

# A New Petrified Bilocular Capsular Fruit *Acanthaceocarpon jamsavlii* gen. Et sp. Nov. From the Deccan Intertrappean Beds of Jamsavli M.P., India.

**Aparna M. Yadav**

P. G. Department Of Botany, J. M. Patel College, Bhandara, 441904 (Ms), India.

Received: July 22, 2018

Accepted: October 09, 2018

## ABSTRACT

*A present petrified fruit is bilocular capsular collected from the Deccan Intertrappean beds of Jamsavli (Lat 21°, 30 to 22°, 55 N and Long 78°, 15 to 79°, 20 E) Madhya Pradesh, India. The present fruit is triangular in shaped, dicotyledonous, bilocular capsule. It is sessile and showing loculicidal dehiscence. Out of two locules, one fertile and one sterile. Pericarp differentiated into epicarp, mesocarp and endocarp. Seed coat untegmic. Embryo ill preserved. On comparison it shows close affinities with the characters of living family Acanthaceae.*

**Keywords:** Bilocular, Triangle, Loculicidal, Pericarp and Seed.

## INTRODUCTION

The dicotyledonous fruits described from the Deccan Intertrappean beds are generally capsules, berries and drupes. The present investigation deals with the bilocular capsular fruit collected from the locality of Jamsavli exposures. The capsular fruits that have been reported from Deccan Intertrappean beds of India are as under, *Enigmocarpon parijai* (Sahni B. 1943), *Daberocarpon gerhardii* (Chitaley and Sheikh 1973), *Chitaleocarpon intertrappea* (Kapgate V.D. 2000), *Schizocarpon aliformii* (Bhowal and Sheikh 2002), *Bicarpelarocarpon singhpurii* (Bhowal and Sheikh 2008), *Tiliaceocarpon jamsavlii* (Meshram S. et.al 2013), *Rodeocarpon mohgaonse* (Konde L. 2015), *Pentaloculocarpon Intertrappean* (Khursel and Narkhede 2016), *Portulacaceocarpon bhuterensis* (Borkar S. et. al 2016) and *Tamaricaceocarpon mohgaonse* (Yadav A. M. 2017)

The present fruit specimen gives additional information to the knowledge of bilocular fruit from the Deccan Intertrappean flora of India.

## MATERIAL AND METHOD

A petrified triangular shaped fruit was obtained on breaking a fossil chert from Jamsavli, M.P., India. The peels were obtained in transverse section, after etching with Hydrofluoric acid. Anatomical details of both part and counterpart were studied. Camera lucida sketches in series were drawn and photographed.

## DESCRIPTION

### Fruit Morphology

The fruit is almost triangular in shape, bilocular, sessile and measuring 288 $\mu$ m in length and 108 $\mu$ m in breadth. The bilocular fruit is separated by single transverse septa. The upper locule is broad and lower locule is narrow with single transverse septa in between giving the triangular structure to the fruit (Text Fig. 1; Plate Fig. 1).

### Fruit Anatomy

On the basis of anatomical characters the present petrified bilocular capsular fruit is described in details under following heads:-

**Pericarp:** The pericarp thickness varies between 172.23 $\mu$ m and 266.64 $\mu$ m. It is multilayered and differentiated into three major zones. Epicarp is the outermost layer of the fruit wall. It is 66.66 $\mu$ m across its width. It is one to two layered, made up of thin walled parenchymatous cells. Mesocarp is the well-defined broad middle layer of the pericarp. The width of this region varies a lot between 98.12 $\mu$ m and 133.33 $\mu$ m cells, it is sclerenchymatous three to four layered at some places and single layered at other. The cells are pentagonal to hexagonal. Endocarp is the inner most layer of the pericarp. The width of this region is 99 $\mu$ m. The cells are one to two layered made up of soft tissues may be parenchymatous in nature (Text Fig. 3; Plate Fig.2).

**Locules:** It is bilocular fruit with two well developed locules, that is upper and lower, upper locule is sterile or empty and lower locule is fertile and includes an embryo. The upper locule measures about 66 $\mu$ m in height and 174 $\mu$ m in breath. Lower locule 228 $\mu$ m in height and 138 $\mu$ m in breadth. (Text Fig. 1; Plate Fig. 1).

**Seed coat:** The seed coat is unigamic and is not differentiated into testa and tegmen. It is ill preserved. In the upper locule, obliquely cut part cells of seed coat appears which are narrow and cylindrical and show distinct annular, spiral thickening presumably to give strength to the seed coat (Text Fig. 2; Plate Fig. 4).

**Embryo:** Embryo dicot, ill preserved. It is 180 $\mu\text{m}$  in length and 30 $\mu\text{m}$  in breadth. Cells of the embryo is not well preserved but at some places it is pentagonal to polygonal (Text Fig. 1; Plate Fig. 3 & 5).

**Dehiscence:** The bilocular capsular fruit dehisces loculicidally (Text Fig. 1; Plate Fig. 1).

## DISCUSSION & IDENTIFICATION

From the above description, based on the fruit morphology and fruit anatomy it is clear that the present specimen shows following important characters which are used for its identification. The fruit is a capsule with loculicidal dehiscence as has been already observed. It becomes evident that the present petrified fruit is bilocular probably formed from bicarpellary, syncarpous, ovary with single seed in fertile locule. Pericarp is well differentiated into three zones:- epicarp, mesocarp and endocarp. Seed coat unigamic and undifferentiated. Embryo dicot in nature and ill preserved.

Comparisons are made with the earlier reported capsular fruit for its identification. *Enigmocarpon parijii* (Sahni B. 1943) is 6-12 locular with spongy wall, each locule contain the rows of seeds. *Dabero-carpon gerhardii* (Chitaley and Sheikh 1973) is a ten locular capsule with a one seed in each locule. *Chitaleocarpon intertrappea* (Kapgate V. D. 2000) is a seven locular capsule with 2-8 seeds in each locule. *Schizocarpic aliformii* (Bhowal and Sheikh 2002) differs in having irregular eye shaped bilocular fruit with two fertile chambers and with empty middle space. *Bicarpelarocarpon singhpurii* (Bhowal and Sheikh 2008) vary in having empty air chamber in the septa. *Tiliaceocarpon jamsavlii* (Meshram S. et. al 2013) is hexagonal shape and unilocular indehiscent capsule. *Rodeocarpon mohgaonse* (Konde L. 2015) differs in having dicotyledonous, multilocular and multiseeded with axile placentation. *Pentaloculocarpon Intertrappean* (Khursel and Narkhede 2016) is pentalocular shape with persistent calyx. *Portulacaceocarpon bhuterensis* (Borkar et. al 2016) vary in having unilocular, multiseeded dehiscent capsule and *Tamaricaceocarpon mohgaonse* (Yadav A. M. 2017) is unilocular indehiscent capsule. The above discussion reveals that the present petrified fossil fruit is incomparable with any of the earlier reported fossils.

As is clear from the above discussion, comparisons are now made, with the living families of order Oleales, Gentianales and some families like, *Polemoniaceae*, *Convolvulaceae*, *Hydrophyllaceae*, *Verbenaceae*, *Callitrichaceae*, *Labiatae*, *Scrophulariaceae*, *Acanthaceae*, *Pedaliaceae*, *Gesneriaceae* and *Lentibulariaceae*.

The order Oleales comprises only one family that is *Oleaceae*. It shows syncarpous, bicarpellary, bilocular fruit with ovules 2 per locule. Loculicidal capsule are seen in *Syringa* and *Forsythia*, circumsessile capsule in *Menodora* or samara as in *Fraxinus*, whereas the studied fruit is loculicidal capsule. (Rendle A. B. 1963, Bhattacharyya and Johri 1998, Hooker J. 1961 and Cook C. 1958).

Order Gentianales has the following families, *Loganiaceae*, *Gentianaceae*, *Apocynaceae*, and *Rubiaceae*. In *Loganiaceae*, the ovary is syncarpous, bicarpellary, bilocular with many ovules, fruit capsule, seeds sometimes winged but in present studied fruit it is capsule with loculicidal dehiscence. Family *Gentianaceae*, shows syncarpous, bicarpellary, ovary usually unilocular but present studied fruit have bilocular ovary. In *Apocynaceae*, the carpel lobe rarely exceeds two and ovules are anatropus, but the number of ovules is infinity, fruit follicle (*Plumeria* and *Nerium*), capsule (*Allemanda*), drupe (*Thevetia*) or a berry (*Arissa*). Whereas the studied fruit is two celled, loculicidal capsule.

In *Rubiaceae*, fruits though capsular but are with septicidal or loculicidal dehiscence and show many seeds in each locules, if indehiscent then it separates into one seeded segments (*Galium*, *Rubia*, *Oldenlandia*). Seeds are sometimes winged.

Fruit of *Polemoniaceae* are trilocular with loculicidal capsule, seeds sometimes with mucilaginous coating (*Collomia* and *Gilia*). *Convolvulaceae*, *Labiatae*, *Callitrichaceae*, *Pedaliaceae*, shows two ovules in each locule or tetralocular by the formation of false septum and one ovule per locule. Fruit of *Hydrophyllaceae* is unilocular, seeds sometimes carunculate, reticulate sculptured or muricate. In *Verbenaceae*, the ovary superior, two to four celled, ovules two sometimes one in each cell, fruits usually drupe with as many pyrenes as the number of ovules in the ovary or nutlet as in *Verbena*, if capsule two to four valved. *Scrophulariaceae*, is similar in having syncarpous, bilocular ovary but differ in having septicidal capsule. *Gesneriaceae*, have unilocular ovary, ovules many, fruit loculicidal capsule, seed numerous. *Lentibulariaceae*, is similar in having syncarpous, bicarpellary, superior ovary, but vary in capsule dehiscing by two to four valves or by an irregular splitting.

Family *Acanthaceae*, bears closest resemblance with present petrified fruit such as bicarpellary, syncarpous, superior, bilocular ovary, fruit normally loculicidal dehiscent capsule, ovules one or more in

each locule. Most of the genera of *Acanthacea* shows bilocular ovary with two ovules in each locule (Cooke C. 1958). But there are some genera like *Lepidagathis* and *Hypoestes* which shows ovary bilocular, ovules two (rarely one) in each locule. In *Monechma* ovary is bilocular with one or two ovules in each locule and present petrified fruit also shows one ovule in each locule.

To sum up, from the comparison made above it can be concluded that the present petrified fruit shows greater affinities towards the living family *Acanthacea* and its genera *Monechma*. Hence, the fossil fruit is named as *Acanthaceocarpon jamsavlii* gen. et sp. nov., the generic name is given after the family *Acanthacea* and the specific name is given after the locality Jamsavali.

## DIAGNOSIS

### *Acanthaceocarpon* gen.nov

Fruit triangular in shape, dicotyledonous, bilocular capsule. It is sessile and showing loculicidal dehiscence. Out of two locules, one fertile and one sterile. Pericarp differentiated into epicarp, mesocarp and endocarp. Seed coat unigemic. Embryo ill preserved.

### *Acanthaceocarpon jamsavlii* gen.et sp.nov

Fruit triangular in shape, sessile and measures 288 $\mu$ m in length and 108 $\mu$ m in breadth. It is bilocular capsule showing loculicidal dehiscence. Fruit is separated by single transverse septa. The upper locule is broad and lower locule narrow with single transverse septa in between giving the triangle shaped structure to the fruit. Upper locule is sterile measure about 66 $\mu$ m in height and lower locule is fertile measured about 228 $\mu$ m in height. Pericarp differentiated into epicarp, mesocarp and endocarp. Epicarp 66.66 $\mu$ m across its width, mesocarp 133.32 $\mu$ m across its width, and endocarp 99.99 $\mu$ m across its width. Seed coat not differentiated into testa and tegmen, embryo ill preserved.

**Holotype : AMY. / Fruit-1. Department of Botany, J. M. Patel College, Bhandara.**

**Locality : Jamsavali, M.P., India.**

**Horizon : Deccan Intertrappean Series of India.**

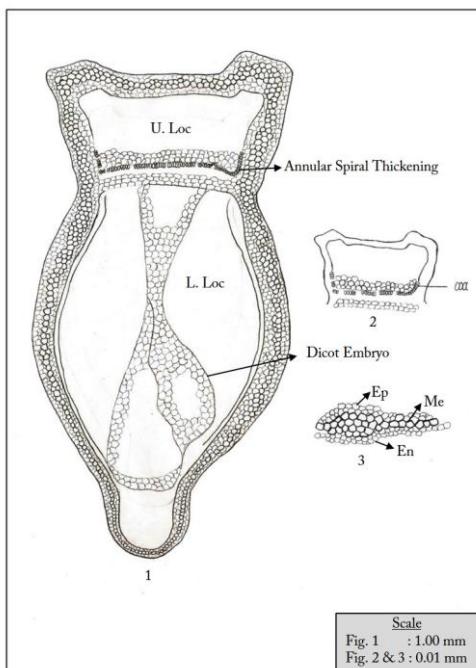
**Age : ? Upper Cretaceous.**

## REFERENCES

- Bhattacharyya, B. M. Johri. (1998). Flowering plants. Narosa publishing house, New Delhi, Madras, Bombay, Calcutta, London.
- Bhowal, M. and Sheikh, M. T. (2002). A petrified dicot fruit from the Intertrappean beds of Singhpur, M. P., Trends in life science (India). 17(2):89-101.
- Bhowal, M. and Sheikh, M. T. (2008). A petrified dicot fruit Bicarpelarocarpon Singhpurii, from Deccan Intertrappean beds of Singhpur, M. P., India. Palaeobotanist. 57(3): 473-441.
- Borkar S. U, Nagrale V. D, Meshram S. M, Korpenawar A. N and Ramteke D. D (2016). Taxonomical identification of a new petrified multiseeded capsular fruit from the Deccan Intertrappean beds of Bhutera, India. Palaeobotanist. 65:271-278.
- Chitaley, S. D. and Sheikh, M. T. (1973). A ten locular petrified fruit from the Deccan Intertrappean series of India . Palaeobotanist Silver Jubilee. 20(3):297-299.
- Cooke, C. I. E. (1958). The flora of the presidency of Bombay. Bot. Survey of India, Calcutta.
- Hooker, J. D. (1961). The Flora of British India. Vol.I,II and III L. Recev. and Co. England.
- Kapgate, V. D. (2000). A seven locular prtrified dicot fruit from the Deccan Intertrappean series of India. Proc. 6<sup>th</sup> Int. P4alaeo. Bot. Con. Qinhuangdao: 62.
- Khursel A. S and Narkhede S. D (2016). A new petrified pentalocular capsular fruit from the Deccan Intertrappean beds of Mohgaonkalan, M. P., India. International Journal of Current Microbiology and Applied Sciences. 5(4):483-487.
- Konde (2015). A new multilocular fruit from the Deccan Intertrappean beds of Mohgaonkalan, M. P., India. IJRBAT, Special issue. 6:166-169.
- Meshram S. M, Narkhede S. D and Bhowal M (2013). A new petrified unilocular fruit from the Deccan Intertrappean beds of Jamsavali, M. P., India. International Journal of Life Sciences. 1(3): 221-225.
- Rendle, A. B. (1963).Classification of flowering plant. Vol.II, Cambridge.
- Sahni, B. (1943). Indian Silicified plant II. Enigmocarpon parijai a Silicified fruit from the Deccan with the review of fossil history of the Lythraceae. Proc. Ind. Acad. Sci. 17:59-96.
- Yadav A. M (2017). Tamaricaceocarpon mohgaonse gen. et. sp. nov. from the Deccan Intertrappean beds of Mohgaonkalan, M. P., India. Advances in Bioresearch. 8(2):196-200.

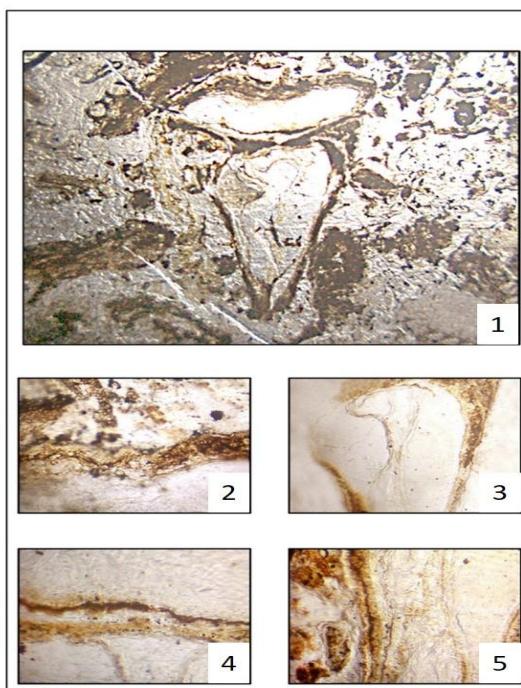
## ACKNOWLEDGEMENT:

The author is thankful to United Grant Commission (UGC) for providing the fund for the research project and also thankful to the principal of J.M. Patel College, Bhandara for providing all the necessary facilities to carry out research.



#### Explanation of text figures

1. Enlarged bilocular fruit which is separated by single transverse septa with upper smaller (sterile) & lower bigger (fertile) locules.
2. Upper locule shows annular spiral thickening.
3. Pericarp differentiated into (Ep) epicarp, (Me) mesocarp and (En) endocarp.



#### Explanation of the plate

1. Fruit showing loculicidal dehiscence (100X)
2. Enlarge pericarp showing epicarp,mesocarp &endocarp (400X)
3. Lower locule showing dicot embryo (100X).
4. Upper locule shows annular spiral thickening (400X).
5. Seed coat & embryo (100X).