

Identification of a new fossil fruit *Tetraloculocarpon singhpurii* gen. et sp. nov. from the deccan intertrappean beds of Singhpur, M. P., India

¹Machhindra P. Nandeshwar, ²Sanjay M. Meshram. & ³Sushama D.Narkhede

¹Assistant Professor Department of Botany, S. A. Science College Salekasa, Dist. Gondia (MS) India

²Assistant Professor Department of Botany, M.B.Patel College, Sakoli, Dist. Bhandara (MS) India

³Associate Professor, Department of Botany, Institute of Science, Nagpur (MS) India

Email - ¹mpnandeshwar@gmail.com, ²sanjaymeshram83@rediffmail.com; ³sushama_narkhede@yahoo.com

Abstract: The present paper deals with investigation of a new tetralocular dicotyledonous fossil fruit reported from the Deccan Intertrappean beds of Singhpur, M. P. India. Many angiospermic fruits have been from Singhpur. The oblique transverse sections of the fruit, shows oblongate shape measuring **4.14 mm** in length & **2.76 mm** in breadth. In the first peel section, the fruit appears tetralocular with two sterile and two fertile, single seed in each locule. In all the serial sections studied, the upper and lower chambers are fertile, while two central chambers are sterile. In subsequent section, the sterile chamber unite or septa in-between chamber disappears and single chamber is seen and the two fertile chamber decreases in size and sterile chamber increases in size. A slit is observed on the two fertile chambers showing loculicidal dehiscence of fruit. In further section fertile chambers gets reduced in size and separates from central sterile chamber at the region of notches in last few section, seed completely exhausted.

Key Words: *Tetraloculocarpon*, Deccan, Intertrappean, Dicot Fruit.

1. INTRODUCTION:

Singhpur, is very rich fossil locality of the Deccan Intertrappean beds. From this locality many macro and mega fossil specimens have been reported. The present specimen deals with a new Dicotyledonous tetralocular fossil fruit. So far there have been a record of many different fruits from the tertiary formation India. To mention a few like *Indocarpa intertrappea* (Jain, 1963); *Deccanocarpon arnoldi* (Paradkar, 1975); *Triloculocarpon mahabali* (Kapgate, 1988); *Euphorbiocarpon deccanii* (Upadhye, 1979); and *Hexaloculocarpon intertrappea* (Dahegaonkar, 2002), *Bicarpelocarpon sishpurii* (Bhowal and Sheikh, 2008), *Verbenaceocarpon mahabale* (Dhabarde, Sheikh, Kolhe, 2012), *Hydrocarpon singhpurii* (Qureshi, and Narkhede, 2016), and *Triloculocarpon bhuteriense* (Ramteke and Gedam, 2017).

2. MATERIAL AND METHOD

A petrified fruit described in this paper is preserved in a piece of chert. It was exposed in oblique transverse plane after breaking the chert into pieces, a complete fruit found in the part and counterpart of the piece. It is studied by peel section after etching it with hydrofluoric acid. The preservation of the material was very good. Its anatomical details were studied by taking serial sections along the same plan.

3. DESCRIPTION:

The oblique transverse section of the fruit, showed oblongate shape measured **4.14 mm** length & **2.76 mm** in breadth. In the first peel section, the fruit appears bilocular with single seed in each locule. In peel number sixth onwards four notches were clearly seen, two on upper side, two on lower side (Plate Figs. 3). From the sixteenth section new (two) locule like structure appeared and in the twenty fifth sections all the four locules were seen. But in all the serial sections studied, the upper and lower chambers are fertile, while two central chambers are sterile. In subsequent section, the sterile chamber unite or septa in-between chamber disappears and single chamber is seen and the two fertile chamber decreases in size and sterile chamber increases in size. A slit is observed on the two fertile chambers showing loculicidal dehiscence of fruit. Embryo like structure was seen in the lower chamber, two cotyledons were also seen (Plate Fig.13 & Tex Fig. 25). Then in further section fertile chambers gets reduced in size and separates from central sterile chamber at the region of notches in last few section, seed was completely exhausted.

Pericarp:- Pericarp was well preserved. The wall of fruit **159 – 190 µm** in thickness (Plate Fig. 10-11 & Text Fig. 62). It was multilayered and differentiated into, epicarp, mesocarp & endocarp. At the corner of the fruit notches were seen. Epicarp was the outermost layer of the fruit wall and measured about **30 µm** in thickness. It was made up of thin walled

well preserved parenchymatous cells; bounded on outer side by unilayered epidermal cells, not regular due to presence of notches, the cells of their notches were loosely arranged with intercellular spaces. Mesocarp was the broadest zone of the pericarp which measured **120 µm** in thickness and made up of thin walled parenchymatous cells. Endocarp, the innermost layer of pericarp. The endocarp was made up of dark brown cells measuring **45 µm** in thickness.

Locule:- T. S. of the fruit shows four well preserved locules, size of the locule **14.20 µm**. The seeds were seen in only two locules, while other two sterile.

Seed:- The seed was large measuring **12.00 µm** in diameter oval to semicircular in shape. The seed of each chamber was found attached to the central axis showing axile placentation. (Text Fig.1 & 9; Plate Fig. 2 & 3).

Seed coat:- The seed coat was thin and not differentiated, into testa and tegmen but made up of two layered parenchymatous cells, **60 µm** in thickness. The central portion of the seed, ill preserved (Text Fig. 9; Plate, Fig. 11 & 14).

Embryo:- Embryo like structure was seen in the lower chamber, with two cotyledons. The embryo well preserved and dicot type. The embryo shows radical along with the tissue of cotyledons made up of well-preserved parenchymatous cells (Text Fig. 25; Plate Figs. 6, 7 & 13).

4. DISCUSSION AND COMPARISON:

After going through the important characters of the present fossil fruit, it was evident that the present fossil fruit was a tetralocular, single seeded dicot capsular fruit. The two sterile chambers were seen in between the two fertile chambers, there might be an abortive carpel with two fertile carpels occupying the superior position gained in the development, it is also clear that the fruit has a dry pericarp and dehiscence along its locule showing loculicidal dehiscence.

Comparison with fossil fruits

As the present fossil fruit reveals the characters resembling the capsular fruit, so naturally it was initially compared with already reported fossil capsular fruits. It was compared with *Indocarpa intertrappea* (Jain, 1963); *Deccanocarpon arnoldi* (Paradkar, 1975); *Triloculocarpon mahabalii* (Kapgata, 1988); *Euphorbiocarpon deccanii* (Upadhye, 1979); and *Hexaloculocarpon intertrappea* (Dahegaonkar, 2002), *Bicarpelocarpon sishpurii* (Bhowal and Sheikh, 2008), *Verbenaceocarpon mahabale* (Dhabarde, Sheikh, Kolhe, 2012), *Hydrocarpon sishpurii* (Qureshi, and, Narkhede, 2016), and *Triloculocarpon bhuteriense* (Ramteke A. N. and Gedam Y. B., 2017).

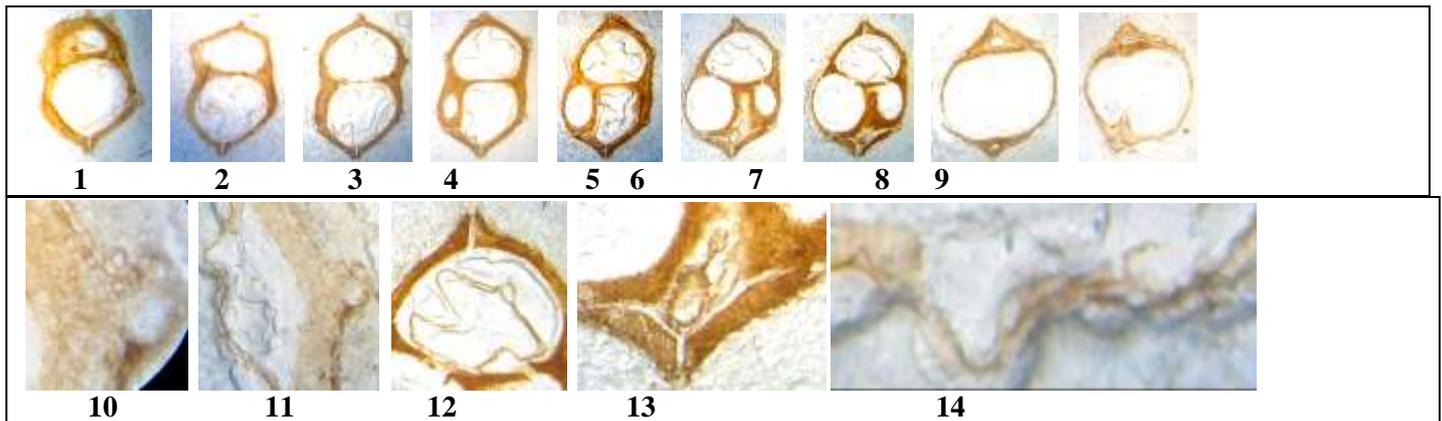
Indocarpa intertrappea (Jain, 1963), was a septifragal multiseeded capsule with columella and fleshy testa, hence comparison not possible. *Deccanocarpon arnoldi* (Pardkar, 1975) was a eight locular, capsular fruit with only one seed in each locule and while the present fruit tetralocular and hence it differs. *Euphorbiocarpon deccanii* (Upadhye, 1979), a trilocular dicotyledonous capsular fruit with septicidal dehiscence having a single seed in each locule and axile placentation which differs from present specimen by having tetralocular. *Triloculocarpon mahabalii* (Kapgata, 1988), a trilocular Capsule with two seeds in each locule, totally different from present fossil fruit specimen. *Bicarpelocarpon sishpuri* (Bhowal and Sheikh 2008), shows bilocular sessile fruit with empty air chamber in the septa single seeded bitegmic capsule with loculicidal dehiscence.

In *Hexaloculocarpon intertrapia* (Dahegaonkar, 2002), though a capsular, dicotyledonous, six locular with axile placentation, septicidal dehiscence, single seed in each locule. *Verbenaceocarpon mahabale* (Dhabarde P.F., Sheikh M.T., Kolhe P.D, 2012) fruit, bilocular with one seed in each locule. Pericarp distinctly differentiated into outer epicarp, middle mesocarp and inner endocarp. *Hydrocarpon sishpurii* (Sayeda Parveen Qureshi, and, S.D. Narkhede, 2016) fruit bilocular, with air chambers. *Triloculocarpon bhuteriense* (Ramteke A. N. and Gedam Y. B., 2017) fruit, trilocular, obovate capsule showing loculicidal dehiscence with two chambers having seed in each and third chamber, quite larger and without any seed.

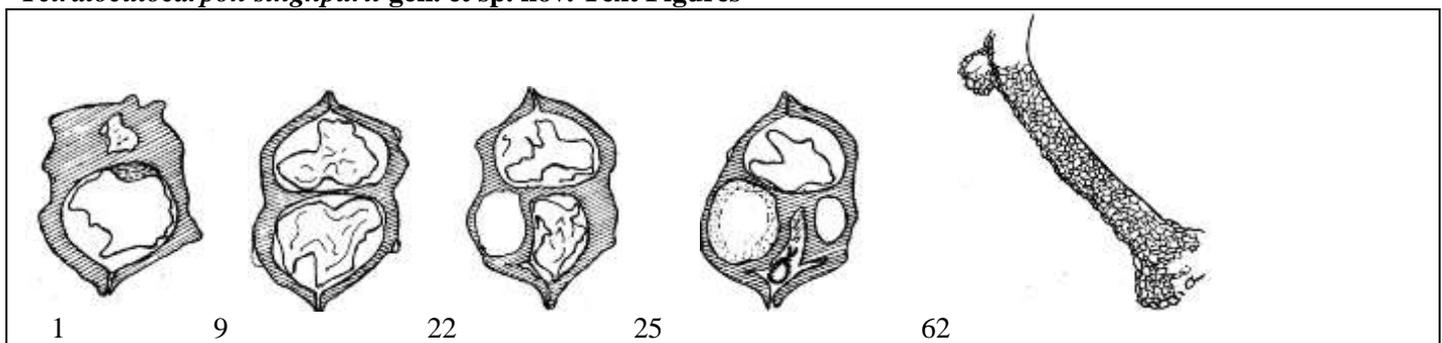
As present fruit does not show comparison with any reported fossil fruits, it was compared with the modern families, having capsular fruit (Eams 1953, Mc – lean & Cook, 1956, Cook 1958, Esau 1961, Rendle, 1967 & Cook & Nicholls 1986) such type of dry dehiscent, 2 - 10 chambered, capsular fruit are seen in dicot and monocot families. So it was compared with some flowering families like, Myrtaceae, Malvaceae, Acanthaceae, Euphorbiaceae, Melastomiaceae, Lythraceae, Bombacaceae, Rhamnaceae and Parnassiaceae. After comparison present fossil was very different from them.

The above discussion clearly indicates that the present dicot fruit cannot be compared with any leaving family as well as with recorded fossil fruits. Therefore a new genus was created as *Tetraloculocarpon sishpurii* gen. et sp. nov., generic name on the basis of number of locules and specific name after locality from where it was collected.

Tetraloculocarpon singhpurii gen. et sp. nov. Explanation of Plate I, Figs. 1 to 14,



Tetraloculocarpon singhpurii gen. et sp. nov. Text Figures



REFERENCES :

1. Bhowal M and Sheikh MT (2008) a petrified dicot fruit *Bicarpelararocarpon singhpurii* from deccan intertrappean beds of Singhpur, M.P. India. *Palaeobotanist*, 57(3): 473-441.
2. Cook & Nicholls 1986. Bot Helv 96: 213 - 267 Bot Helv 97:1- 44
3. Dahegaonkar, R. R. 2002. Investigation of fossil flora, from the Deccan Intertrappean beds of Chhhindwara (M.P.) and Yevatmal (M.S.). Ph. D. Thesis, Nagpur University, Nagpur.
4. Dhabarde P.F., Sheikh M.T., Kolhe P.D. A Petrified Bilocular Fruit from The Deccan Intertrappean Beds Of Singhpur, Madhya Pradesh J. Bio. Innov 1(1), pp: 1-5, 2012
5. Jain, R. K. 1963. *Indocarpa intertrappea* gen. et sp. nov A new dicotyledonous fruit from the Deccan Intertrappean series of India. Bot. Gaz. 125 (i): 26-33.
6. Kapgate, D. K. 1988. *Triloculocarpon mahabalii* A fossil monocotyledonous fruit from the Intertrappean beds of India, Proceedings of the 3rd International Organization of Palaeobotany Conference, Melbourne page 75 – 77.
7. Paradkar, S. A. 1975. *Deccanocarpon arnoldii* gen. et. sp. nov. a new dicotyledonous fruit from Deccan Intertrappean Series of India. Botanique 6(1): 5-10.
8. Ramteke A. N. 2017. *Triloculocarpon Bhuterianse* sp. nov. International Jurnal of Research in Biosciences, Agriculture & Technology , Special Issu (2), Vol-V July 2017.
9. Rendle AB (1956) Classification of flowering plants Vol. II, Cambridge Uni. press. London.
10. Upadhye. E. V. 1979. Morphodogical studies of the Deccan Intertrappean flora of Mohgaonkalan, M.P. Ph. D. Thesis Nagpur University, Nagpur.