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POLLEN GRAINS OF *CTENOLOPHONIDITES* FROM THE NEYVELI LIGNITES OF SOUTH INDIA

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ABSTRACT

Two species of *Ctenolophonidites*, *C. costatus* van Hoeken-Klinkenberg (1966) and *C. neyveliensis* sp. nov., have been described from the Neyveli lignites of South India. The latter is distinct from all the earlier described species.

Key-words — Pollen grains, *Ctenolophonidites*, Neyveli lignites, Miocene (India).

सारांश

दक्षिण भारत की निवेली लिग्नाइट से प्राप्त टीनोलोफोनिडाइटिस के परागकण – कृष्ण अम्बवानी, मोहन बलवंत बाँडे एवं उत्तम प्रकाश

दक्षिण भारत की निवेली लिग्नाइट से एकत्रित टीनोलोफोनिडाइटिस की दो जातियाँ, टी० कॉस्टेटस वान् होयकन क्लिंकनबर्ग (1966) तथा टी० निवेलेन्सिस न० जा० वर्णित की गई हैं। पूर्व वर्णित जातियों से यह बाद वाली जाति भिन्न हैं।

INTRODUCTION

FOSSIL pollen grains showing affinities with the living genus *Ctenolophon* of the family Ctenolophonaceae described under the generic name *Ctenolophonidites* van Hoeken-Klinkenberg (1966) have so far been recorded from the Upper Cretaceous and Tertiary of Nigeria in West Africa (van Hoeken-Klinkenberg, 1964, 1966), Palaeocene of Venezuela, Columbia and the Caribbean (Kuyl *et al.*, 1955; Germeraad *et al.*, 1968). Similar grains under the name *Retistephanocolpites williamsi* have also been recorded from the Palaeocene of Nigeria and the Neogene of Borneo (Germeraad *et al.*, 1968). From India also similar grains were described as *Hexacolpites* and *Septacolpites* from the Warkalli lignites by Rao and Vimal (1952) and Vimal (1953). Erdtman (1956) suggested the affinities of these Warkalli pollen grains with the genus *Ctenolophon*. Ramanujam and Rao (1973) and Navale and Misra (1979) described five species of *Ctenolophonidites* as *C. costatus*, *C. keralensis*, *C. erdtmanii*, *C. saadii* and *C. stellatus* from the Warkalli and Neyveli lignites.

In this paper the two species of *Ctenolophonidites*, viz., *C. costatus* van Hoeken-Klinkenberg (1966) and *C. neyveliensis* sp. nov., have been described from the lignite deposits of Neyveli in South Arcot District of Tamil Nadu.

In the modern flora, the genus *Ctenolophon* is represented by two species, *Ctenolophon engleri* in tropical West Africa and *Ctenolophon parvifolius* in Indo-Malaysian region. The pollen grains of *Ctenolophonidites costatus* and *C. neyveliensis* which are described here from the Neyveli lignites of South India appear to be closely comparable to the pollen grains of the modern species, *Ctenolophon engleri*. This indicates that *Ctenolophon engleri* which is presently restricted to Nigeria and Angola was once widely represented by plants showing closely related pollen grains in South and Central America, Nigeria and South India (van Hoeken-Klinkenberg, 1964, 1966; Kuyl *et al.*, 1955; Germeraad *et al.*, 1968; Ramanujam & Rao, 1973). In India, it is known during the Mio-Pliocene times from the Warkalli deposits and the Neyveli lignites of Kerala and Tamil Nadu respectively. It,

TABLE 1 — SHOWING CHARACTERS OF KNOWN SPECIES OF *CTENOLOPHONIDITES* VAN HOEKEN-KLINKENBERG

Species	Shape (Polar view)	Size (Diameter)	Symmetry	No. of colpi	Apocolpial ring	Radial costa	Additional endexinous thickenings inside apocolpial ring	Nature of unthickened wall	Any special feature
Ctenolophonidites costatus van Hoeken-Klinkenberg	Spherical to stellate	35-55 μm	Radially symmetrical	6-8	Present	One in each mesocolpium	Present	Smooth or minutely punctate	—
C. keralensis Ramanujam & Rao	Stellate	47-66 μm	Radially symmetrical	7-8	Present	2-4 in each mesocolpium	Present	Smooth	—
C. saadii Ramanujam & Rao	Stellate to rounded	31-50 μm	Radially symmetrical	5-7	Present	Two in each mesocolpium	Present	Minutely granulose	—
C. erdtmanii Ramanujam & Rao	Rounded	40-50 μm	Radially symmetrical	7	Present	More than one radial costae often in some mesocolpi	Present	Finely granular	—
C. lisamae Germeraad *et al.*	Stellate to circular	17-31 μm	Radially symmetrical	5	—	Two in each mesocolpium	—	Scabrate	—
C. stellatus Navale & Misra	Stellate	42-57 μm	Radially symmetrical	9	Present	One in each mesocolpium	Present	Smooth or minutely punctate	—
C. neyveliensis sp. nov.	Stellate	33-35 μm	Radially symmetrical	8-9	Present	One in each mesocolpium	—	Profusely granulose grana ± 1·1.5 μm in diameter	Radial costae arrow-head-shaped. The area between radial costa and outer margin of mescolpium lamellate.

however, became extinct from the Indian subcontinent as well as from South and Central America and remained restricted to Africa.

Ctenolophonidites van Hoeken-Klinkenberg, 1966

Ctenolophonidites costatus van Hoeken-Klinkenberg, 1966

Pl. 1, figs 4-6; Text-fig. 2

Description— Pollen grains stellate, spherical in polar view, 35-37 μ in diameter, radially symmetrical, 6-8 colpate, isopolar; colpi 15-17 μ long with increasate margins; one conspicuous ring of endexinous thickening present around apocolpium of each hemisphere; single radial costa present in each mesocolpium, each costa about 3 μ thick; additional irregular endexinous thickenings present inside the apocolpial ring; unthickened area of the pollen grains profusely punctate, size of the puncta varies from 0·5-1·5 μ.

Comments — The pollen grains are comparable with those of *Ctenolophonidites costatus* described earlier by van Hoeken-Klinkenberg (1966), Germeraad *et al.* (1968) and Ramanujam and Rao (1973) except for the minor variations in the size of the colpi and the puncta.

Ctenolophonidites neyveliensis sp. nov.

Pl. 1, figs 1-3; Text-fig. 1

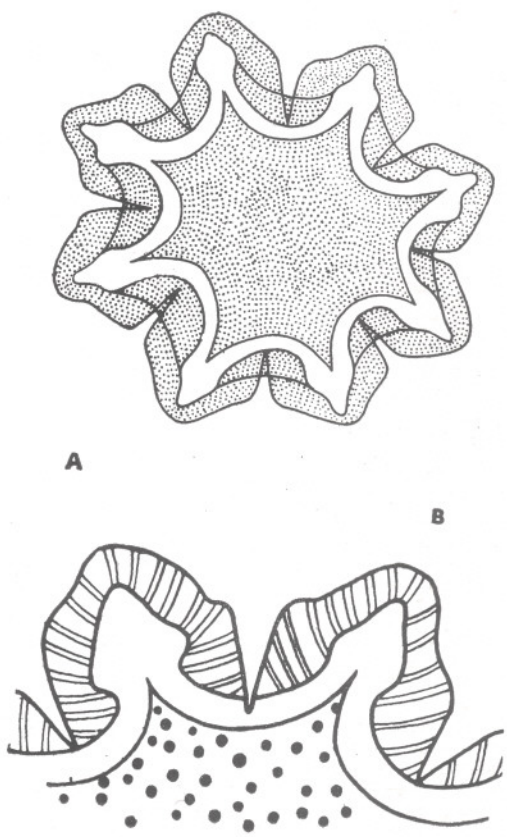
Diagnosis — Pollen grains stellate, spherical in polar view, 33-35 μ in diameter, radially symmetrical, 8-9 colpate, isopolar; colpi 5·0×1·5 μ, tenuimarginate; one conspicuous ring of endexinous thickening present around apocolpium of each hemisphere; radial costa arrow-head-shaped present in each mesocolpium, about 5 μ thick; area between radial costa and outer margin of mesocolpium lamellate; unthickened wall of the pollen grain profusely granulose, grana ± 1·0-1·5 μ in diameter.

Holotype — B.S.I.P., slide no. 5894/8.

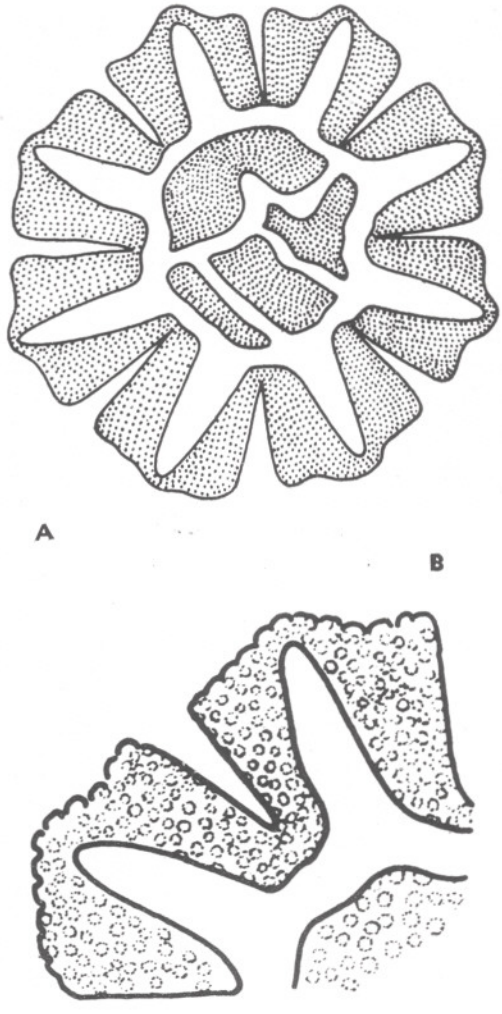
Locality — Neyveli, South Arcot District, Tamil Nadu.

Age — Miocene.

Description— Pollen grains stellate, spherical in polar view, 33-35 μ in polar diameter, radially symmetrical, isopolar, 8-9 colpate, colpi 5·0×1·5 μ in size with acute ends in polar view, tenuimarginate. Only one conspicuous ring of endexinous thickening is present around apocolpium of each hemisphere. Each mesocolpium is marked by a conspicuous arrow-head-shaped endexinous thickening in the form of radial costa. The number of radial costae corresponds with the number of colpi in the pollen grain. Each radial costa measures about 5 μ in thickness in polar view. It extends laterally in the form of a semilunar arch which joins with similar arch of the adjacent costa to form a continuous ring encircling apocolpium in both the hemispheres. The area between each radial costa and the outer margin of mesocolpium shows lamellate structures. The lamellae are 1·5-2·0 μ in length in polar view. The unthickened wall of the pollen grain inside the apocolpial ring is profusely granulose, the grana



TEXT-FIG. 1 — **A.** *Ctenolophonidites neyveliensis* sp. nov. — polar view × 1500. **B.** A part of the same magnified to show lamellae, radial costae and grana × 4000.



TEXT-FIG. 2 — **A.** *Ctenolophonidites costatus* van Hoeken-Klinkenberg — polar view × 2500. **B.** A part of the same magnified to show prominent radial costae and puncta × 4000

measuring about 1·0-1·5 μ in diameter. The density of the grana increases from periphery towards the centre of the pollen grain.

Discussion— The morphological characters of the pollen grain indicate that it belongs to the genus *Ctenolophonidites* van Hoeken-Klinkenberg (1966) instituted to include the pollen grains showing affinities to those of *Ctenolophon*. Six species of *Ctenolophonidites* viz., *C. erdtmanii*, *C. keralensis*, *C. saadii*, *C. costatus*, *C. stellatus* and *C. lisamae* have so far been described, from India and abroad (van Hoeken-Klinkenberg, 1966; Germeraad *et al.*, 1968; Ramanujam & Rao, 1973; Navale & Misra, 1979).

Morphological characters of all these species have been summarised in Table 1. It is obvious from the table that the pollen grains from Neyveli differ from all these species in the possession of characteristic lamellate structures in the area between radial costa and the outer margin of each mesocolpium. Such lamellae have been observed for the first time in the pollen grains of *Ctenolophonidites*. Moreover, the grains of the present species also differ from other species in having its unthickened wall profusely granulose with slightly bigger grana 1·0-1·5 μ in diameter. The unthickened wall of the pollen grains in rest of the species is either minutely punctate, smooth or minutely or finely granulose. Lastly, the radial costae in the pollen grains from Neyveli are arrow-head-shaped, a character not known in any other species of *Ctenolophonidites* described so far.

As the pollen grains described above differ from all the earlier known species of *Ctenolophonidites*, these have been placed under a new species, *C. neyveliensis* indicating its presence in the Neyveli lignites of India.

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EXPLANATION OF PLATE

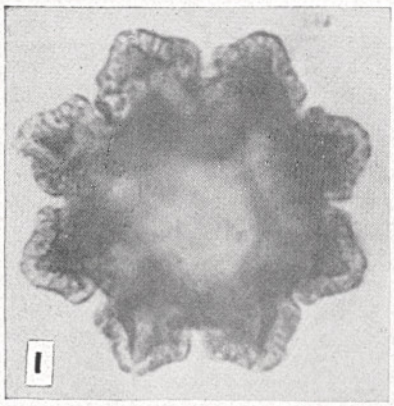
PLATE 1

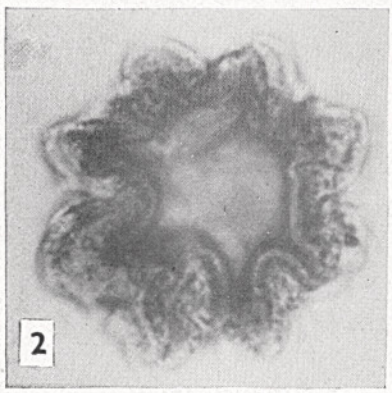
Ctenolophonidites neyveliensis sp. nov

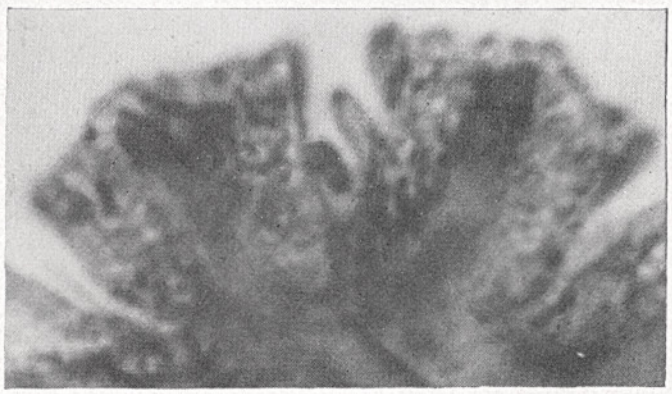
1. Pollen grain in polar view. × 1500, slide no. 5894/8.
2. Pollen grain in polar view showing apocolpial ring. × 1500, slide no. 5894/8.
3. A part of the grain magnified to show lamellae and radial costae. × 3500, slide no. 5894/8.

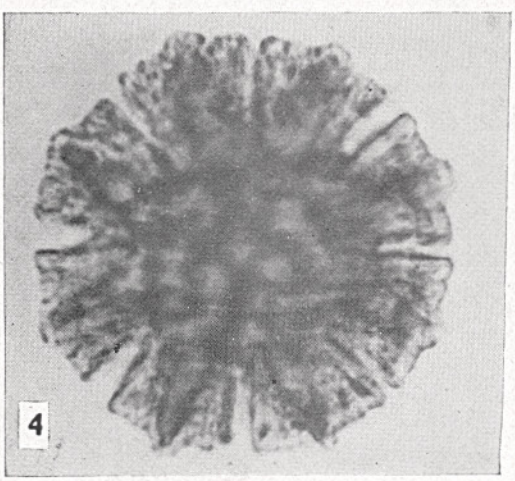
Ctenolophonidites costatus van Hoeken-Klinkenberg

4. Pollen grain in polar view. × 1500, slide no. 5895/13.
5. Pollen grain in polar view showing apocolpial ring with additional apocolpial thickenings and radial costae. × 1500, slide no. 5895/13.
6. A part of the grain magnified to show prominent radial costae and the puncta. × 3500, slide no. 5895/13.









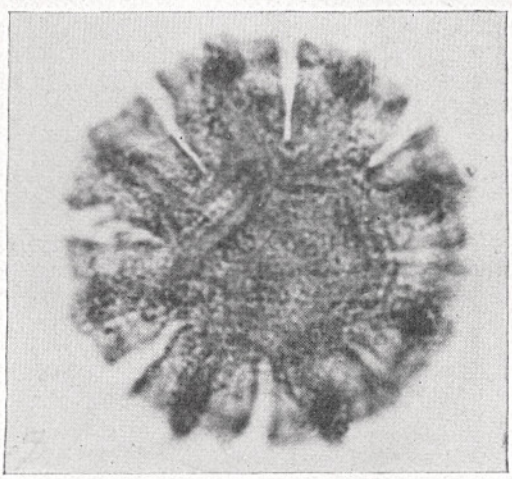


PLATE 1