SURANGEA MOHGAOENSE, GEN. ET SP. NOV., A PTERIDOPHYTIC FRUCTIFICATION FROM DECCAN INTERTRAPPEAN BEDS OF INDIA

S. D. CHITALEY AND M. T. SHEIKH

Institute of Science, Nagpur

ABSTRACT

This paper gives a detailed description of a five chambered elliptical petrified synangium of 3 × 4 mm. size. The chambers are arranged in a ring around a small central core. Each chamber is full of spiny megaspore tetrads. Material comes from the Mohgaonkalan locality of the Deccan Interrappean series of India. Identification with modern plants, not being complete, the synangium is named as *Surangea mohgaoense*, gen. et sp. nov. to include all pteridophytic synangia.

INTRODUCTION

So far, only a few pteridophytic remains are reported from the Deccan Intertrappean beds of India. A fossil *Azolla* was described well by SAHNI and RAO (1943). Petrified *Salvinia* megaspores (MAHABALE, 1950) were previously described by SAHNI and SRIVASTAVA (1934) under a different genus as *Sausarospermum*. Another genus initiated by SAHNI and RAO (1943) as *Massullites* was removed by MAHABALE (1957) to *Salvinia* as its male member. Recently NAMBUDIRI and THOMAS (1969) gave a brief account of a sporocarp "*Kuprianovaites deccanii*" from Mohgaonkalan.

The present specimen is an additional record to the known pteridophytic remains from Deccan Intertrappean Series of India. Such a synangial fructification is being described for the first time from these beds.

MATERIAL AND METHOD

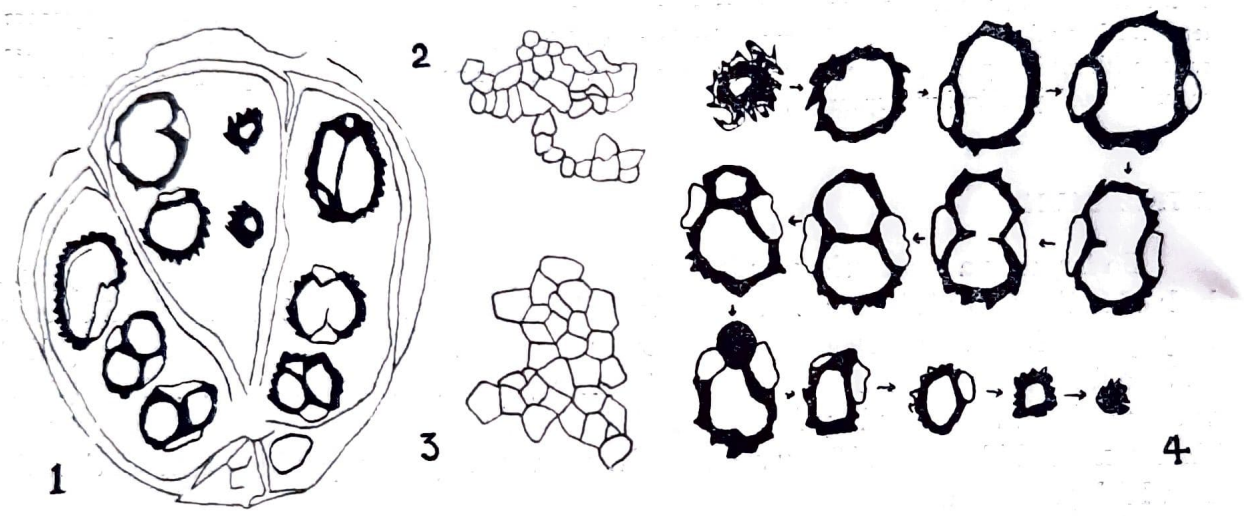
The material was collected from the Deccan Intertrappean beds of Mohgaonkalan in the month of May 1968 by the junior author. It is well petrified in black silicified chert. The part and counter part of the specimen are studied for details by means of peel sections taken serially along T.S., T.L.S., and R.L.S. planes.

DESCRIPTION

While breaking some of the cherts, the specimen under study fell into two parts. Each part was elliptical in shape measuring 4 mm in length, and 3 mm in thickness, broader at one end and narrower at the other (Pl. 1, Figs. 4, 5; Text-fig. 1). The exposed surface showed an oblique T.L.S. with 3 chambers. Some peel sections of the same, later showed 5 chambers, with 5 partitions, radiating from a sterile central core 0.5 × 0.75 mm. The wall and the septae separating the chambers of this body are of same structure. Epidermis is not preserved. Synangial wall being of 6 to 10 cell layers and 0.11 mm thick, is of moderately thick walled

parenchymatous cells, each being 10 to 25 μ in size. Inter-cellular spaces are absent. (Pl. 1, Fig. 6; Text-fig. 3). The septae are 6 to 7 cell layers wide and measured 0.9 mm in thickness.

Each chamber contains 8 to 9 spiny tetrads (Pl. 1, Figs. 1, 4, 5; Text-fig. 1), each measuring 0.7 × 0.82 mm in size. Serial sections of these tetrads were studied to understand their composition (Text-fig. 4). It is seen that the four spore like units of the tetrads are firmly attached with each other (Pl. 1, Figs. 1, 4, 5, 7; Text-figs. 1, 4). Out of these four units, generally, the two are well developed with an outer spiny wall and an inner thin smooth membrane, each spore being 0.4 to 0.5 mm in size. (Pl. 1. Fig. 7). All the developed spores seem to be alike in different planes (Text-figs. 4). The two smaller undeveloped or abortive ones do not show any spiny wall and are of 0.2 to 0.3 mm in size each. (Pl. 1, Fig. 7; Text-fig. 4). The spiny spore exine is differentiated into thick columellate sexine and a thin nexine (Pl. 1, Fig. 2). Intine is thin and membranous. Normally, the spores are empty except in some cases a soft parenchymatous tissue is well marked (Pl. 1, Fig. 8; Text-fig. 2). Triradiate mark was not seen anywhere.



Text-figs. 1-4. *Surangea mohgaoense*. 1. T.L.S. synangium showing 3 locules with tetrads, and two locules getting exposed. X-8; 2. Gametophytic mass of thin walled parenchymatous cells. X-400; 3. Cells of synangial wall. X-200; and 4. Serial sections of one tetrad. X-20.

DISCUSSION

It is concluded from the above description that the present specimen is a pteridophytic fructification containing megaspore tetrads having in each, two spores developed, and two abortive. Abnormal joined megaspores are recorded by PANT (1962) in Indian species of *Isoetes*. However, they are only two to three together, showing same size and structure of joined spores with connecting tubes, which condition is not seen in the present specimen. He did record spore tetrads of four spores together in the case of microspores, which are evidently different from the megaspores of the present tetrads. The five chambered condition with the outer common wall in the present specimen suggests, that it is a synangium. Synangia in Pteridophytes are well known only in Psilophytales, Psilotales, and Marattiales. *Yarravia* shows a synangial condition without any central axis. In *Psilotum* there is no distinct central axis, though there is some tissue in the centre as is present in the specimen under study. Synangia in Marattiaceae are just a group of sporangia grouped together some times in a circle, like in fossil *Cyathotrachus* (ANDREWS, 1961) and *Ptychocarpus* (BOWER, 1935; ARNOLD, 1947). In these also, a small core is present in the centre. Such a condition is comparable to the present fossil specimen under investigation. However, the main difference is, in the

presence of homospory in *Marattiaceous* synangia. In Psilophytales too, the spores are all alike. In both, the spores are much smaller in size than the spores present in the fossil specimen under observation. Not only that, but, such spore tetrads as seen in the present specimen are generally absent in Marattiaceae though present in Psilotales.

Thus the present specimen being new, and not fitting in any particular group of Pteridophyta is named as *Surangea mohgaoense* gen. et sp. nov. Generic name is after Dr. K. R. Surange an eminent Indian Palaeobotanist and specific name is after the fossiliferous locality.

Generic diagnosis

Synangium chambered, chambers arranged in a ring around a small central core. Spores present in chambers.

Species diagnosis

Synangium elliptical, size 3 × 4 mm., five chambered, with a small central core of 0.5 × 0.75 mm Synangial wall 0.11 mm thick, parenchymatous. Chamber septum 0.9 mm thick. Each chamber with 8 to 9 spiny tetrads of *ca* 0.82 mm diameter each. Two of the four spores of a tetrad bigger and more developed, measuring 0.4 to 0.5 mm each; spore wall thick with spiny exine, and thin, smooth, intine. Spiny exine differentiated further into columellate sexine and thin smooth nexine. Smaller undeveloped or abortive spores measured 0.2 to 0.3 mm each, with thin smooth wall, not differentiated into exine and intine. Some tetrads showing parenchymatous gametophytic tissue inside larger spores.

Holotype — 3 Dn/Sh Dept. of Botany, Institute of Science, Nagpur.
Locality — Mohgaonkalan, Madhya Pradesh.
Age — Palaeocene.
Horizon — Deccan Intertrappean Series.

ACKNOWLEDGEMENTS

The authors express their gratitude to Prof. T. M. Harris, F.R.S. of the University of Reading, England, for going through the manuscript and for making helpful suggestions. They extend their thanks to the Director, Institute of Science, Nagpur, for providing facilities during the progress of this work. Thanks are also due to the University Grants Commission for the award of a Research Scholarship to the Junior author.

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EXPLANATION OF PLATE 1

1. T. S. synangium showing central core, five locules and tetrads. X-10.
2. Spiny spore wall. X-170.
3. T. S. central core with five vascular bundles each opposite each septum. X-35.
4. T. L. S. part of synangium showing 3 locules full of tetrads and rest two at the base unexposed. X-10
5. T.L.S. counter part of synangium. X-10.
6. Synangium wall showing compactly arranged parenchymatous cells. X-100.
7. Single magnified tetrad showing two well developed spores with spiny wall and two undeveloped or abortive small spores with smooth wall. X-40.
8. Tetrad spore with gametophytic tissue inside. X-55.

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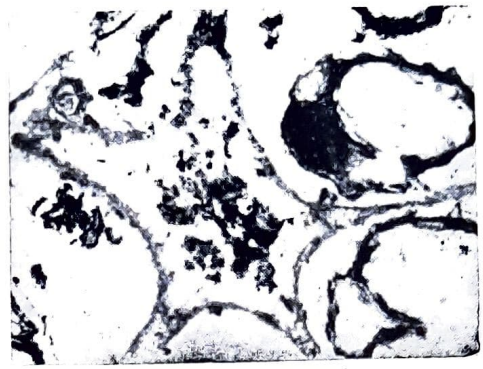

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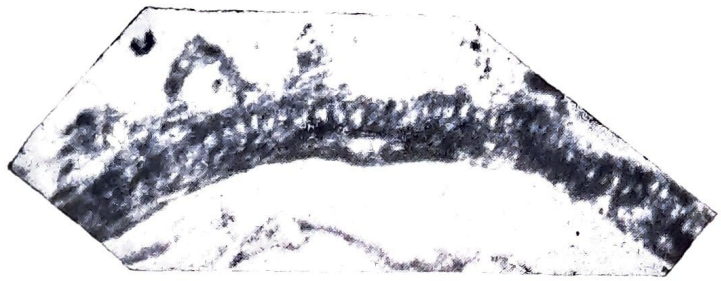

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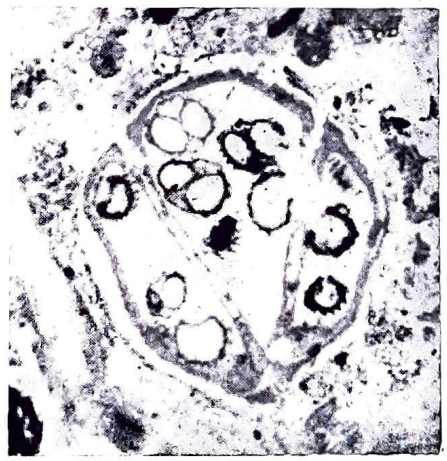

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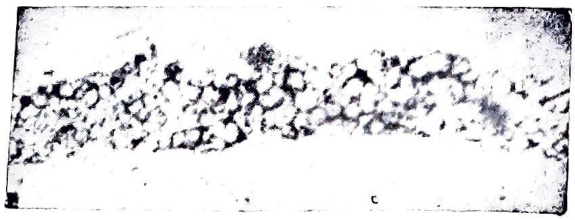

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