Clavadiporopollenites raneriensis gen. et sp. nov. from the Tertiary sediments of Bikaner District, Rajasthan, India

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Clavadiporopollenites raneriensis gen. et sp. nov. described here is based on the light and scanning electron microscopical observations. This new taxon has been recovered alongwith the typical marker taxa from bore-core no. RGBH-33/14 drilled at Raneri Village in Bikaner District, Rajasthan, India. *Clavadiporopollenites* is characteristically a diporate pollen with a whorl of clava around each pore and microreticulate exine.

Key-words—Palynology, Morphotaxonomy, Palaeocene, Rajasthan (India).

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सारांश

राजस्थान (भारत) में बिकानेर जनपद के तृतीयक अवसादों से *क्लेवाडिपोरोपोलिनाइटिस रनेरियेन्सिस* नव प्रजाति व जाति

कृष्ण अम्बवानी एवं रमा शंकर सिंह

क्लेवाडिपोरोपोलिनाइटिस रनेरियेन्सिस नव प्रजाति व जाति प्रकाश एवं क्रमवीक्षण इलेक्ट्रॉन सूक्ष्मदर्शीय प्रेक्षणों पर आधारित है । अन्य सूचक वर्गकों के साथ मिलने वाला यह नया वर्गक राजस्थान में बिकानेर जनपद में रनेरी गाँव के पास किये गये वेध-छिद्र की आर जी बी एच. 33/14 नामक क्रोड़ से प्राप्त हुआ है। प्रत्येक छिद्र के चारों ओर विद्यमान क्लेवा एवं सूक्ष्मबाह्य-चोल से युक्त यह एक लाक्षणिक द्विछिद्रीय परागकण है।

THE Tertiary palynology of Rajasthan has been worked out by Bose (1949, 1952), Rao and Misra (1949), Rao and Vimal (1950), Jain *et al.* (1973), Sah and Kar (1974), Tripathi (1993) and Kar (1995). However, the palynological investigations carried out by them are preliminary morphotaxonomical observations. Bore core samples at Raneri Village (27° 47' : 72° 40'), Bikaner District, Rajasthan under the Lignite Project, Government of the Rajasthan, have yielded a rich spore-pollen assemblage which is being studied separately for the palynostratigraphical correlations. The samples at the depth 90.20-90.70 m of bore core no. RGBH-33/14 contain the new genus—*Clavadiporopollenites* associated with typical Palaeocene marker taxa, viz., *Lycopodiumsporites palaeocenicus* Dutta & Sah; *Dandotiaspora dilata* Sah, Kar & Singh; *Proxapertites cursus* van Hoeken-Klinkenberg; *Matanomadhiasulcites maximus* (Saxena) Kar, etc. The slides and negatives of the figured specimens have been deposited at the repository of the Birbal Sahni Institute of Palaeobotany, Lucknow, India.

SYSTEMATIC DESCRIPTION

Genus—*Clavadiporopollenites* gen. nov.

Genotype—*Clavadiporopollenites raneriensis* gen. et sp. nov.

Pl. 1, figs 6-8

Generic diagnosis—Pollen grains circular in equatorial plane, concave at poles; 20-25 x 45-55 µm in size, body tyre-shaped excluding apertural projections, diporate, pores opposite to each other (jux-

taposed twin), circular, annulated, surrounded by 3-7 clavae. Exine microreticulate to foveolate having verrucate, gemmate and clavate sculptural elements.

Clavadiporopollenites raneriensis gen. et sp. nov.
Pl. 1, figs 1-13

Specific diagnosis—Pollen grains subcircular, body tyre-shaped excluding apertural projections, 20-25 x 45-55 µm in size; diporate, pores opposite to each other (juxtaposed twin), circular, 22-27 µm wide, sunken, annulated, surrounded by finger-like projections (clavae), 3-7 in number around each pore, arranged in a whorl. Exine microreticulate to foveolate, lumina less than 1 µm wide, muri 1-2 µm thick, muri fused and raised at places forming verrucate, gemmate, clavate sculptural elements. Verrucae and gemmae heads 5-7 µm wide, clavae 12-22 in number, 8-15 µm long, 5-7 µm wide, tips sometimes bifurcated.

Holotype—Pl. 1, figs 6-8; Slide no. BSIP 11527.

Type locality—Bore core no. RGBH-33/14 (depth 90.20 m from ground level), Raneri Village, Bikaner District, Rajasthan, India.

Age—Palaeocene.

Affinity—A perusal of the published literature on the fossil pollen indicates that no fossil pollen hitherto described is comparable with the present new taxon described here. A comprehensive account of diporate pollen grains from the Indian sediments was done by Varma and Rawat (1968). They dealt with 13 species of diporate palynomorphs (some of which seem to be fungal bodies), but none of them indicate morphotaxonomical similarities with the present taxon. Thanikaimoni *et al.* (1984) described a few species of diporate pollen under the genus *Psiladiporites* Varma & Rawat but they are also not comparable with the present pollen. *Retiverrumonosulcites barmerensis* Tripathi 1993, a monosulcate pollen recorded from Palaeocene-Eocene of Rajasthan can be compared with the present diporate pollen in its gross exinal morphology but not in the apertural orientation. In the extant plants diporate pollen are produced both by monocotyledons and dicotyledons but the affinity of these could not be ascertained with *Clavadiporopollenites*.

REMARKS

Wodehouse (1936), Kuprianova (1967), Nair (1967), Sowunmi (1968) and Muller (1970) put forwarded their views on aperture evolution. Muller (1970) proposed pathways for the evolution of different aperture types in angiosperm pollen based mostly on hypothetical presumptions but later studies in this aspect by Thanikaimoni (1970), Walker (1974), Chanda *et al.* (1979), Muller (1981), Friis and Skarby (1982), Basinger and Dilcher (1984), Friis (1985) and Traverse (1988) made his hypothesis more plausible. According to Muller's scheme, the diporate condition in pollen is derived from the monosulcate pollen via disulcate type. Chanda *et al.* (1979) on the basis of polarity and tetrad arrangements in some mono- and diaperturate pollen also concluded that the disulcate condition gives rise to two pores by the reduction of sulcus equatorially. Thus, as per Muller's scheme (on the basis of close similarities of the exinal morphology) *Retiverrumonosulcites barmerensis*, a monosulcate pollen, can be presumed as an ancestral type of diporate *Clavadiporopollenites raneriensis*, linked with pollen type morphologically comparable with above two taxa and having disulcate condition, not known so far. According to Sowunmi (1968) the diporate condition is derived from a monocolpate pollen via a hypothetical pollen having two pores

PLATE 1

Clavadiporopollenites raneriensis gen. et sp. nov.

1, 2. SEM photomicrographs showing gross morphology of pollen. Note the arrangement of sculptural elements around the pores and their distribution on the interapertural area. x 800 & x 750 respectively.
3. Pollen showing reduced numbers of clava around the pore. x 750.
4. Single clavum enlarged to show degradation. x 5000.
5. A part of pollen showing bifurcated clavum around the pore. x 2000.
6-8. Pollen under LM showing exine and pore character under different focii (Note the reticulate, verrucate and clavate nature of exine). x 1000.
9. Pollen under LM showing exine stratification; note the clearly defined exine. x 1000. Slide no. BSIP 11528.
10. SEM photomicrograph showing sunken aperture and sculptural elements. x 1200.
11, 12. SEM photomicrograph showing formation of different sculptural elements (verucae, gemmae and clavae). x 3000.
13. A part of aperture showing annulus. x 5000.

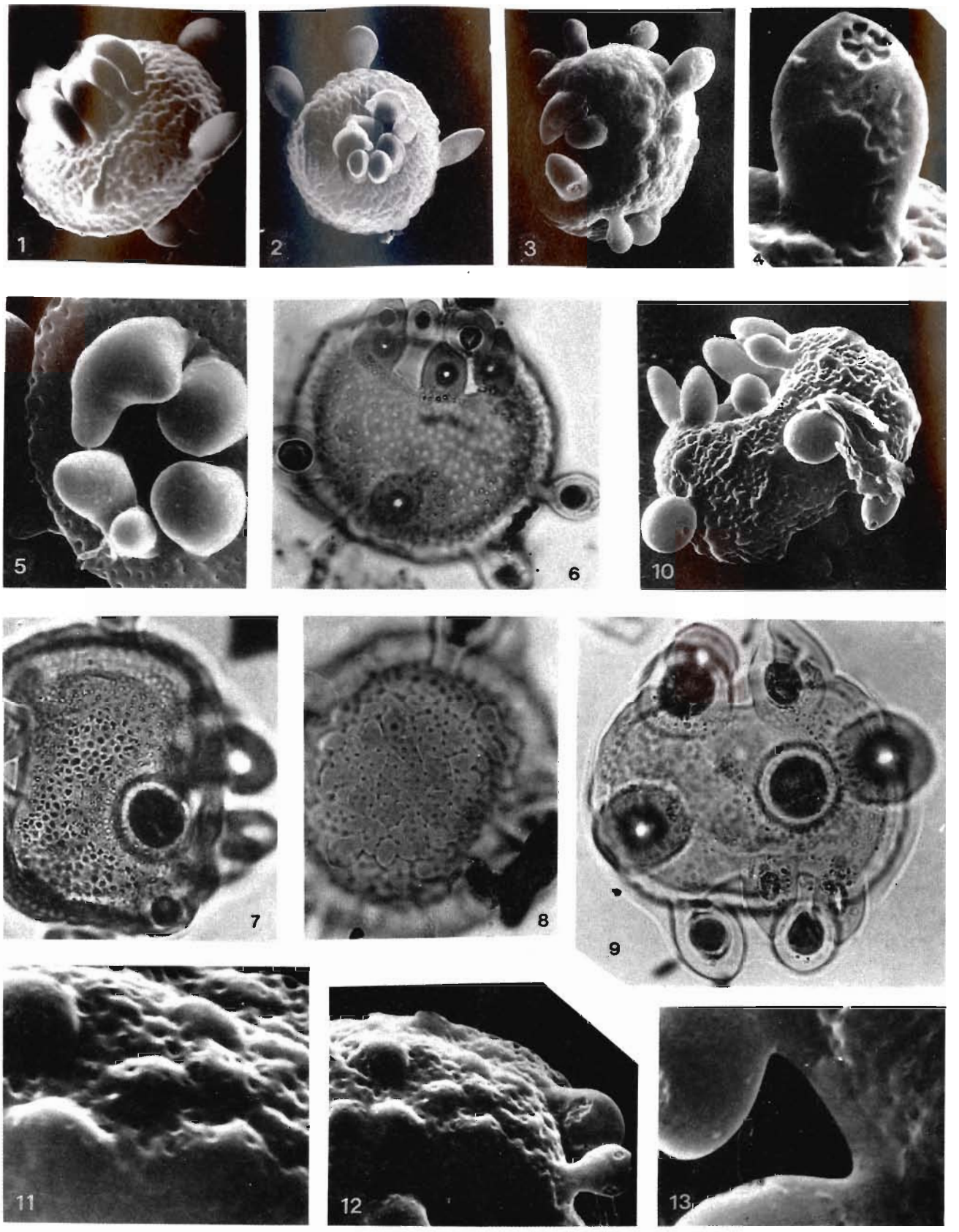

PLATE 1

with a colpoid streak connecting the pores. Such hypothetical pollen have recently been recognised under three genera from the Lower Eocene of Rajasthan (Kar, 1995). Amongst them, only *Piladiporocolpites* Kar shows some exinal similarity with the monosulcate pollen *Retiverrumonosulcites barmerensis* and the diporate pollen *C. raneriensis*, hence may bridge the evolutionary gap.

The affinity of *R. barmerensis* is suggested with Arecaceae by Tripathi (1993), and if it is so, *C. raneriensis* should also belong to the same or its related family. However, the suggested affinity of *R. barmerensis* is based on conjecture, therefore, remains uncertain so is the case with *Piladiporocolpites caratinii* Kar. Amongst the dicots, diporate pollen are produced by the members of Acanthaceae, Apocynaceae, Amaryllidaceae, Moraceae, Ulmaceae and Urticaceae (Wodehouse, 1936; Erdtman, 1969; Bhoj Raj, 1973; Chanda *et al.*, 1979; Muller, 1979, 1981; Scotland, 1991). In monocots diporate pollen are recorded in Haemodoraceae and Arecaceae (Thanikaimoni, 1970; Dahlgren & Clifford, 1982) but neither in monocots nor in the dicots the pollen recorded so far possess finger-like sculptural elements around the pores so unique to *Clavadiporopollenites raneriensis*. In extant plants, pollen with sculpture around the apertures are recorded in the members of Acanthaceae, viz., *Bravasia berlandieriana* (Nees) Daniel and *Petalidium glandulosum* Moore but the pollen in the former species are characterised by having pseudocolpi and that of latter species are triaperturate. Functionally, such sculptural elements around the pores of *Clavadiporopollenites raneriensis* suggest to act in volume change accommodations of the pollen (Harmomegathy) for opening and closing of apertures in response to humidity fluctuation.

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