

# SATSANGIA, A NEW PLANT ORGAN FROM THE TRIASSIC OF NIDHPURI, MADHYA PRADESH

SHYAM C. SRIVASTAVA AND HARI K. MAHESHWARI

*Birbal Sahni Institute of Palaeobotany, Lucknow 226007*

## ABSTRACT

*Satsangia* is a campanulate organ with basal tubular part densely covered with trichomes. Inner surface is studded with a large number of irregularly arranged, small scars. Cuticle is delicate, one surface shows a few stomata, the other surface shows remnants of trichome bases.

## INTRODUCTION

The Triassic beds exposed on the west bank of the Gopad River near Nidhpuri (Nidpur on topo sheets), Sidhi District, Madhya Pradesh have yielded a well preserved megafloora. The constituent elements include besides leaf genera, certain fruiting bodies, such as *Nidistrobis* and *Nidia* (BOSE & SRIVASTAVA, 1973a, 1973b). Recently we discovered some more fructification-like bodies in the same beds. One of these types is described here as *Satsangia* gen. nov.

## DESCRIPTION

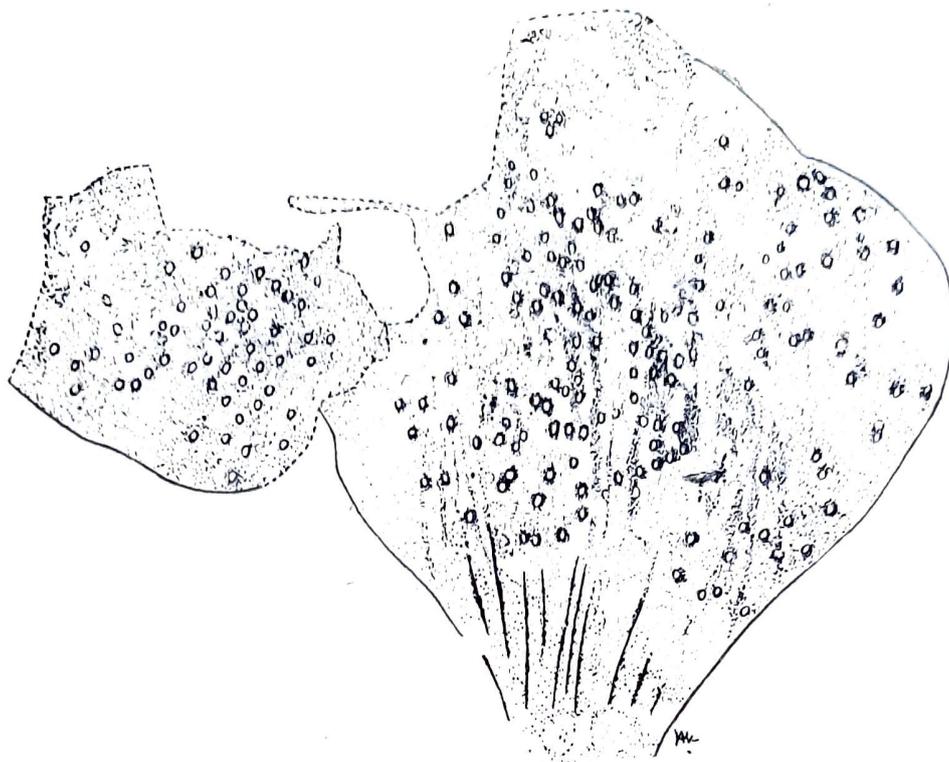
***Satsangia* gen. nov.**

Type species—*Satsangia campanulata* sp. nov.

*Diagnosis*—Bell-shaped (campanulate) body; ?sessile, basal tubular part densely covered with unicellular trichomes; expanded part on outside smooth except for some faint longitudinally running ridges, inner surface bearing irregularly arranged, more or less oval scars, sometimes with a tiny boss in the centre; in between scars scanty trichomes visible at places.

Cuticle brittle, thin, one surface (probably outer) showing a few stomata, elements of the stomatal apparatus not clearly seen. Cells of the other surface (probably inner) mostly rectangular or longish polygonal, 2-4 times longer than broad, lateral- and end-walls straight, surface smooth; a few cells show scars of hair bases.

*Description*—*Satsangia* is based on 13 specimens, unfortunately none of those is complete. However, two specimens (Pl. 1, Fig. 1 and 4) were fairly complete and give the general idea about the shape and organization. Most of the specimens occur as compressions, but in three specimens a cast is found inside the bell-shaped organ. The best preserved specimen consists of a part and a counterpart. The counterpart (Pl. 1, Fig. 3) shows the carbonized one half part (longitudinal) of the bell-shaped organ as seen from inside. The surface is studded with irregularly arranged, oval, small, 0.5 mm in diameter, scars or depressions. Occasionally a tiny boss may be seen in the centre of the depressions. The part (Pl. 1, Figs. 1, 2) consisting of a cast shows impressions of the inner surface of the counterpart. The oval depressions of the counterpart are represented on the cast as tubercles.



Text-Fig. 1—*Satsangia campanulata* gen. et sp. nov., semi-diagrammatic sketch of the counter part of the holotype (B. S. I. P. no. 35079) showing oval scars on the inner surface.  $\times 2$ .

When a portion of the cast is removed from the part, similar tubercles are visible on the other side of the cast. The removed portion of the cast shows a carbonized crust underneath (Pl. 1, Fig. 2 c). The exposed carbonized crust also shows depressions similar in shape, size and arrangement as on the counterpart. Thus it represents the other half (longitudinal) of the bell-shaped organ. When a transfer preparation is made of a portion of the carbonized crust, the outer surface is found to be smooth. From this it is inferred that in life *Satsangia* was bell-shaped with smooth outer surface and an inner surface with a number of protuberances of some kind which have now left their scars.

The true nature of these scars is not evident because whatever was borne at these points has been shed. It is definite that these are not hair bases, firstly because their diameter is too large to be that of hair bases, and secondly because true trichomes have been found on both the inner and outer surfaces of the bell-shaped lamina. May be they are the bases of sporangia or seeds but as we do not find any attached ones it is not possible to predict their true nature.

The trichomes (Pl. 1, Fig. 5) occur much more profusely on the inner surface of basal tubular part of the bell than anywhere else. They are unicellular, 350-400  $\mu$  long, hollow, with swollen bases and acute apices. Sometimes a solid core is seen in the centre of the trichomes. Trichomes have also been observed on other areas but they are scanty. The trichomes are seen more clearly under liquid at spots where the carbonized crust has been removed.

On a couple of casts, under liquid, we observed a large number of pollen grains (Pl. 1, Fig. 6-p). Almost all these pollen are disaccate, nonstriate. However, there is a wide range in shape as well as size so as to encompass a few genera of disaccate nonstriate *sporae dispersae*. It will be too presumptuous to predict definitely, on the basis of this pollen occurrence, that this plant organ was microsporangiate in nature, but the possibility of its being a fruiting body can not be ruled out if we compare our specimens with Palaeozoic *Dictyopteri-*

*dium* Feistmantel and *Isodictyopteridium* Rigby which show similar scars. It is also probable that the pollen found over the casts came with the sediment during the usual course of preservation and just represents the *sporae dispersae* of the bed.

The lamina of the bell-shaped organ was quite thin as is evident from the crust, and had delicate cuticles. From none of the specimens we were able to obtain cuticular pieces of any good size. Only one small piece, probably of the outer cuticle, showed a few stomata. Other pieces were non-stomatiferous and occasionally showed remnants of trichome bases. These probably represent the inner cuticle.

The cells of the stomatiferous surface are usually much longer than broad and have straight lateral- and end-walls. Surface walls are unspecialized. Stomata are scanty, irregularly distributed but probably longitudinally orientated (Text-fig. 2A). In shape and size the subsidiary cells are like other epidermal cells, but their inner walls are highly cutinized (Text-fig. 2D). Guard cells are thin.

The cells of the other surface are rectangular to longish-polygonal with straight lateral- and end-walls. Surface walls are usually unspecialized except that occasionally a



Text-Fig. 2—*Salsangia campanulata* gen. et sp. nov.: A, showing distribution and orientation of the stomata, Slide no. 35083  $\times 60$ ; B, showing trichome bases, Slide no. 35081-1,  $\times 150$ ; c, showing a trichome (apex broken), Slide no. 35081-2,  $\times 150$ ; D, a stoma, Slide no. 35083,  $\times 150$ .

cell may show remnants of trichome bases (Text-fig. 2B, C), sometimes as hollow circular patches with a dark rim.

*Derivatio nominis*—after Mr. P. P. Satsangi of the Geological Survey of India, Calcutta.

***Satsangia campanulata* sp. nov.**

Pl. 1, Figs. 1-6; Text-figs. 1-3

*Diagnosis and description*—(as for the genus)

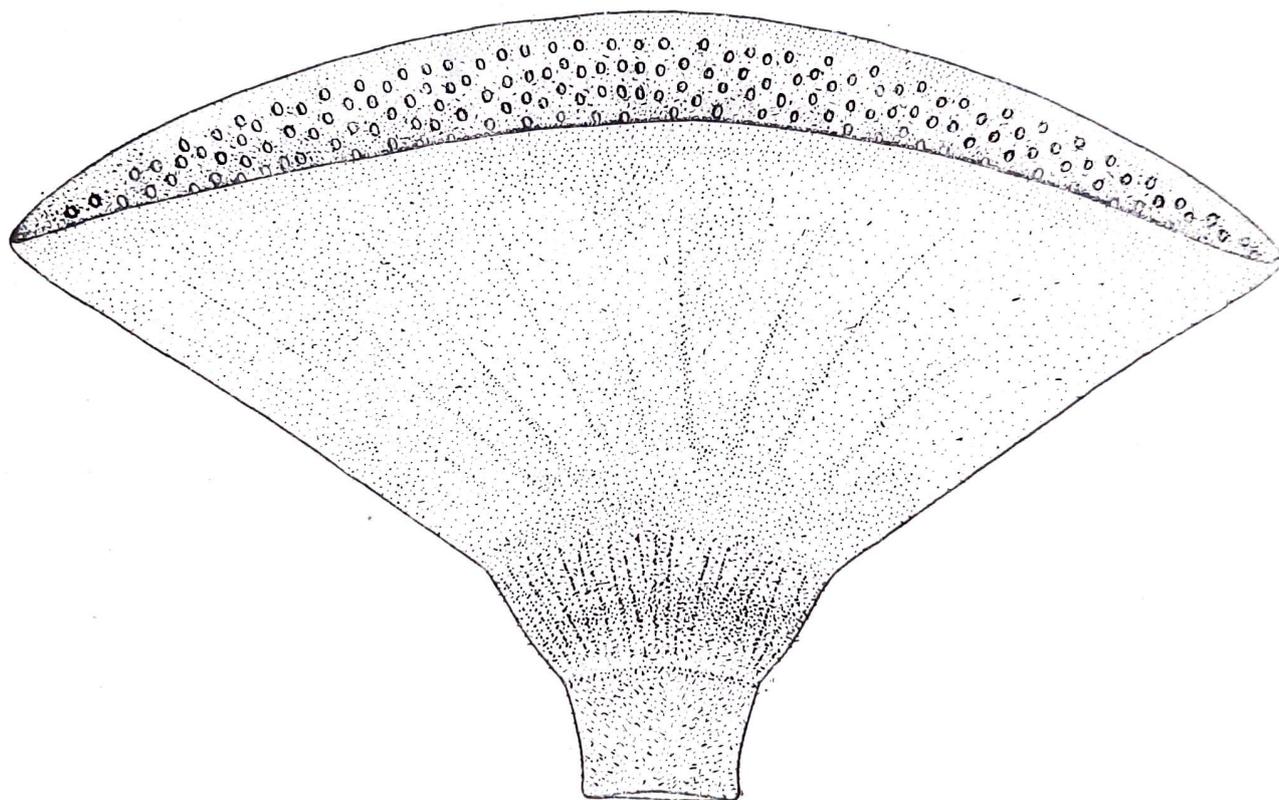
*Dimensions*—Holotype 3.5 cm long  $\times$  4.7 cm broad at the widest. Other specimens up to 6 cm long (incomplete) and 7 cm broad at the widest. Base 1.5 cm broad in specimen B.S.I.P. no. 35080. Trichomes 350-400  $\mu$  long.

*Holotype*—No. 35079, Birbal Sahni Institute of Palaeobotany, Lucknow.

*Age*—Triassic.

*Locality*—Carbonaceous shale band, West bank of Gopad River, near Nidhpuri, Sidhi District, Madhya Pradesh.

*Reconstruction*—Text-fig. 3



Text-Fig. 3—Diagrammatic reconstruction of *Satsangia campanulata* gen. et sp. nov.

#### COMPARISON

At first glance the new genus *Satsangia* reminds one of the Palaeozoic genus *Dictyopteridium* Feistmantel as interpreted by MAHESHWARI (1965, p. 146). Compressions of both the genera show that one surface is dotted with small, 0.5 mm in diameter, oval scars usually with a tiny boss in the centre. However, the similarity ends there. While *Dictyopteridium* is a linear, lanceolate organ, now supposed to be a stalked female cone (SURANGE & CHANDRA, 1973, p. 128), *Satsangia* is a campanulate structure, more in the style of a gamopetalous corolla. The genus *Isodictyopteridium* (RIGBY, 1972, p. 9, text-figs. F, H, I)

also has a fertile, tubercle-bearing face and a sterile nontuberculate face, similar to *Dictyopteridium* (*sensu* MAHESHWARI, 1965, pl. 1, figs. 4, 5) and *Satsangia*. However, *Isodictyopteridium* differs from *Satsangia* in being a flat lamina unlike the bell of the latter.

In shape, the genus *Satsangia* can be compared with certain medullosean pollen-bearing organs, like *Whittleseya*, *Codonothea*, *Dolerothea*, *Potonica* etc. However, organizationally there is no point of similarity. The medullosean male fructifications are interpreted as synangia made up of a number of sporangia fused side by side (HALLE, 1933, 1937), whereas *Satsangia* consists of a campanulate body, inner surface of which probably did bear some kind of fertile structure.

The cuticle of *Satsangia campanulata* closely compares with the cuticle of *Glossopteris nidpurensis* Srivastava 1971. In both the species the epidermal cells are more or less serially arranged, rectangular and much longer than broad. In both, the stomata are sparse, longitudinally orientated, and the subsidiary cells have highly cutinized inner walls.

#### AFFINITIES

In the absence of knowledge about the fertile structures (seeds or sporangia) borne by *Satsangia* it is difficult to hazard a guess about its affinities. The cuticle, however, shows resemblance with *Glossopteris nidpurensis* Srivastava 1971 and is quite unlike that of *Dicroidium* which is the dominant genus in the Nidhpuri beds. The genus *Glossopteris* is not uncommon in the sediments in which *Satsangia* is found.

#### ACKNOWLEDGEMENT

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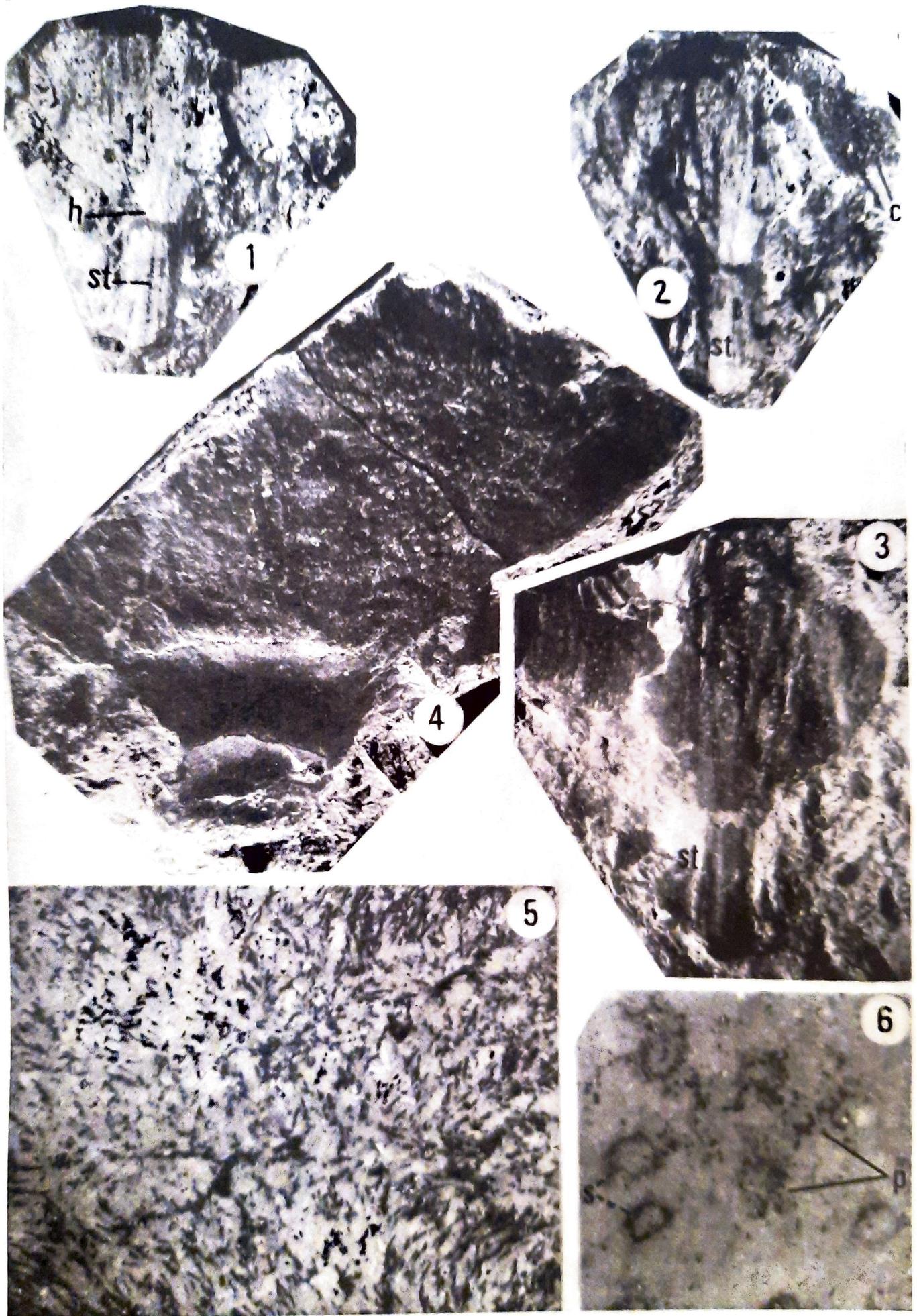
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#### EXPLANATION OF PLATE I

*Satsangia campanulata* gen. et sp. nov.

1. Holotype (B. S. I. P. no. 35079) showing the cast of the inner part of the bell-shaped organ. *St* marks an axis which is not in organic connection with the specimen proper.  $\times$ Nat. size.



2. Holotype (B. S. I. P. no. 35079) as in figure 1 but with a part of the cast removed at 'c' to reveal a part of the other half of the bell-shaped organ.  $\times$ Nat. size.
3. Holotype (B. S. I. P. no. 35079) counter part showing one longitudinal half of the bell-shaped organ. *Sf* marks the axis which is not in organic connection with the specimen proper.  $\times 1.5$ .
4. Specimen no. B. S. I. P. 35080, showing a hollow tubular base and one longitudinal half of the organ marked with oval depressions.  $\times 2$ .
5. Unicellular trichomes as seen under liquid on the basal part of specimen B. S. I. P. no. 35079 at 'h'.  $\times 13$ .
6. Showing pollen masses 'p' under liquid on a cast in between tubercles 's'. Specimens B. S. I. P. no. 35052.  $\times 13$ .