue there is an inner lining of the fruit wall which is smooth and wavy, because of certain outgrowths. These outgrowths are seen in different stages of development. Some are very young, showing small protrusions of tissue. Others are older than these, showing thicker protrusions. The

well-developed out- growths are stalked, with globular bodies each globular structure has an epidermis of thin-walled, flattened cells and is filled with thin-walled parenchymatous cells. These developed structures vary in size from 0.5 to 1 mm with or without stalk and look very much like glandular projections. Such structures are also seen on the septae between the loculi (Plate fig. 3).

Dehiscence gaps are clear in the fruit wall against each loculus running longitudinally from top to the bottom (Plate fig. 1).

## DISCUSSION

From the description, it becomes evident that the specimen corresponds to a fruit of *Enigmocarpon*. The shared characters such as its capsular form, the number of locules, placental arrangement, wall structure, and seed morphology align with established characteristics of the genus. Nevertheless, the present specimen exhibits distinct features not previously observed in the known species *E. Parijai.*

The current specimen is in a spherical shape, unlike the ellipsoidal form characteristic of the known species. Despite being smaller in size compared to E. parijai, it demonstrates, well developed mature seeds in the same number of locules. However, there is a discrepancy in the seed count per locule, while in *E. parijai* typically exhibits eighteen seeds per locule, whereas in the present specimen presents only six to eight seeds per locule. The seeds in our specimen are slightly smaller than those of *E. parijai*. The thickness of the fruit wall remains largely consistent between the two, despite the smaller size of the present fruit. Notably, Sahni (1943) did not report the presence of stalked, glandular outgrowths on the inner lining of the fruit wall and septa in his observations. Additionally, the attachment of septa to the placenta, a feature absent in Sahni's specimen, is distinctly evident in our examination. Thus, it is evident that the *Enigmocarpon* fruit under scrutiny represents a new species, designated as *Enigmocarpon sahnii* sp. nov. The specific epithet honors the esteemed palaeobotanist of India, the late Professor Birbal Sahni.

## DIAGNOSIS

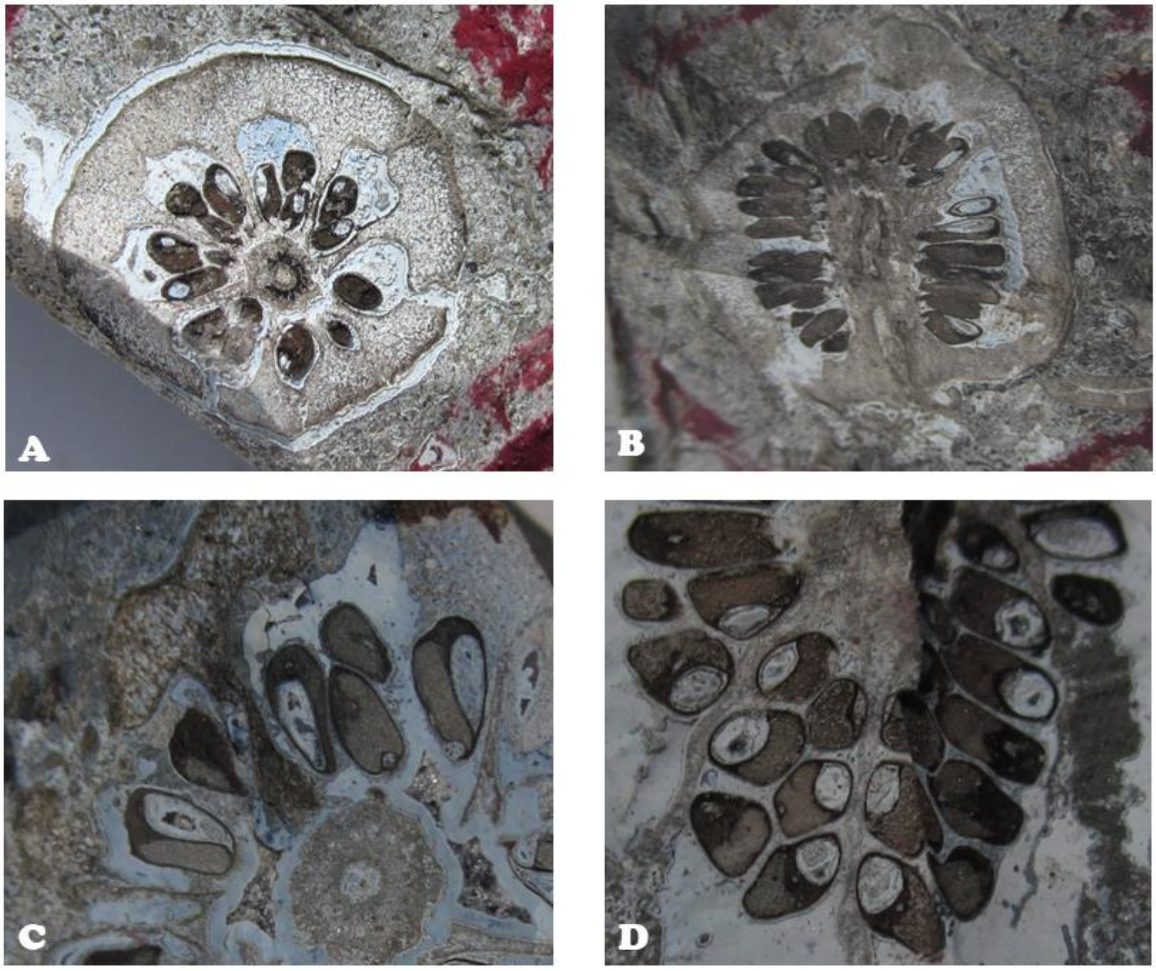
***Enigmocarpon chandrapurensis* sp. nov.**

The fruit is spherical, comprising an eight-chambered capsule, measuring between 9 mm to 11 mm in width, lacking a visible stalk. Externally, the fruit wall appears smooth and is approximately 2 mm thick. The outer layer of the fruit wall consists of thin-walled parenchymatous cells, while the hypodermis comprises six to eight layers of thick-walled cells containing brown to black contents, fruit wall and the septa are parenchymatous, composed of spongy tissue. Notably, the inner epidermis of both the fruit wall and the septa are stalked globular outgrowths, ranging from 0.5 mm to 1 mm in size.

The seeds are obovate triangular, measuring 1.5-2 mm in length, with six to eight seeds per locule arranged horizontally in alternating rows. The chalaza is positioned obliquely, while the micropyle curves towards the short, thick funicle. The raphe, as thick as the seed body, consists of spongy tissue. The integument's epidermis is composed of polygonal cells with sinuous side walls and central hyaline papillae, beneath which several layers of longitudinal fibers are present. The seed cavity is lined by elongated thick-walled cells, with a curved vascular supply. The hypostase appears crescent-shaped, comprising thick-walled cells, while the epistase extends conically into a bristle-like nucellar process. The embryo is dicotyledonous and exalbuminous. The placenta measures 4 mm in thickness, with an outer lacunar cortex containing 16 vascular bundles and an inner compact cortex encircling 24 vascular bundles. A central lysigenous cavity contains a sausage-shaped patch of thin-walled parenchymatous cells. Dehiscence occurs loculicidally.

*Enigmocarpon* fruits, originating from Sahnianthus flowers, have been documented by several authors across different Intertrappean beds (Rode, 1933; Sahni, 1943; Chitaley, 1954; Dwivedi, 1956; Patil, 1972). The current collection of fruit specimens exhibits numerous similarities with the typical dicot fruit Enigmocarpon, although with minor variations in the fruit wall and seeds. Consequently, a new species is proposed and designated as *E. chandrapurense* sp. nov., named after the district to which this locality belongs.

**Holotype**: Ang/fr.1/ Deposited at Botany Department, Dr. Ambedkar College, Chandrapur- M.S.
**Horizon**: Deccan Intertrappean sediments of India.
**Locality**: Pudiyalmohada, M.S. India.
**Age**: Uppermost Cretaceous (Maastrichtian)




**Explanation of Plate**

Figure A-T.S. fruit with outgrowths on inner wall and on septae. Dehiscence of capsule visible.

Figure B-L.S. fruit showing placenta and a row of seeds attached on central placenta.

Figure C-T. S locule showing seeds, central axis and lysigenous cavity.

Figure D-L.S. fruit showing row of seeds attached on central axis.

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