

Maraipatnocarpon deccanii gen. et sp. nov. A bilocular, multiseeded fruit from the Deccan Intertrappean beds of Marai Patan, Dist- Chandrapur, Maharashtra, India

Vaibhav Junghare¹, Surekha Nimgade¹, Nitesh Kamble²

¹ Dr. Ambedkar College of Arts, Commerce and Science, Chandrapur.

² Department of Botany, Yashwantrao Chawhan Arts, Commerce and Science College. Lakhandur. Dist - Bhandara. Pin code - 441803 (M.S.).

*Corresponding Author: Email: junghareamar7@gmail.com

Abstract: Most studies of Cretaceous flora from India have been conducted on specimens from Mohagaon Kalan. The Deccan Intertrappean flora is significant, with characteristics distinct from modern flora. Investigation of the flora helps to understand the flora at the time of the Deccan Trap Formation. To date, fruits with multiple seeds in a single locule have been discovered; however, the specimen under investigation is unique: it has two chambers, each containing multiple seeds. This study helps to understand the diversity of the Cretaceous flora in India.

Keywords: Cretaceous flora, Bilocular, multiseeded fossil fruit, Deccan Intertrappean

INTRODUCTION

The Deccan trap spans across Maharashtra, Gujarat, Madhya Pradesh, Telangana, Andhra Pradesh, and some parts of Karnataka. During the quiescent period, a large amount of flora was preserved. The Deccan Intertrappean beds have a very unique preservation of flora. It includes some fruits such as Nautiyalocarpon sikhpurii (Juneja, 1993), Harrisocarpon sahni (Chitale & Nambudiri, 1976), Oleaceocarpon nagpurensis (Kapgate, et al., 1986), Schizocarpon alifornii (Bhowal, 1988), Bicarpellocarpon sikhpurii (Bhowal, 2008), Erythroxylocarpon intertrappea (Khubalkar, 1982), Biloculocarpon mongaonse (Yawle, 1975), Biloculaire intertrappea (Kate, 1974), Rodeocarpon deccanii (Saxena, 2004). This shows the floral diversity of the time when the Deccan Trap formed. There are very few localities that show well preservation. Chandrapur district of Maharashtra has potential sites for Deccan Intertrappean plant fossils. In the last decade, the investigator has highlighted the locality of Marai Patan; it is a prominent locality with numerous reported specimens of Cryptogams and Phanerogams. The Angiospermic flora, particularly, is well preserved there. The specimen in this study is bilocular multiseeded fruit, which is additional evidence of the diversified flora of the Cretaceous period.

MATERIAL AND METHOD

Fossiliferous cherts were collected from the Deccan Intertrappean beds at Marai Patan, Chandrapur district, Maharashtra, India (Latitude: 19.539678° ; Longitude: 79.133668°). Only a portion of the specimen was available, as the counterpart was lost during the breaking of the cherts. The specimen was exposed in an oblique transverse section. Following etching with hydrofluoric acid and subsequent washing with water, a multiseeded, bilocular fruit became visible. Using the Peeling technique (Darrah, 1936), sequential peel sections were prepared along the transverse plane and mounted in Canada balsam. Examination of the fractured surface, serial sectioning, and successive peels revealed detailed morphological and anatomical features of the fruit.

DESCRIPTION

GENERAL DESCRIPTION

The present fossil Specimen is exposed in an obliquely transverse plane. The fruit is bilocular, multiseeded (Figure III-E). The whole fruit is about 1594 µm in length and 1459.3 µm in width. The fruits appear to be oval to elliptical in shape.

PERICARP: The pericarp of the fruit is about 363.2 µm in thickness and is divided into well-differentiated outer epicarp, middle mesocarp and inner endocarp.

LOCULE: The fruit consists of two locules, a large locule and a small locule. The large locule measures about 1081.6 μm in length and 1455.3 μm in breadth (Figure III-B), and the small locule measures about 765.8 μm in length and 452.6 μm in breadth (Figure III-C). maximum number of seeds were found in the developed, large locule (Figure III-E). Another small locule is developed with three poorly developed seeds.

SEPTA: It is very thin as compared to the size of the pericarp separating the larger locule from the smaller locule containing three seeds (Figure III-F) .

SEED: The number of seeds is found embedded inside the fruit. In the median oblique transverse region of the fruit, there are about 10-12 seeds located in a well- developed large locule, while the smaller one contains only three. As seen in the section (Figure III-E), in the larger locule, seeds with larger dimensions are positioned at the periphery, i.e. near the pericarp, while the seeds with smaller dimensions are arranged near the centre. The seed coat is bitegmic. As the detached seeds are moved toward the fruit's periphery, they display free central placentation (Figure III-E).

EMBRYO: Out of the 10-15 seeds, the majority of the seeds are empty, lacking any cellular endosperm, but a few show an embryo, which is not a typical dicot one, though it was observed in all the sections of the specimen. As the angle of the fracture could also affect the appearance from the standard nature, it is interpreted as a dicot embryo

DISCUSSION AND IDENTIFICATION

The specimen described here has two chambers encasing numerous complete, independent quadrangular structures, which rules out the possibility that it is a Cryptogam or the vegetative parts of a Phanerogam. The First and final interpretation of the specimen confirms that it is a reproductive organ of the plant, and thus its outer layer narrows it down to being considered the Fruit of an Angiosperm.

The specimen revealed the following important details for its identification.

- The fruit is simple.
- The fruit is bilocular, multiseeded, and oval to elliptical in shape.
- The fruit wall is divided into outer epicarp, middle mesocarp, and inner endocarp
- The seed coat is thick and develops into the tegmen and testa.
- The seeds exhibit free-core placentation and are pushed toward the fruit's periphery when detached.
- The majority of the seeds are empty without any cellular features of the embryo or endosperm, but a few seeds show an embryo.

Based on the aforementioned characteristics, the present specimen appears to be simple, bilocular, dry, indehiscent, and to contain numerous seeds with free central placentation.

COMPARISON WITH FOSSIL FRUITS

For the identification of the specimen, the characteristics described above were matched with those of the specimens reported earlier from the Deccan Intertrappean Beds of India. *Nautiyalocarpon singhpurii* (Juneja, 1993) and *Nautiyalocarpon patanii* (Dahegaonkar, 2002) are drupes with multilayered pericarp, large oval to oblong seed and a single seed per locule, while the current fossil fruit is bilocular and multiseeded. *Oleaceocarpon nagpurensis* (Sheikh, Kapgate and Mahajan, 1986) fruit is bilocular, with axile placentation; each locule consists of two seeds, and the seeds are tetrahedral with membrane-based seed coats. These characters are very different from those of the current fossil fruit. *Schizocarpon aliformii* (Bhowal, 1988) is bilocular, single-seeded, unitegmic; the seed coat displays the embryo sac, while the current fossil fruit has several seeds and is bilocular. *Bicarpelocarpon singhpurii* (Bhowal, 1988) is a bilocular, sessile fruit with empty air chambers in the septa, single-seeded, bitegmic, capsule with loculocidal dehiscence, while the current fruit is bilocular, multiseeded and indehiscent. *Biloculocarpon mohgaonse*, (Yawale, 1975) is a bilocular, drupe, ovoid fruit that has a single seed in each locule, as opposed to the current bilocular, multiseeded fruit. *Biloculaire intertrappea* (Kate, 1974) is a schizocarpic fruit with a big seed in each locule; oil or resin ducts are in the inner and outer zones, while the present fruit is different in many respects. The characteristics of *Centrospermocarpon chitaley* (Sheikh & Khubalkar, 1979) are very similar to those of the specimen under investigation in terms of the number of seeds per locules, but differ in having a single Locule.

Portulacaceocarpon bhuterensis (Borkar et al., 2018) resembles the current specimen to some extent, but differs in having two Umbos and four notches, which are lacking in the current specimen.

Rodeocarpon deccanii (Saxena, 2004) resembles the current specimen in most of the parameters such as number of locules and placental position but differs in the number of seeds in the smaller locule because *R. deccanii* encase 8-10 seeds while current specimen 3 only

The present fruit specimen exhibits several distinct characteristics compared to previously reported bilocular fossil fruits from the Deccan Intertrappean strata of India.

COMPARISON WITH MODERN FAMILIES

Additionally, the current fruit is contrasted with the bilocular fruit of modern families. Such as Goodeniaceae, Campanulaceae, Rubiaceae, Oleaceae, Bombaceae, Pittosporaceae, Solanaceae (Cook, 1967; Hooker, 1961;). The fruits of Goodeniaceae, Campanulaceae, and Rubiaceae possess too many locules, numerous ovules, and axile placentation, but the current fruit is bilocular, multiseeded, with free central placentation. Fruits of Oleaceae, Bombaceae, and Pittosporaceae are bilocular, with a superior ovary, hairy capsules and loculicidal dehiscence, but the current fruit is bilocular, multiseeded, with free central placentation. The fruits that belong to the family Solanaceae are more similar to the present fruit in having bicarpellary, bilocular, oblong capsules with septicidal dehiscence and numerous seeds on an axile placenta, but the present fruit differs in being bilocular, multiseeded, and oval to elliptical in shape with free central placentation.

The current material does not resemble any modern fossil fruits or the recorded fossil flora of the Intertrappean beds. Hence, the given fossil fruit is referred to as a new genus *Maraipatnocarpon deccanii* gen. et sp. nov. The generic name indicates the locality of the specimen collected from, and the specific name denotes the Deccan Intertrappean beds.

DIAGNOSIS

***Maraipatnocarpon deccanii* gen. nov.**

The fruit is simple, dry, dehiscent, bilocular, with many seeds and free central placentation.

***Maraipatnocarpon deccanii* gen. et sp. nov.**

The fruit is simply dry, dehiscent, bilocular, with many seeds and free central placentation. The fruit wall is differentiated into epicarp, mesocarp, and endocarp. The majority of the seeds are empty, without any cellular features of the embryo or endosperm. Seeds are detached and pushed towards the peripheral region of the fruit, indicating free central placentation.

Holotype: The type specimen is deposited at the Department of Botany, Dr Ambedkar College, Chandrapur, with the code SMN/ANG fruit.

Horizon: The Deccan Intertrappean beds

Locality: Marai Patan Situated in the Chandrapur district of Maharashtra, India

Age :? Uppermost Cretaceous.

DECLARATIONS

Funding: The author received no specific funding for this research.

Conflict of Interest: The author declares no conflict of interest.

Author Contributions: The author conceived the study, performed the experimental data analysis and interpretation, and prepared the manuscript.

Data Availability: The supplementary data supporting the findings of this study are available from the author upon reasonable request.

RECOMMENDATION

As the specimen is studied with the peeling technique further investigation of the same specimen with more advanced Palaeontological techniques could reveal the details the morphology of the specimen and thus helps in providing the definite systematic position

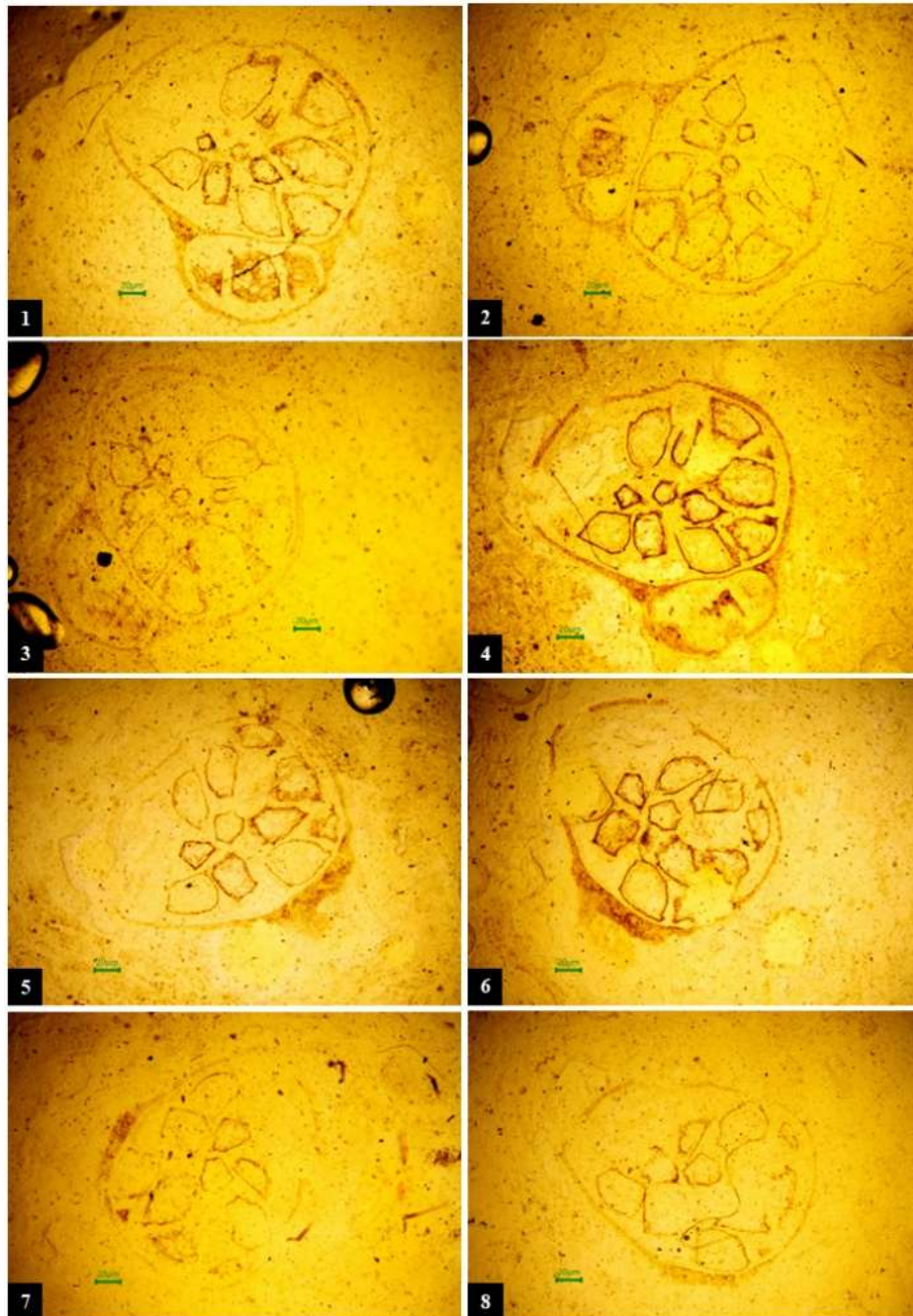


Figure I: Sequential peeling showing the fruit at different stages, showing bilocular nature, with many seeds in each locule

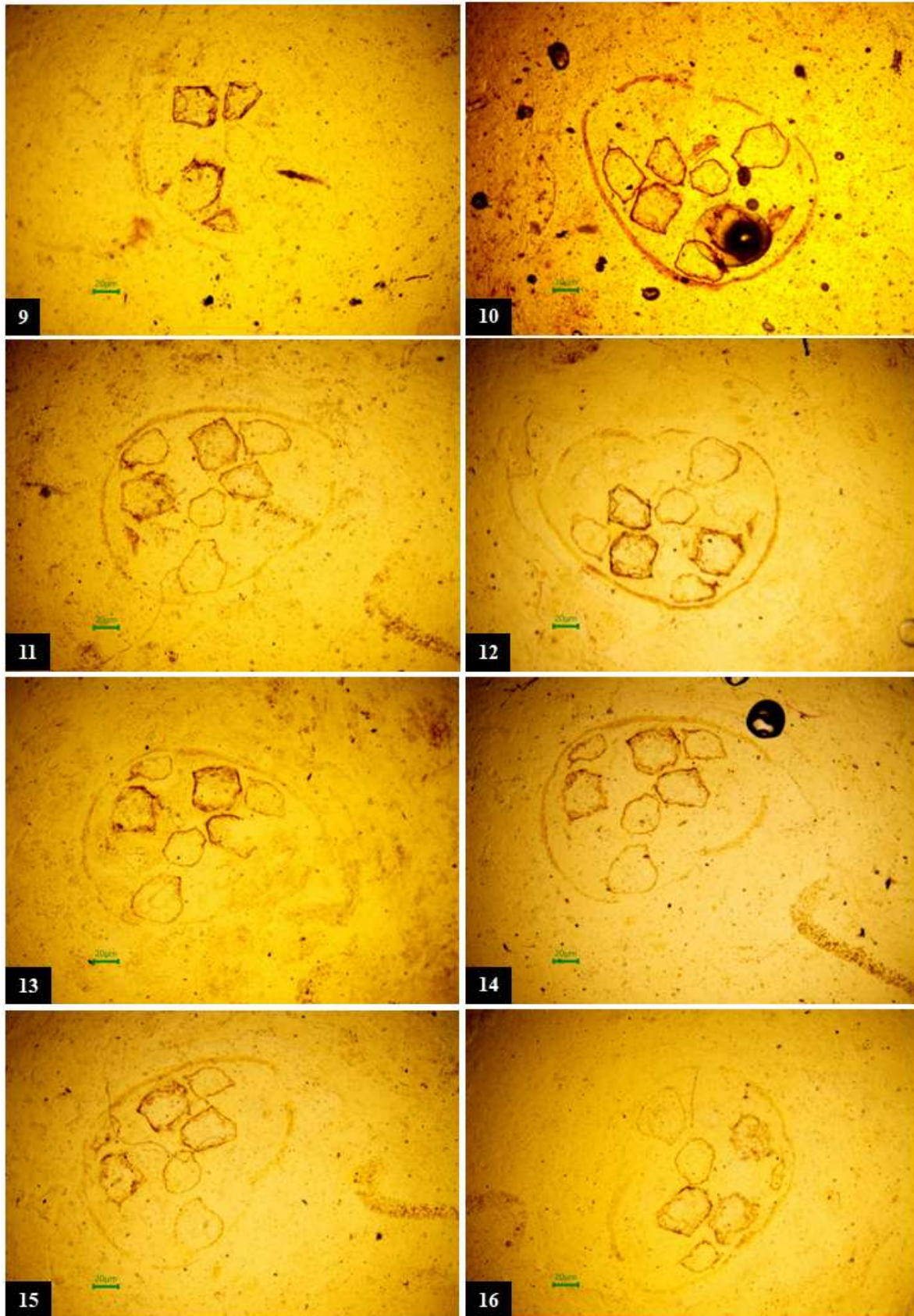


Figure II: Sequential sections of the fruit showing a disappeared small locule

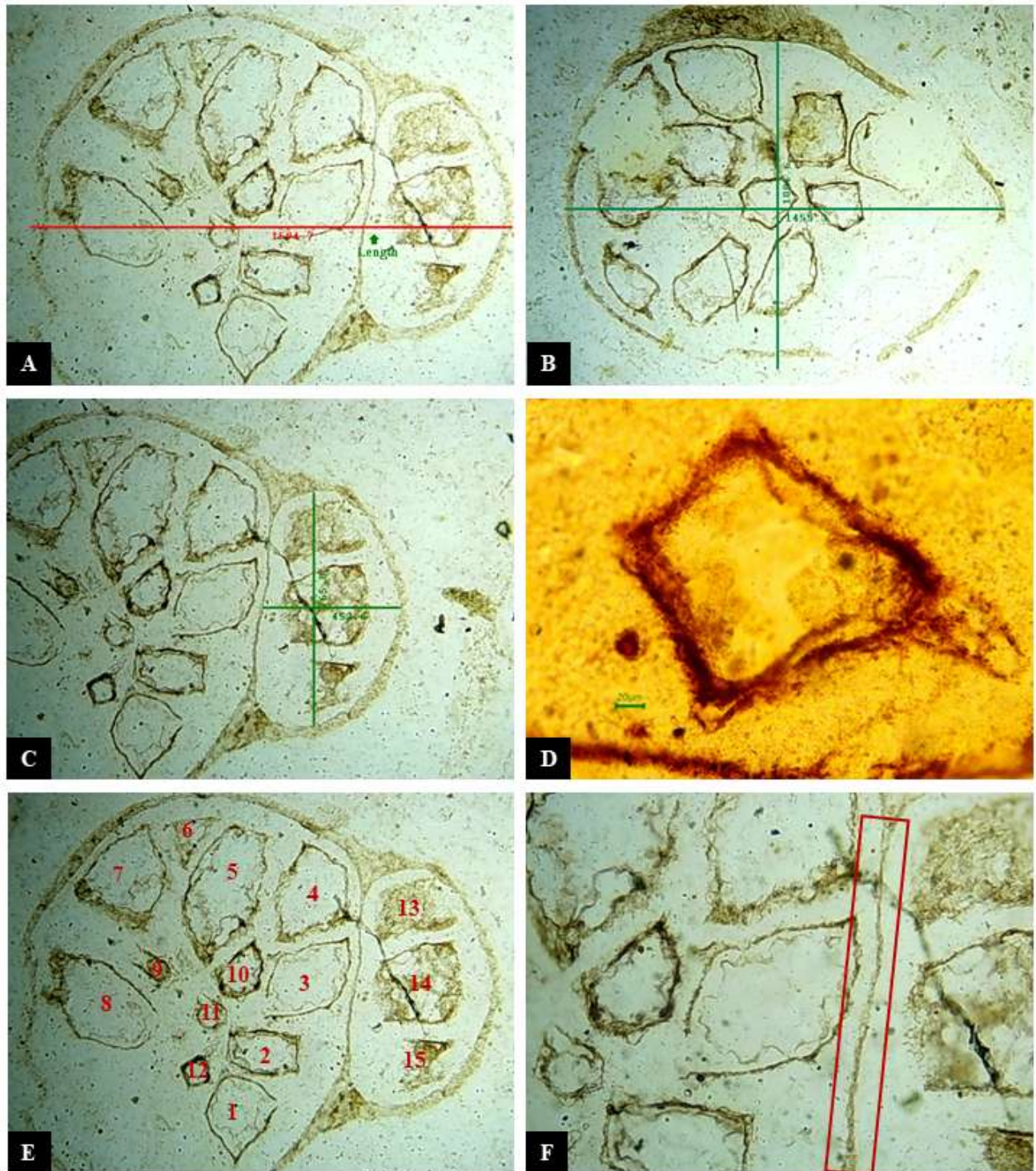


Figure III: A) Figure shows the length of the specimen; B) Dimension of the large chamber (Locule) of the specimen; C) Dimension of the smaller chamber (Locule); D) shows the quadrangular-shaped smallest seed; E) numerous seeds in both the locules numbered with red colour; F) Thin partition separating two chambers appears to be the septum.

REFERENCE

1. Borkar, S. U., Nagrale, V. D., Meshram, S. M., Korpenwar, A. N., & Ramteke, D. D. (2016). Taxonomical identification of a new petrified multiseeded capsular fruit from the Deccan intertrappean beds of Bhutera, India. *The Palaeobotanist*, 65(1-2), 271-278.
2. Sheikh MT & Khubalkar NV 1979. *Centrospermocarpon chitaley* gen.et sp.nov., A new petrified fruit from the Intertrappean beds of Mohgaonkalan, M.P., India. *The Botanique* 10: 23-40.
3. Corner E.J.H. 1976 *The seeds of dicotyledons*. Vols 1-2. Cambridge University Press, Cambridge.
4. Spjut, R. W. (1994). *A systematic treatment of fruit types*
5. Darrah WC 1936 The peel method in paleobotany. *Bot Mus Leaflet Harv Univ* 4:69-83.
6. Kubhalkar, N. V. (1982). Petrified Plants from the Mohogaon Kalan Beds of India. Ph.D. Thesis, Nagpur University, Nagpur.
7. Kate, V. R. (1974). Ph. D. Thesis, Nagpur University, Nagpur
8. Juneja, C. D. (1993). Study of the uppermost Cretaceous Intertrappean Flora of central India. Ph.D.Thesis Nagpur University.
9. Bhowal, M., Sheikh, M. T. (2008). A petrified dicot fruit ***Bicarpelarocarpon singhpurii*** from the Deccan Intertrappean beds of Singhpur M. P. India. *Palaeobotanist* 57:437-441.
10. Saxena, N. C. (2004). "Angiospermic Fossil Flora of central India" Ph.D.Thesis Nagpur University
11. Cook, C. I. E. (1958). *The flora of the presidency of Bombay*, Botanical Survey of India, Calcutta (Reprint 1967) Vol.I, II, & III
12. Hooker, J. D. (1879). *The Flora of British India* Vol II: 312-317. L. Reeve and Co. London.