

A new interpretation on the structure of *Sabnia nipaniensis* Mittre from the Rajmahal Hills

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Description of five, serial, longitudinal sections cut through a male flower *Sabnia nipaniensis* of the Pentoxyleae, collected from the Rajmahal Hills, Bihar has been given. The flower was borne terminally on a dwarf shoot. Sporophylls are spirally arranged around a cylindrical receptacle. Sporangia are produced in opposite rows. A restoration of the flower is also given.

Key-words—Megafossil, Pentoxyleae, Gymnosperm, *Sabnia*, Rajmahal Hills (India).

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सारांश

राजमहल पहाड़ियों से साहनिआ निपनियेन्सिस की संरचना पर एक नवीन व्याख्या

ओ० पी० सुथार एवं बी० डी० शर्मा

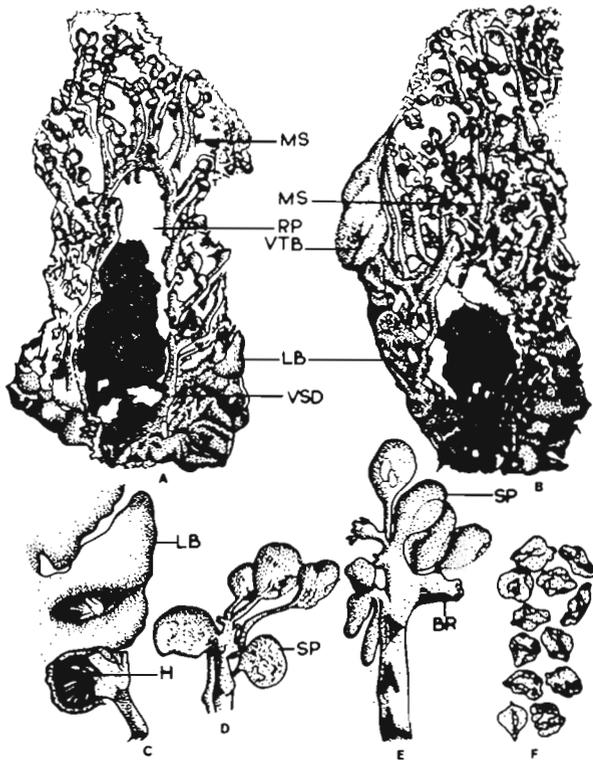
बिहार में राजमहल पहाड़ियों से एकत्रित पेन्टाक्सीली समूह के साहनिआ निपनियेन्सिस नामक नर पुष्प की पाँच क्रमिक लम्बवत् काटों का वर्णन किया गया है। यह पुष्प एक बौने प्ररोह के अन्तिम सिरे पर लगा हुआ था। इस पुष्प में बीजाणुपुष्प बेलनाकार धानी के चारों ओर चक्र के रूप में विन्यस्त हैं तथा बीजाणुधानीयाँ विपरीत पंक्तियों में विद्यमान हैं। इस पुष्प का पुनः स्थापित चित्र भी इस शोध-पत्र में प्रस्तुत किया गया है।

THE genus *Sabnia* was established by Vishnu-Mittre (1953) for a male flower of the Pentoxyleae, borne terminally on a dwarf shoot and consisting of about 24 simple or branched microsporophylls with spirally arranged pear-shaped sporangia. Each sporangium produced a large number of boat-shaped, monocolpate pollen. For the present study 5 serial longitudinal sections were cut through a male flower collected from Nipania, Rajmahal Hills by late Professor K. M. Gupta in 1956 and very kindly spared for the present study. It is a hard silicified chert.

DESCRIPTION

The dwarf shoot is covered with spirally arranged, rhomboid or laterally elliptical leaf bases, the abaxial surfaces of which are provided with dense growth of hairs (Text-fig. 3). Each leaf base

has a hypodermal layer and the ground tissue is made up of parenchyma. A number of vascular bundles are arranged in a straight line on the upper half of each leaf base; however, details of the bundles are not clear. In the terminal portion of the dwarf shoot is a long, cylindrical receptacle measuring 10×4 cm (Pl. 1, fig. 1; Text-fig. 1A) from the entire surface of which arise simple or branched, 2.7-4.2 mm long, microsporophylls in close spirals. Each microsporophyll has a number of balloon- or pear-shaped, sub-sessile or stalked, sporangia in two lateral rows (Pl. 1, figs 3, 4; Text-figs 1D, E). The sporangia originate little above the point of attachment of sporophylls to the receptacle. Each sporangium is $162 \times 129 \mu\text{m}$ in size and encloses boat-shaped, elliptical or circular monocolpate pollen ranging 7×17 - $10 \times 22 \mu\text{m}$ in size (Pl. 1, figs 5-7; Text-fig. 1F). Young sporangium has 3-4 cells thick wall which remains only one cell thick in the

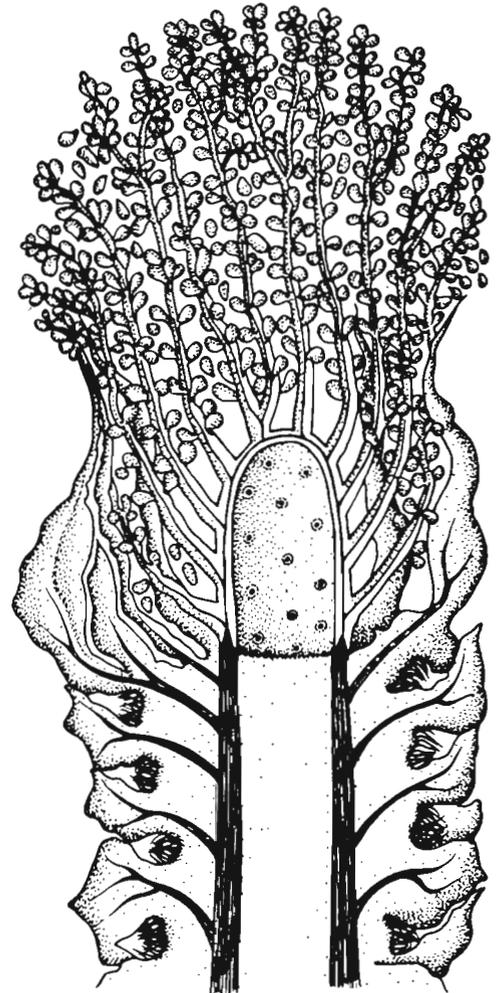


Text-figure 1—A, *Sabnia nipaniensis*: L. S. showing central receptacle and sporophylls originating from its entire surface. Sporophylls possess sporangia. $\times 8$; B, Tangential longitudinal section showing fertile portion and the dwarf shoot. $\times 8$; C, Leaf bases on dwarf shoot bearing hairs on abaxial surfaces. $\times 24$; D, Portions of microsporophylls producing opposite rows of balloon-shaped microsporangia. $\times 24$; E, Spores of various shapes and sizes with irregular exine. $\times 120$. (MS—Microsporophyll, SP—Sporangium, DS—Dwarf shoot, LB—Leaf bases, H—Hair, R—receptacle).

mature sporangium. The cells of inner layers are different from that of the outermost layer, i.e., epidermis. The former are large, rectangular and probably acted as tapetum. The basal portion of receptacle with its microsporophylls is protected by the vertically oriented bracts (Pl. 1, fig. 2; Text-fig. 1B). These are modified leaves, 4 to 6 mm in length.

RECONSTRUCTION

Vishnu-Mittre (1953) in his reconstruction of *Sabnia nipaniensis* suggested the occurrence of 24 unbranched sporophylls united at their bases, around a dome-shaped receptacle at the apex of the dwarf shoot. Bose *et al.* (1985) believe that the sporangiophores were stiff, straight and branched and bore simple pollen-sacs. In the re-construction suggested here (Text-fig. 2), the apical long, cylindrical receptacle bears spirally arranged,



Text-figure 2—*Sabnia nipaniensis*: Restoration, male fertile portion is produced terminally on a dwarf shoot covered with leaf bases. The former has a cylindrical receptacle covered with spirally, arranged, simple or branched microsporophylls bearing opposite rows of microsporangia. $\times 10$.

branched or unbranched microsporophylls. Branching is dichotomous or monopodial. Two lateral, opposite rows of balloon-shaped sporangia are produced on the sporophylls. Each sporangium encloses a large number of monocolpate pollen with reticulate exine. The dwarf shoot possesses spirally arranged leaf bases with dense growth of hairs on abaxial surface. In the upper portion of the shoot there are vertical bracts which surround the receptacle and basal portions of the sporophylls.

DISCUSSION

The male reproductive organ of the Pentoxyleae is rare in occurrence. It was earlier believed to be partly identical to the male bennettitalean flower

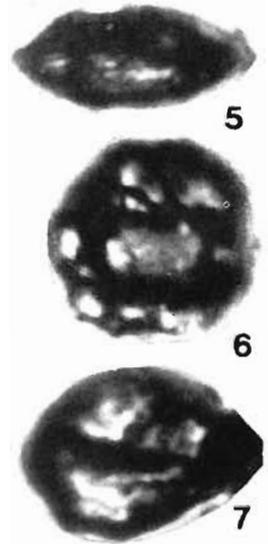


PLATE 1

Weltrichia santalensis Sitholey & Bose 1971 (Mittre, 1953, 1957; Rao, 1974, 1981). Twenty to 24 microsporophylls originated in a whorl surrounding a small dome-shaped receptacle. The bases of microsporophylls were fused and formed a cup-like structure. However, on the basis of the study of a well-preserved *Sabnia* fructification it is suggested that *Sabnia* is not identical to *Weltrichia santalensis*. It has spirally arranged, radial, branched sporophylls similar to some of the pteridospermous plants, e.g., Caytoniales and Corystospermales. Bose *et al.* (1985) also suggested that *Sabnia* was built on a different plan than *Weltrichia*.

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PLATE 1

Sabnia nipaniensis

1. L.S. of fructification showing a long, cylindrical receptacle with microsporophylls originating from it. On dwarf shoot portion leaf bases are seen. × 10.
2. Tangential longitudinal section through the fructification: Basal portion with dwarf shoot bearing leaf bases and the upper portion with microsporophylls. × 10.
3. A microsporophyll with opposite, balloon-shaped sporangia. × 18.
4. Balloon-shaped sporangia. × 24.
- 5-7. Monocolpate pollen of various shapes and sizes. Exine irregular. × 600.