
Surmaspora Singh & Rao from the Neogene sediments of southern India : its stratigraphic and botanical significance

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The paper deals with the occurrence of *Surmaspora* (*S. karti*) from the subsurface Miocene sediments of Godavari Basin in Andhra Pradesh and Cauvery Basin in Tamil Nadu and highlights its stratigraphic and botanical significance.

Key-words—Palynology, *Surmaspora*, Miocene, South India.

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सारांश

दक्षिणी भारत के निओजीन कालीन अवसादों से प्राप्त सुरमास्योरा सिंह व राव : इसका स्तरिकीय एवं वनस्पतिक महत्व

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प्रस्तुत शोध-पत्र में तमिल नाडु में कावेरी द्रोणी तथा आंध्र प्रदेश में गोदावरी द्रोणी के उपसतही मायोसीन युगीन अवसादों से प्राप्त सुरमास्योरा (सु० कराई) का वर्णन किया गया है तथा इसके स्तरिकीय एवं वनस्पतिक महत्व की विवेचना की गई है।

THE genus *Surmaspora* was instituted by Singh and Rao (1984) for fairly large trilete spores with laesural arms surrounded by prominently thick, ribbon-like labra, globular thickenings at ray ends and verrucate sculpture all over. Two species of *Surmaspora* are known so far, viz., *S. sinuosa* from the Surma Group (Lower Miocene) of Jaintia Hills, Meghalaya (Singh & Rao, 1984) and *S. karti* from the Meenakunnu phase II (Miocene) of Cannanore District in Kerala (Rao & Rajendran, 1996).

The present contribution deals with the occurrence of *Surmaspora* (*S. karti*) from the subcrops of Godavari Basin in Andhra Pradesh and Cauvery Basin in Tamil Nadu, and highlights the stratigraphic importance and botanical affinities of this spore type.

MATERIAL AND METHODS

The material consists of a number of borewell palynosamples from the onshore Narsapur well No. 2 (NSP 2) in the Godavari Basin of Andhra Pradesh; and a borewell RP-40, 10 km north-east of

Jayamkondam in the Jayamkondam block and a few kilometers south of the III mine of Neyveli lignite (South Arcot District) in the Cauvery Basin of Tamil Nadu. Eighty six palynosamples (Neogene) covering the depth range 50 to 1180 m of NSP-2 borewell in the Godavari Basin were studied, of which 27 samples of clay and fine sandstone from the depth sequence 660 to 1000 m have yielded *Surmaspora* spores. From the borewell RP-40 near Jayamkondam in the Cauvery Basin the Miocene lignite samples (4) from the depth range 156.60 to 161.40 m have yielded *Surmaspora* spores. The samples consisting of carbonaceous clays and lignites were treated with HCl, HF and HNO₃ followed by bleaching in 3-5% solution of KOH. Heavy liquid (mixture of Potassium iodide and Cadmium iodide) treatment was employed for concentrating the palynomorphs recovered from the clays of Narsapur well No. 2. The slides were made with DPX mountant. Trinocular Research Microscope of Olympus make (CHS-TR-PCD) with semiautomatic photomicrographic system has been used for morphographic study and photography.

Genus — *Surmaspora* Singh & Rao 1984 emended

Type species — *Surmaspora stnuosa* Singh & Rao 1984

Original diagnosis — Miospores triangular to sub-triangular with broadly rounded apices. Trilete, y-rays extend up to 3/4 of the radius, surrounded by a thick labra having globular thickenings at the ray ends. Exine verrucose, verrucae generally sparsely spaced.

Emended diagnosis — Miospores triangular to sub-triangular with broadly rounded apices. Trilete, y-rays extend up to 3/4 of the radius, laesural arms surrounded by a thick, ribbon-like labra, globular thickenings at ends of laesural arms often prominent. Exine verrucate all over. Verrucae sparsely or densely spaced, when densely spaced adjacent verrucae laterally fuse to form pseudoreticulate condition.

Remarks — The spores of *Surmaspora karti* described earlier by Rao and Rajendran (1996) and presently recorded from Godavari and Cauvery Basins show densely verrucate condition all over with the neighbouring verrucae often coalesced to form pseudoreticulate condition. Figure 3 of the type species *S. stnuosa* provided by Singh and Rao (1984) also shows locally densely placed undulating verrucae with occasional coalescence. It is therefore felt that the generic diagnosis of *Surmaspora* should be suitably emended to incorporate this particular aspect.

Surmaspora karti Rao & Rajendran 1996

Pl. 1, figs 1-5

Description — Miospores triangular to sub-triangular with smoothly rounded apices, 42-72 x 72-77 μm , trilete, laesural arms extending up to 3/4 of radius, surrounded by conspicuously thick (5.6-8.0 μm) ribbon-like labra, additional globular thickenings seen often at ends of laesural arms, in some

instances such thickenings not prominent. Exine 3-6.5 μm thick, densely verrucate on proximal and distal facets; verrucae thick (2.5 x 4.5 μm) often irregular, undulating, show lateral coalescence to form pseudoreticulate condition. Fused verrucae form wavy or undulating muri.

Remarks — The specimens from Godavari (Pl. 1, figs 1, 2, 4) and Cauvery (Pl. 1, figs 3, 5) Basins are exactly similar to *Surmaspora karti* from the Cannanore district of Kerala and accordingly have been placed in the same species. *Surmaspora stnuosa* from the Surma Group of Meghalaya (Singh & Rao, 1984) shows somewhat sparsely spaced irregular, often wavy verrucae. *Surmaspora verrucata* from Kutch, Gujarat (see Singh & Rao, 1984) does not appear to be a spore type of *Surmaspora* as it lacks thick ribbon-like labra, the most diagnostic feature of this genus.

DISCUSSION

The highly characteristic sporomorph *Surmaspora* (*S. stnuosa*) was originally recorded from the Lower Miocene Surma Group in Meghalaya (Singh & Rao, 1984; Rao & Singh, 1987). Subsequently *S. karti*, another species of this genus, was recorded from the Miocene outcrops of the Cannanore District in Kerala (Rao & Rajendran, 1996). Spores resembling exactly *S. karti* are now documented from the Miocene sediments (subsurface) of the Godavari Basin in Andhra Pradesh and Cauvery Basin in Tamil Nadu. This clearly indicates that *Surmaspora* is of stratigraphic significance, and may probably constitute a marker spore type for the Miocene strata.

In the Godavari, Cauvery and Kerala Basins, alongwith *Surmaspora karti* spores, *Crassorettriletes vanraadshovent* has also been encountered repeatedly and one can notice striking similarity between both these taxa in size, shape and ornamentation. In both of them, the exine all over is of

PLATE 1

(Unless otherwise mentioned all figs. x 750)

1, 2, 4. *Surmaspora karti* from NSP 2 borewell, Godavari Basin.

3, 5. *Surmaspora karti* from a borewell, 10 km north-east of Jayamkondam in Cauvery Basin (fig. 5 x 500).

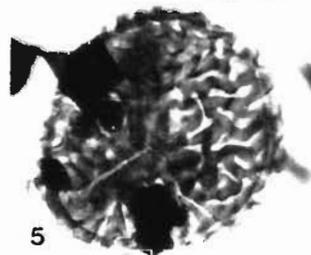
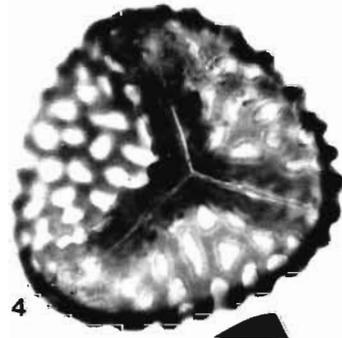
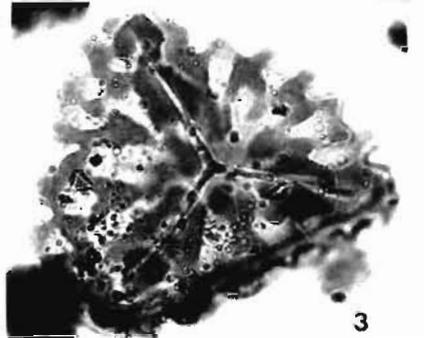
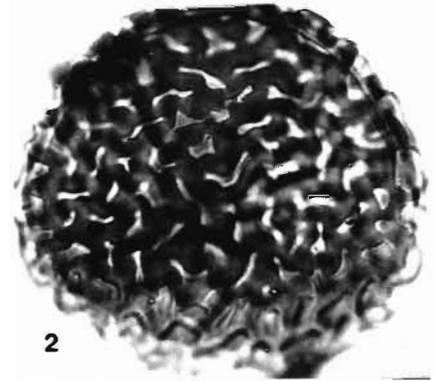
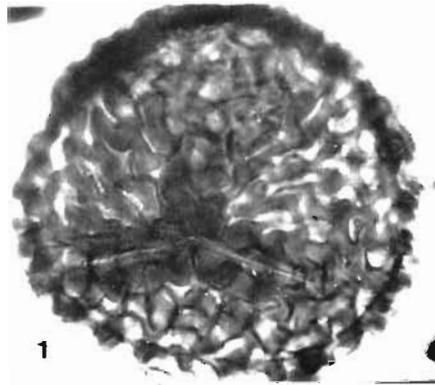


PLATE 1

heavily reticulate type with more or less sinuous muri. *Crassorettriletes* is, however, distinguishable from *Surmaspora* in lacking prominently thick, ribbon-like labra and globular thickenings at the tips of laesural arms.

Comments on botanical affinities—The botanical affinities of *Surmaspora* were considered unknown by the earlier workers (Singh & Rao, 1984; Rao & Rajendran, 1996). However, the overall morphology of the *Surmaspora* spore type clearly indicates that there should be no two opinions regarding its filicinean affiliation. The spores of the modern *Actinopteris australis* of Adiantaceae resemble *Surmaspora* rather strikingly in the possession of thick, ribbon-like labra and dense verrucate sculpture with some of the verrucae coalescing locally (Nayar *et al.*, 1964). The collar-like equatorial ridge (cingulum) in the spores of *A. australis*, however, facilitates easy differentiation of *Actinopteris* from *Surmaspora*.

Similarly, the spores of *Lygodium smithianum* (Nayar *et al.*, 1964) and *L. flexuosum* (Santa Devi, 1977) of Schizaeaceae resemble *Surmaspora* in some important features. Thus *L. smithianum* is comparable to *S. karti* in having conspicuously thick, ribbon-like labra and densely verrucate ornamentation on distal side. The granular proximal surface and the distinct equatorial ridge, however, demarcate the spores of *L. smithianum* from *S. karti*. The spores of *Lygodium flexuosum* resemble *S. karti* in the possession of verrucate sculpture all over, with the neighbouring verrucae coalescing.

The thick ribbon-like labra seen in *S. karti*, however, is not seen in *L. flexuosum* spores.

In view of the impressive similarity with *Crassorettriletes vanraadschovent*, which is affiliated with *Lygodium microphyllum* (Germeraad *et al.*, 1968), we are of the opinion that *Surmaspora* (*S. karti*) is also related to *Lygodium*, probably to some extinct species of the Schizaeaceae.

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