



Additional Insights into the Fossil Fruit *Sahniocarpon* from the Deccan Intertrappean beds of Keria, Madhya Pradesh, India.

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ABSTRACT

This study presents a petrified dicotyledonous capsular fruit from Keria, a notable fossil-rich site in the Chhindwara district of Madhya Pradesh, India. The specimen displays distinctive features not observed in previously described fossils, such as septicidal dehiscence, a persistent calyx, and a long stalk. These traits closely resemble those found in the Linaceae family more than any other living family, which forms the basis for this paper and an updated diagnosis.

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Introduction

The Deccan Intertrappean Beds of India, particularly those in Madhya Pradesh, are renowned for their rich assemblage of fossilized dicotyledonous fruits. Notable discoveries from these beds include *Enigmocarpon parijai* (Sahni, 1943), *Indocarpa intertrappea* (Jain, 1964), *Harrisocarpon sahnii* (Chitaley and Nambudiri, 1968), *Indocarpa jainii* (Nambudiri, 1969), *Sahniocarpon harrisii* (Chitaley & Patil, 1973), *Deccanocarpon amoldii* (Paradkar, 1975), *Wingospermocarpon mohgaonse* (Sheikh and Kapgate, 1984), and *Hexaloculocarpon intertrappea* (Dahegaonkar, 2002). These findings have significantly contributed to our understanding of the diversity and evolution of angiosperms during the Late Cretaceous to early Paleogene periods.



The present study introduces a new fossil fruit specimen from the Deccan Intertrappean Beds of Keria, Madhya Pradesh. Preliminary morphological assessments indicate distinct differences from previously documented taxa, suggesting the potential for new insights into the paleoecology and plant diversity of this region. This paper provides a detailed description and analysis of the specimen, aiming to enhance our comprehension of the floristic composition during this geologic interval.

Material and Methods

Fossiliferous chert samples were collected from the locality of Keria, situated approximately 5 km from Mohgaonkalan in Madhya Pradesh, India. Upon cutting the cherts, several fossilized capsular-type fruits were exposed in longitudinal section across different specimens. Owing to the satisfactory state of preservation, the fossils were studied using the standard peel technique. Serial sections were prepared from the material to facilitate detailed anatomical and morphological examination.

Description

The fruit is a stalked, spherical capsule, tapering at both the apical and basal ends, and broadly rounded at the center. It measures approximately 4.2 to 9.2 mm in length (including the stalk) and 3.3 to 6.0 mm in width. The fruit wall is segmented into five distinct chambers, each separated by longitudinal splits. The thickness of the fruit wall ranges from 0.84 to 2.2 mm per chamber. Anatomically, the fruit wall is differentiated into two distinct zones. The outer zone, measuring 0.36 to 0.8 mm in thickness, comprises a single-layered epidermis made up of parenchymatous cells covered with a thin cuticle. The inner zone is 0.56 to 0.84 mm thick and consists of thick-walled parenchymatous cells interspersed with intercellular spaces, which may have originated from the disintegration of certain cells. Notably, fibrovascular bundles are clearly visible within this zone, exhibiting both protoxylem and metaxylem elements.

Seed Structure

The seeds within each locule are separated by septa composed of two to three layers of parenchymatous cells. Each septum contains a single row of fibrovascular bundles. The five seeds converge at the center of the fruit, forming an axile placenta upon which they are borne. Each locule houses a single seed, positioned vertically. These seeds are elongated, measuring approximately 1.8 to 2.5 mm in length and 1.0 to 1.9 mm in width.



Morphologically, the seeds are three-sided and three-ribbed, tapering at both the apical and basal ends. Three distinct longitudinal ribs extend from the base to the apex—one oriented toward the center and two positioned laterally. The seed coat is thick and features a single-layered epidermis. It is structurally divided into three zones: the outermost zone consists of 2–3 layers of thick-walled parenchymatous cells; the middle zone comprises a single layer of larger cells that connects the outer and inner regions.

Embryo and Fruit Axis Structure

Each seed contains two prominent cotyledons along with a clearly distinguishable plumule and radicle. In both transverse and longitudinal sections, the cotyledons appear as finger-like projections. The cotyledonary cells are polygonal and enclosed by a single-layered epidermis. The radicle is oriented toward the center of the fruit. In some specimens, the micropylar region is also observed facing the center, indicating an anatropous orientation of the seed. The embryo is embedded within the endosperm, which is composed of thin-walled, parenchymatous cells.

The fruit axis is observable in longitudinal section and bears a persistent calyx at its base (Pl. 1, Figs. 1–3). The fructification axis measures approximately 4.0 to 5.2 mm in length and 1.2 mm in width. The stalk is enclosed laterally by a single-layered epidermis and lacks any external outgrowths. Epidermal cells are tangentially elongated and thin-walled. The calyx, consisting of 2–3 layers, is made up of thin-walled, penta- to hexagonal parenchymatous cells. A row of fibrovascular bundles, containing both metaxylem and protoxylem elements, is present within the cortical zone. The stalk extends into a broad calyx measuring 0.80 to 0.90 mm in length and 2.50 to 2.60 mm in width. Cells of the persistent calyx are parenchymatous and bound externally by a single epidermal layer.

Discussion

The present fossil fruit originates from a pentacarpellary, syncarpous, superior ovary with axile placentation, as observed in transverse sections. However, longitudinal sections of the specimens reveal only two carpels, each containing a single seed per locule. In some specimens, the elongated, large seeds are embedded within the soft tissue of the fruit. The fruit wall exhibits slits opposite the septa, suggesting a pentalocular condition; yet, longitudinal sections reveal a bilocular structure with septicidal dehiscence, each locule containing an anatropous seed.



Notably, one specimen displays 4 to 7 layers of thick-walled sclerenchymatous cells in the middle zone of the seed coat. Based on these distinctive features, a new species within the genus *Sahniocarpon* is proposed, named *Sahniocarpon ganeshii*.

Comparisons were made between this fossil and fruits from several families including Tiliaceae, Malvaceae, Sterculiaceae, Sapindaceae, Convolvulaceae, and Linaceae. In families such as Tiliaceae, Malvaceae, Sterculiaceae, Sapindaceae, and Convolvulaceae, fruits are typically loculicidal or schizocarpic capsules that dehisce into multiple seeded cocci—a condition differing from the present fossil.

In contrast, the family Guttiferae produces capsular fruits with septicidal or septifragal dehiscence, usually 3–6 locular and bearing many seeds per locule. The fossil fruit differs in having a single seed per locule. The Geraniaceae family shows 3–5 locular capsules with single seeds per locule, somewhat similar to the bilocular condition seen here, but Geraniaceae capsules are loculicidal and often many-seeded with false partitions. Linaceae fruits are also 3–5 locular with septicidal dehiscence like the fossil, but typically contain 1–2 seeds per locule and are divided into several valves, a feature absent in the fossil fruit.

The fossil was further compared with known fossil fruits: *Enigmocarpon parijai* (Sahni, 1943) is a 6–12 locular capsule, differing significantly from the present specimen; *Indocarpa intertrappea* (Jain, 1964) is tetralocular with many seeds per locule, resembling Guttiferae; *Indocarpa mahabalei* (Nambudiri, 1969) has three locules, differing from the current fossil; *Harrisocarpon sahnii* (Chitaley & Nambudiri, 1968), although pentalocular and similar in size, bears two seeds per locule, unlike the single-seeded locules of the present specimen. The only common feature among these fossils and the present fruit is their capsular nature.

Overall, the present fossil fruit differs from all known fossil and modern capsular fruits from India. However, it bears some resemblance to the previously reported fossil genus *Sahniocarpon* (Chitaley & Patil, 1973) but with notable differences. Consequently, a new species within this genus is established as *Sahniocarpon ganeshii* sp. nov., named in honor of the eminent palaeobotanist Dr. M. T. Sheikh.

Holotype – Ang/fr.1/ Deposited at Botany Department, Dr. Ambedkar College, Chandrapur- M.S.

Horizon – Deccan Intertrappean sediments of India.

Locality –Keria, near Mohgaonkalan, M.P. India.

Age – Uppermost Cretaceous (Maastrichtian).



Explanation of Plate

- Fig. A -T.S. Fruit showing five seeds, one in each locule. x10
Fig. B- Fruit in L.S. showing stalk and persistent calyx x10
Fig. C- The same enlarged showing seeds cut in T.S. x10
Fig. D-The same enlarged showing seeds cut in L.S. x10

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