

A Fossil Megasporophyll with a Two Ovules from the Deccan Intertrappean Beds of Marai Patan in the Region of Chandrapur, Maharashtra, India

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Abstract:- The present paper describes a fossil megasporophyll with a pair of ovules from the Deccan Intertrappean Beds in the Indian state of Maharashtra, from Marai Patan, Taluka-Jiwati, District: Chandrapur. Two ovules are oppositely placed and are completely surrounded by an ovuliferous scale. Integument of small ovule is multilayered and differentiated into three zones, viz., outer and inner are sclerenchymatous, while middle one is parenchymatous. In a large ovule integument is two layered. Micropylar canal is narrow. It is compared with modern taxa of Cycadales and Coniferales with the families like Pinaceae, Taxodiaceae, Cupressaceae, Podocarpaceae, Cephalotaxaceae and Araucariaceae and also with earlier described fossil ovules. It is evident from the study that present fossil megasporophyll resembles with *Coniferoovulites* with minor differences and hence named as *Coniferoovulites patanii* sp. nov.

Keywords:- Megasporophyll, Deccan Intertrappean, Ovules, Integument, Ovuliferous Scale.

I. INTRODUCTION

The present study describes and discusses a fossil megasporophyll with a pair of ovules from the Deccan Intertrappean Beds in the Indian state of Maharashtra, from Marai Patan, Taluka-Jiwati, District, Chandrapur. The Deccan Intertrappean flora is quite rich in gymnospermous megafossil remains (Kapgate, 2005). They are represented by cones like *Pityostrobus crassitesta*, *Indostrobus bifidolepis* and *Takliostrobus alatus* (Sahni 1931, 1934), *Mohgaostrobus sahani* (Prakash 1957, 1962) *Harrisostrobus intrappea* (Chitale and Sheikh 1973). The ovules like *Gymnoovulites intertrappea* (Shukla 1948), *G. deccanii* (Paradkar 1976), *Cycadoovulites* (Shukla 1948), *C. deccanii* (Singhai 1975), *Coniferoovulites intertrappea* (Chitale and Yawle 1978), *Podocarpoovulites chitaleii* (Sheikh and Kolhe 1982), *Cupressaceoovulites intertrappea* (Mistrietal. 1985), *Araucarian* seed scale *Araucarites* sp. (Mehrotra and Srivastava. 1994). In addition to these reproductive parts, some gymnospermous woods are reported *Dadoxylon*

resinosus (Shukla, 1944), *Araucarioxylon mohgaonse* (Lakhanpal et al. 1975), *Podocarpoxylon deccanensis* (Trivedi and Shrivastav 1989). Present specimen is well preserved and it differs in many characters from gymnospermous reproductive parts described so far.

II. MATERIAL AND METHOD

From the Marai Patan (Uppermost Cretaceous) Intertrappean bed, a fragment of chert was taken. Only a portion of the chert was accessible after it was broken, and the counterpart was lost. Following hydrofluoric acid etching and water washing, a longitudinal segment of two separate ovules is visible. In both the transverse and longitudinal planes, serial peel sections were obtained. The Canada balsam mountant was used to mount the peels. The two ovules thus provided information about morphology and anatomy by means of peelings, serial sectioning, and surface fracture analysis. Biowizard software and a Sony camera (4X) were utilized for material measurement and imaging.

➤ Description

The specimen is an elongated structure and measures 2 mm long and 1 mm broad. It possesses an ovuliferous scale with a pair of ovules oppositely placed (Photo1-3). Each ovule is anatomically similar. One of the ovule is obovate and larger in size and other is globular and smaller in size. The larger ovule measures 1.5µm in length and 0.7µm in breadth, while the smaller one has a 1.4µm length and 0.7µm breadth.

➤ Ovuliferous Scale

There is a single ovuliferous scale covering both the ovules. However, the bract scale is absent. Ovuliferous scale consists of outermost covering of thin layered epidermis followed by megasporophyll tissue which is not well preserved. Vascular supply is not traced. It is tapering at the lower ends and blunt at upper end (Photo1-3).

➤ Ovule

There is a pair of ovules on the single megasporophyll placed oppositely. The ovules are covered completely by

ovuliferous scale. The two ovules are not of same size. The larger ovule measures 1.5 μ m in length and 0.7 μ m in breadth, while the smaller one has a 1.4 μ m in length and 0.6 μ m in breadth. One of the ovules is obovate and larger in size and other is smaller in size and globular in shape. The larger ovules have distinct micropylar opening (Photo-10). Each ovule consists of two parts (Photo-7, 8).

- Integument and
- Nucellus
- **Integument:** It is well preserved and in small ovule it is differentiated into outer, middle and inner (Photo-7). The outer layer is moderately thick and measuring about 0.2 μ m. and consists of sclerenchymatous cells. The middle layer is parenchymatous, single layered measuring 0.03 μ m in thickness. The Inner layer is single layered and 0.02 μ m in thickness. In large ovule integument is differentiated into two layers. Outer integument is measuring about 0.01 μ m and inner integument measuring about 0.10 μ m. Micropyle in large ovule tapers towards the apex. The inner layer encloses nucellar tissue completely.
- **Nucellus:** It is completely covered by integument leaving a narrow gap at the apex forming a micropyle (Photo-8). It is free from integument completely.

➤ Identification

The following important characters are used to identify the ovule;

- Two ovules on one ovuliferous scale.
- Presence of ovuliferous scale and absence of bract scale.
- Differentiation of integument into outer stony layer, middle parenchymatous and inner sclerenchymatous layer.
- Presence of narrow micropylar canal.
- Nucellar tissues without embryo are seen.

III. COMPARISON AND DISCUSSION

➤ Comparison with modern taxa

The present specimen matches with Cycadian ovules in having three integuments but differs in having structure of it as outer and inner Sclerenchymatous layers and middle parenchymatous layer. It shows a single ovuliferous scale which bears two embedded orthotropous ovules. This particular structure is comparable with that of Coniferales. It could not resemble with family Pinaceae, as it is characterized by both ovuliferous and bract scales as well as fusion of nucellus with the integument. Family Taxodiaceae also differs from the present specimen, as there is presence of both ovuliferous scale and bract scale and 2 to 9 ovules are present on each ovuliferous scale. In Cupressaceae, there is profound fusion between ovuliferous scale and bract scale and a number of ovules per ovuliferous scale varies from 3-20, whereas in the present fossil specimen, there are only two ovules. In Podocarpaceae, there is presence of bract scale and ovuliferous scale as well as formation of an extra envelope to the ovules by the ovuliferous scale called epimatium and

therefore the present specimen cannot be compared with it. Similarly, in the families like Cephalotaxaceae and Araucariaceae, normally a single ovule is developed from the ovuliferous scale, whereas in the present specimen there are two oppositely placed ovules on a single ovuliferous scale.

➤ Comparison with fossil specimens

Affinities of the present ovules are also traced with recorded fossil gymnosperms cones, *Pityostrobus crassitesta*, *Indostrobus bifidolepis* and *Takliostrobus alatus* (Sahni 1931, 1934). *Mohgaostrobus sahni* (Prakash 1957, 1962), resemble the present specimen in having the integument distinguished into outer and inner soft layers and central hard layer. *Takliostrobus alatus* (Sahni 1931) and *Harrisostrobus intertrappea* (Chitaley and Sheikh 1973) resemble the current fossil specimen in taking ovuliferous scale but they differ from the current specimen in taking both ovuliferous scale and bract scale. It is compared with reported ovules, *Gymnoovulites intertrappea* (Shukla 1948), *G. deccanii* (Paradkar 1976), *Cycadoovulites deccanii* (Shukla 1948), *C. mohgaonse* (Singhai 1975), and *Podocarpoovulites chitaleii* (Sheikh and Kolhe 1982), which are also different and not comparable to the above as they possess a single ovule per ovuliferous scale. The present specimen resembles with *Cupressaceoovulites intertrappea* (Mistri et al., 1985) in having two ovules covered by a single ovuliferous scale and having nucellus free from the integument, but differs from it in multilayered, differentiating into three zone integument and absence of two large air spaces on either side of micropylar canal. The present ovule shows close similarity with *Coniferoovulites intertrappea* (Chitaley and Yawle 1978) in having two ovules surrounded by ovuliferous scales. The integument also differentiated into three zones. It differs only in absence of bract scale. Thus, it remains in the form genus. *Coniferoovulites* after group Coniferales and new species is created as *Coniferoovulites patanii* sp. nov. The particular label is after the area Marai Patan.

➤ Diagnosis

- *Coniferoovulites patanii* sp. nov.

The complete specimen measures length of 3 mm and width of 1.5 mm. Pair of ovules oppositely placed covered with smooth boundary. Both ovules are anatomically similar. The integuments are well preserved. In small ovule it is differentiated into outer, middle and inner. The outer layer is moderately thick and measuring about 0.2 μ m. and consists of sclerenchymatous cells. The middle layer is parenchymatous, single layered measuring 0.03 μ m in thickness. The Inner layer is single layered and 0.02 μ m in thickness. In large ovule integument is differentiated into two layers. Outer integument is measuring about 0.01 μ m and inner integument measuring about 0.10 μ m. Micropyle in large ovule tapers towards the apex. The inner layer encloses nucellar tissue completely.

- ✓ Holotype : SMN/Gymno. Megasporophyll/ Deposited in Department of Botany, Dr. Ambedkar College, Chandrapur.
- ✓ Horizon : Deccan Intertrappean beds
- ✓ Locality : Marai Patan, Tahasil- Jiwati, Dist. Chandrapur, Maharashtra, India.
- ✓ Age : ?Uppermost Cretaceous

present fossil ovule shows some unique characters of its own. Finally summing up the comparison and discussion on the described fossil specimen it can be concluded that the study present fossil megasporophyll resembles with Coniferoovulites with minor differences and hence named as *Coniferoovulites patanii* sp. nov. This has been done on the basis of morphological and anatomical characters of the ovules.

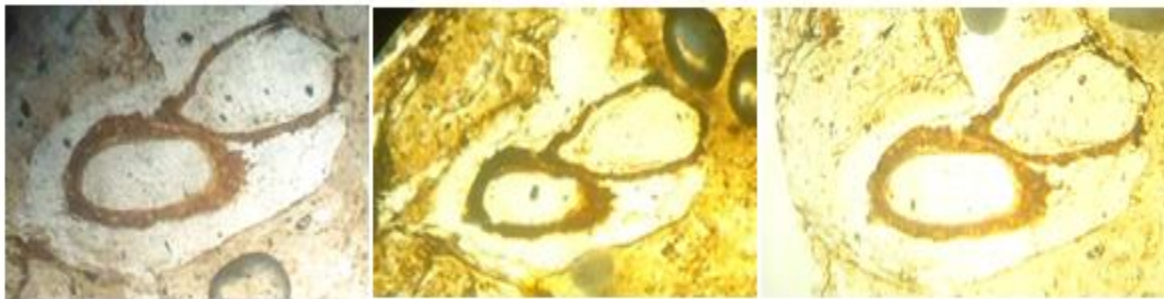
IV. CONCLUSION

The above comparison clearly shows that the present fossil specimen shows some resemblances with ovules of Coniferales. But when the comparison is made at family level, it does not correlate with any of the family of Coniferales. The

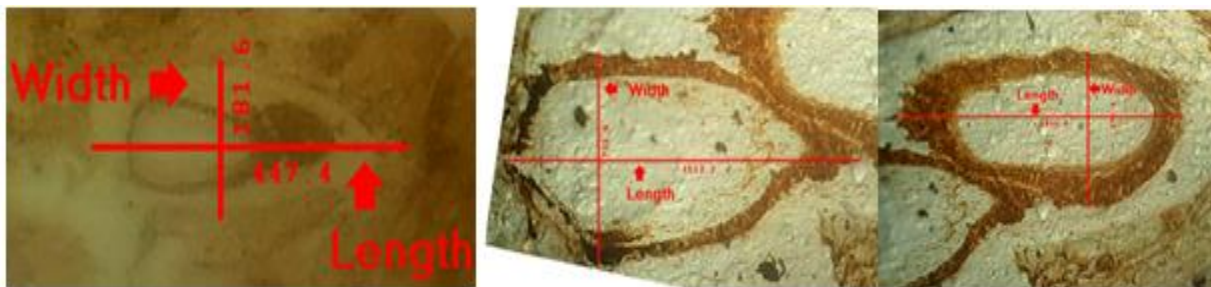
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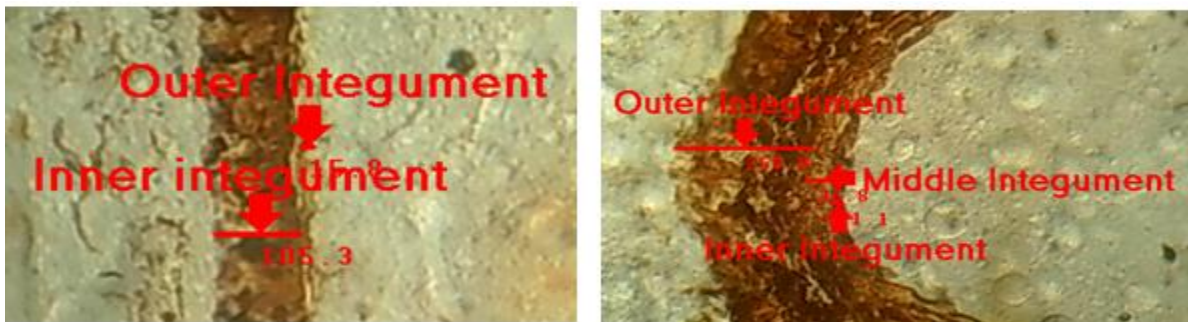
PLATE - I, PHOTO 1 – 10



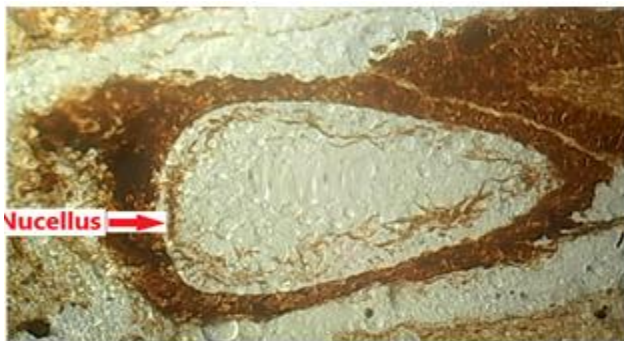
1 (L.S. of Megasporophyll) 2 (L.S. of Megasporophyll) 3 (L.S. of Megasporophyll)



4 (Megasporophyll- X20) 5 (Large Ovule-X40) 6 (Small Ovule-X4)



7 (Large Ovule Integuments-X40) 8 (Small Ovule Integuments-X200)



9 (Nucellus-X40)



10 (Micropyle canal-X40)

➤ EXPLANATION OF PLATE – I, PHOTO 1-10

- Photo 1-3. A typical Megasporophyll in L.S. showing two ovules. One of the ovule is globular and larger in size and other is smaller in size.....X20.
- Photo 4. A typical Megasporophyll in L.S. showing size of Megasporophyll.....X20.
- Photo 5. L. S. of Megasporophyll showing Length and Breadth of Large Ovule.X40.
- Photo 6. L. S. of Megasporophyll showing Length and Breadth of small Ovule.X40.
- Photo 7. L. S. of Megasporophyll showing Large Ovule Integuments.....X40.
- Photo 8. L. S. of Megasporophyll showing small Ovule Integuments.X200.
- Photo 9. Nucellus.X40.
- Photo 10. Micropyle canalX40.

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