

STUDIES IN THE TALCHIR FLORA OF INDIA —
3. *STELLAPOLLENITES*: A NEW MONOSACCATE POLLEN
GENUS FROM THE SOUTH REWA GONDWANA BASIN

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ABSTRACT

A new monosaccate pollen genus, viz. *Stellapollenites* is described from the Talchir Stage of the South Rewa Gondwana basin. The saccus is attached sub-equatorially on both faces of the body and the triangular attachment zones on the two faces are mutually reversed. A new series, viz. *Amphisacciti* is proposed to include *stellapollenites* and other pollen genera with a brief comment on their organizational trends.

INTRODUCTION

ARICH assemblage of spores and pollen from two shale beds of the Talchir stage exposed near Goraia in the South Rewa Gondwana basin was first described by Potonié and Lele (1961). The predominant grains of this assemblage, earlier referred to *Nuskospores* Pot. & Kl., were subsequently critically reinvestigated by Lele (1964) and assigned to two new genera *Plicatipollenites* and *Virkkipollenites*. It has now become evident that many of the Southern pollen show an attachment of the saccus as found in *Plicatipollenites* and *Virkkipollenites*, i.e. the monosaccus is attached along the body equator on the proximal hemisphere whereas it is sub-equatorially attached on the distal hemisphere. This has been called as the "Distal condition of saccus attachment" (LELE, 1964).

In the same year, when *Plicatipollenites* was described, a different type of saccus attachment became evident from the finding of the new genus *Parasaccites* by Bharadwaj and Tiwari (1964). This kind of attachment was called "Para-condition of saccus" in which case, according to the definition of the above authors, the saccus was "attached sub-equatorially both on proximal as well as on distal face of the spore-body, leaving almost circular, equal bladder-free areas on both faces". With the subsequent finding of the unusual pollen-grain *Crucisaccites* Lele and Maithy (1965) and the recent amendment of *Vesicaspora* (Schemel) by

Wilson and Venkatachala (1963) it has become increasingly clear that although a sub-equatorial attachment on both faces of the body was a basic plan shared by a number of monosaccate pollen genera, a 'para-condition' as envisaged for *Parasaccites* was not a general rule, but only a particular pattern of double-sided saccus attachment.

A double-sided saccus attachment as found in *Parasaccites* was hitherto unknown from the Talchir strata. Recent observations have, however, indicated that a few grains conforming to the essentials of *Parasaccites* are present in the Talchir sediments of the Goraia section in the South Rewa Gondwana basin. Besides these, a quite remarkable monosaccate pollen has been found in the same sediments (previously studied by POTONIÉ and LELE, 1961) which exhibits yet another mode of a double-sided saccus attachment, quite distinct from that of *Parasaccites* and *Crucisaccites*. This new pollen type is described below under the name *Stellapollenites*.

DESCRIPTION

SUPER-DIVISION — *Pollenites* R. Potonié
DIVISION — *Saccites* Erdtman
SUB-DIVISION — *Monosaccites* (Chitaley) Pot. & Kr.

Amphisacciti ser. nov.

Diagnosis — Alete, trilete or monolete, monosaccate pollen grains showing amphilateral (double-sided) saccus attachment, i.e. the saccus is sub-equatorially attached on both faces of the body, leaving free a recognizably wide saccus-free area around the two poles.

Remarks — The newly introduced term "Amphilateral saccus attachment" is somewhat broadly defined so as to encompass a variety of attachment patterns, depending upon the relative encroachment of the

saccus on the two faces of the body as well as the symmetry of the attachment zones and their orientation with respect to each other. In other words, the saccus free areas on the two faces of the body may be equal to unequal, radial to bilateral in symmetry and the orientation of the attachment zones on the two faces of the body may be in the same or different directions with respect to each other. The new genus *Stellapollenites* and the known genera *Parasaccites*, *Crucisaccites* and *Vesicaspora* (as reinterpreted by Wilson and Venkatachala, 1963) bear evidence to the variety of amphilateral saccus attachments.

It is now evident that the term "Para-condition of saccus" (Bharadwaj & Tiwari, 1964) is only a particular pattern of amphilateral saccus attachment (exemplified by *Parasaccites* at present) in which case the saccus attachment zones on the two faces of the body are mutually superposed leaving equal saccus-free areas. In my opinion, therefore, the term "Para-condition" should be used, if at all necessary, in a restricted sense. The term "Para-position", which is used in current palynological literature without having any adequate definition, appears to imply a different meaning.

The institution of the new series "Amphisacciti" is meant to recognize a rather unique group of pollen, specially in the Lower Gondwana strata, which are morphologically interrelated and share a basic plan of amphilateral saccus attachment. All such pollen referable to the Amphisacciti may be conveniently called "Amphisaccate". The nature of the tetrad mark, if at all present in Amphisaccate pollen, is apparently vestigial and has, therefore, no supra-generic value. It may be added that the appropriate replacing of the genera *Parasaccites* and *vesicaspora* under Amphisacciti also serves to further purify the heterogeneity of the series *Triletisacciti* and *Disacciatrileti* which hitherto accommodated the two genera respectively.

Stellapollenites gen. nov.

Generic Diagnosis — Radially symmetrical, monosaccate pollen showing amphilateral saccus attachment; outline roundly triangular to sub-circular, body indistinct to distinct with a faint structure, tetrad mark unknown; amphilateral zones of saccus attachment radially symmetrical, triangular,

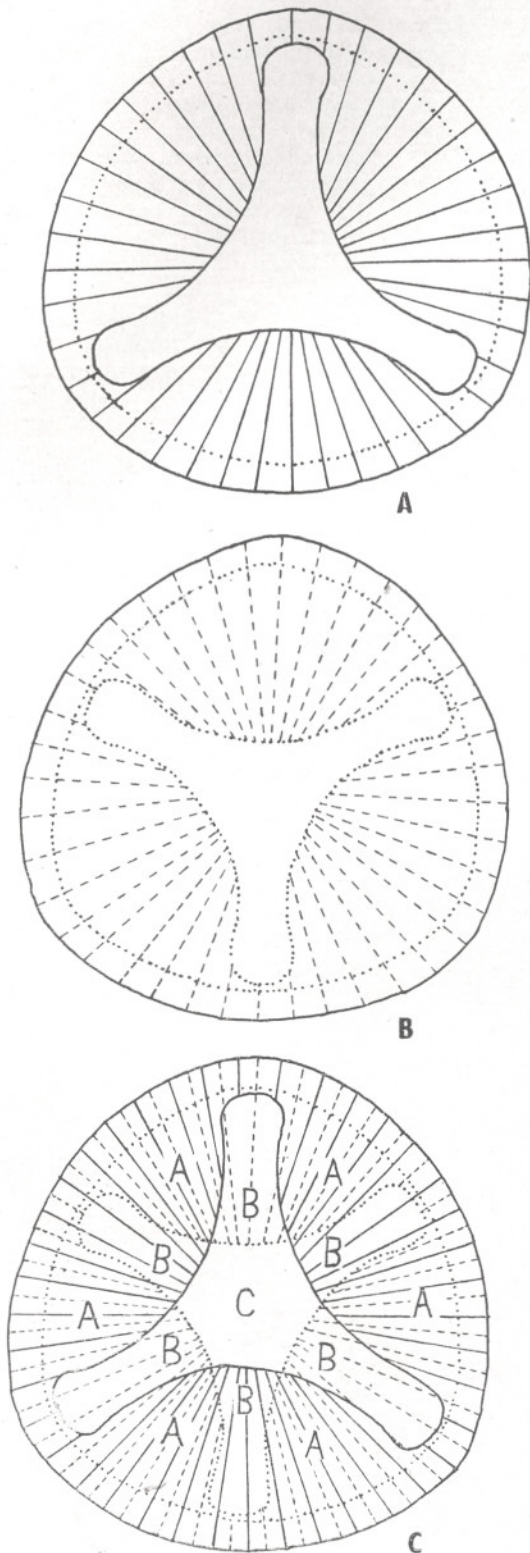
leaving a correspondingly broad triangular saccus-free area around the poles; amphilateral attachment zones mutually reversed in position; saccus structure intra-reticulate, firm.

Type Species — *Stellapollenites talchirensis* sp. nov.

Locus Typicus — Near Goraia, South Rewa Gondwana basin, India, Talchir Stage, Lower Gondwana (Permo-Carboniferous).

Organization — The grains exhibit an essentially radial symmetry in regard to their overall shape as well as the amphilateral zones of saccus attachment. The most remarkable feature of the saccus is the manner in which it encloses the body and is attached to it. The saccus encloses most of the body but leaves free on both sides a more or less wide triangular (radially symmetrical) area along which it is attached. The zones of attachment on the two faces of the body are reversely orientated with respect to each other with the result that the two saccus-free triangular areas of the body are also mutually reversed. When seen in a polar view the double-sided attachment zones jointly produce a star-shaped figure; hence the name *Stellapollenites*. The organization of the genus is elucidated in Text-fig. 1 A-C.

The mutually reversed orientation of the two attachment zones can be clearly made out by differential focal analysis in all well-preserved examples. In the type-species the saccus attachment zone on one face of the body is more well-defined than that on the other. A natural result of the reversed attachment is that one may often notice six areas on the pollen grain (indicated by A in TEXT-FIG. 1; cf. PL. 1, FIG. 1) which are deepest in colour because here the saccus is present on both faces of the body. Similarly, there are six other areas (indicated by B in TEXT-FIG. 1; cf. PL. 1, FIG. 1) which appear mediumly deep in colour, for the saccus is present here on only one face of the body. The central hexagonal area (indicated by C in TEXT-FIG. 1), which includes both the poles of the body, is the only region completely free from saccus overlap and is thus the ideal place for examining the body structure or sculpture. In cases where the central saccus free zone is preserved, a faint intra-microreticulate structure can be sometimes discerned in the body exine. There is so far no evidence of a trilete or other mark on any



face of the body. The saccus has a firm structure, being built up of strong muri.

Comparison — There are only two monosaccate genera in the Lower Gondwana which show an amphilateral saccus attachment. These are *Parasaccites* Bharadwaj & Tiwari (1964) and *Crucisaccites* Lele & Maithy (1964).

In *Parasaccites* the attachment condition (called 'Para-condition' *sensu restrictus*) is perhaps the simplest, for the amphilateral zones of attachment are superposed leaving almost equal saccus-free areas on each face of the body. The genus *Parasaccites* has, therefore, little in common with *Stellapollenites* in which case the attachment zones are reversed, although they still retain a radial symmetry. Even in the latter respect, a difference can be well recognized in the fact that the attachment zones in *Parasaccites* are circular in shape while they are triangular in the case of *Stellapollenites*.

The other genus *Crucisaccites* also differs fundamentally from *Stellapollenites*, although in both cases the amphilateral attachment zones are not superposed. In *Crucisaccites*, the saccus attachment zones on each face of the body are distinctly bilateral in symmetry and they are orientated cross-wise at 90 degrees to each other. On the other hand, in *Stellapollenites* the saccus attachment zones on each face of the body are radially symmetrical and they are mutually reversed in disposition, one of them being rotated at 180 degrees with respect to the other.

The *Vesicaspora*-plan of construction (irrespective of the question about the occurrence of this genus in the Lower Gondwana)

TEXT-FIG. 1 — Interpretation of the organization of *Stellapollenites*. A. Polar view of one face of the grain showing the extent of subequatorial encroachment of saccus (radial unbroken lines) and its attachment, leaving a triangular saccus-free area in the centre. B. Polar view of the opposite face of the grain showing the extent of subequatorial encroachment of saccus (broken radial lines) and its attachment leaving a triangular saccus-free area in the centre. It may be noticed that the zone of saccus attachment in B is reversely orientated with respect to that in A. C. Combined effect of the views in A and B. The attachment zones produce a star-shaped figure. The saccus is present on both faces of the body at A and on only one face of the body at B. Body area marked C is entirely saccus-free.

is not, in any way, comparable with that of *Stellapollenites* since the saccus attachment zones in the former case are orientated in the same direction on both faces of the body.

Stellapollenites talchirensis sp. nov.

Pl. 1, Figs. 1-4

Specific Diagnosis — Outline of grain roundly triangular, body large, indistinct, roundly triangular; amphilateral zones of saccus attachment \pm concavely triangular, attachment zone on one face comparatively more well-defined than that on the other; saccus fine to mediumly intrareticulate, muri coarse. Rest same as for the genus.

Holotype — Pl. 1, Fig. 1; overall size 140 μ , body ca. 130 μ .

Description — Specimens shown in Pl. 1, Fig. 2, 4 represent the approximate range in size noted for this species. The body is indistinct but large in size as is evident from some better preserved examples (Pl. 1, Figs. 1, 2) where the body outline can be made out quite near the margin of the saccus. The saccus attachment zones on each face of the body are \pm concavely triangular in outline. The mutually reversed position of the amphilateral attachment zones can be clearly made out by differential focal analysis. One of the attachment zones is more well defined than the other. When seen in a polar view the two attachment zones jointly produce a star-shaped figure.

ORGANIZATIONAL TRENDS IN
AMPHISACCITI

The existence of amphisaccate pollen in the Lower Gondwana strata is well demonstrated by the occurrence of *Parasaccites*

from the Talchir Stage and the overlying Karharbari and the Barakar Stages. The genera *Stellapollenites* and *Crucisaccites* appear to be more characteristic of the Talchir and the Karharbari Stages respectively. The genus *Vesicaspora* which, in view of the reinterpretation of Wilson and Venkatachala (1963) is here included as a member of the Amphisacciti, needs more confirmatory evidence as to its occurrence in the Lower Gondwanas.

Broadly speaking, the morphological specializations expressed by amphisaccate pollen suggest the presence of two sets: The first set comprising *Parasaccites* and *Vesicaspora* in which the amphilateral zones of saccus attachment are orientated in the same direction on the faces of the body, and the second set including *Stellapollenites* and *Crucisaccites* in which the saccus attachment zones are orientated in different directions on the two faces of the body.

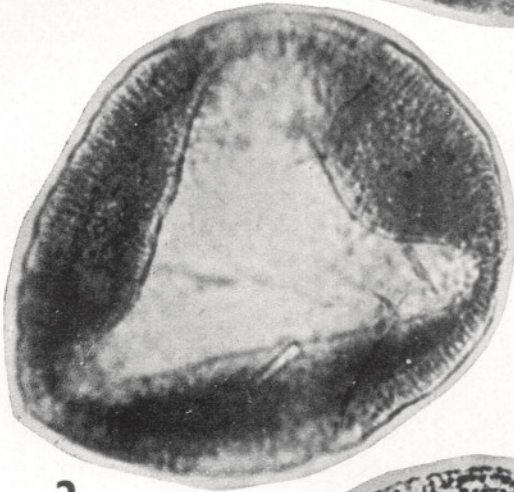
The plan of construction in the pollen genera of the first set is evidently simpler than that of the second set. Among all the amphisaccate genera, however, the construction of *Parasaccites* is admittedly the simplest and is also more fundamentally monosaccate. From *Parasaccites*, it may be possible to morphologically derive other genera through a certain number of steps involving essentially a shift in the symmetry of the saccus attachment zones and/or a rotation of one of the attachment zones with respect to the other. These circumstances are tempting enough to consider that a *Parasaccites*-type of plan may have been the originating source for the diverse trends of specilization manifest in the other members of Amphisacciti. A fuller consideration of this interesting aspect will be attempted elsewhere.

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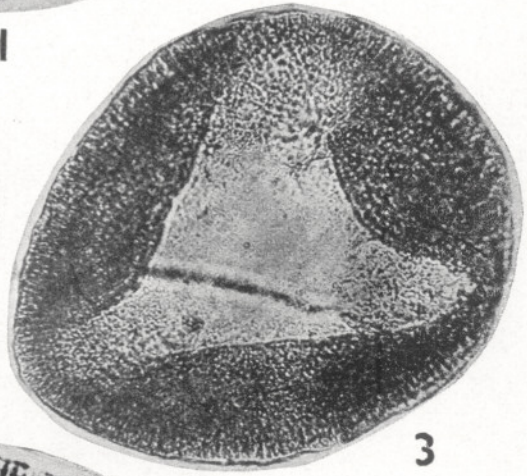
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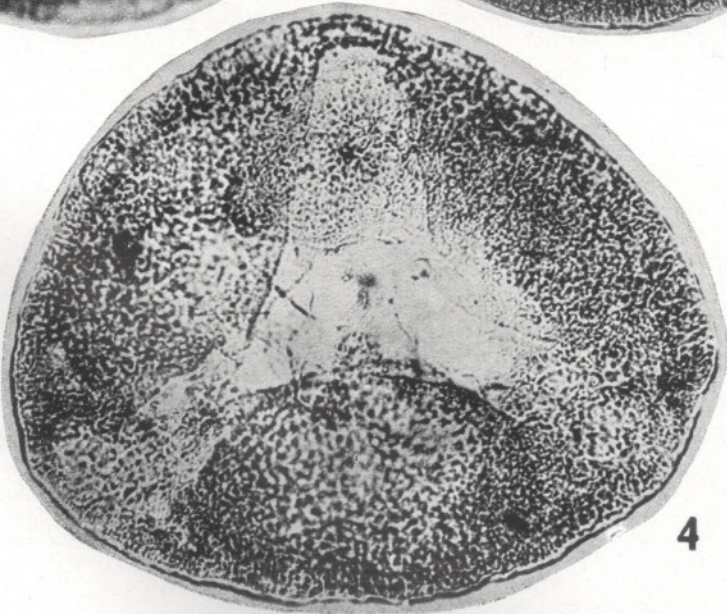
1



2



3



4

EXPLANATION OF PLATE I

(All photomicrographs are $\times 500$ enlarged. The slides are preserved at the Museum of the B.S.I.P., Lucknow)

Stellapollenites talchirensis gen. et sp. nov.

1. Holotype. The outline of the body is faintly discernible near the saccus margin. The reversed disposition of the two zones of attachment and the formation of stellate figure is evident. Central part of body is broken. No. 716.

2. Another specimen. One face of the body is in sharper focus showing the concavely triangular saccus attachment zones. The saccus portion on the other side of the body is only vaguely seen.

The body is thin, but evident near saccus margin. No mark present. No. 694.

3. Specimen same as in Fig. 2 in slightly deeper focus showing the saccus structure of the other side. The zone of attachment is not sharp enough on this side of the body. No. 694.

4. A large specimen. The amphilateral zones of attachment can be made out. Central part of the body is broken. No. 699.