Fungal remains from Tertiary sediments of Kerala Basin, India

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Fungal remains recovered from Arthungal, Kalarakod and Nirkunnam bore-holes of Alleppey District and Meenkunnu and adjoining areas of Cannanore District, Kerala consist of 13 genera and 17 species. Of these, 6 genera and 7 species belong to microthyriaceous fungi and 7 genera and 10 species pertain to fungal spores. The important taxa are: *Parmathyrites, Kutchiathyrites, Lirasporis, Foveoletisporonites* and *Palaeocirrenalia.* The age of the sediments is assigned to Eocene- Lower Miocene.

Key-Words- Fungi, Tertiary, Kerala Basin, India.

INTRODUCTION

THE Tertiary sequence of Arthungal, Kalarakod and Nirkunnam, Alleppey District, and Meenkunnu and adjoining areas of Cannanore District, Kerala consists of ferruginous sandstones with clayey intercalations, predominant clay with sandy intercalations, ball clay and lignite. The studied sediments of these areas yielded a good number of spore-pollen, fungal remains and dinoflagellate cysts. The detailed morphological study of spore-pollen and data interpretation have been submitted for publication (Rao, 1990; Rao, 1995; Rao & Rajendran, in press).

The fungal remains from the Tertiary sediments of Kerala Basin have been recorded earlier by Jain and Gupta (1970), Ramanujam and Rao (1978), Jain and Kar (1979), Ramanujam and Srisailam (1980), Varma and Patil (1985), and Patil and Ramanujam (1988). A good number of fungal bodies and spore types recovered for the first time from the above bore hole and out crop sediments, their relevance to palaeoenvironmental considerations and age is discussed. The slides and negatives are deposited at the museum of Birbal Sahni Institute of Palaeobotany, Lucknow.

List of Fungal remains

(Taxa with an asterisk (*) mark have either been described or commented on in the text.

Fungal fruiting bodies

Phragmothyrites eocaenica Edwards 1922, emend. Kar & Saxena 1976 (Pl.1,fig.1).

Notothyrites setiferus Cookson 1947

Paramicrothallites menonii Jain & Gupta 1970 (Pl. 1, fig. 2)

Parmathyrites indicus Jain & Kar 1970 (Pl. 1, fig. 3)

**P. ramanujamii* Singh, Saxena & Rao 1986 (Pl. 1, fig. 9)

Kutchiathyrites eccentricus Kar 1979

Lirasporis intergranifer Potonie & Sah 1960 emend. Jain & Kar 1979

Fungal spores

Inapertisporites kedvesii Elsik 1968 (Pl. 1, fig. 7)

**Inapertisporites* sp. 1 (PL. 1, fig. 6)

**Inapertisporites* sp.2 (Pl. 1, fig. 8)

Monoporisporites sp.

Diporisporites sp.

* *Dyadosporonites* sp. (Pl. 1, fig. 4)

Foveoletisporonites miocenicus (Pl. 1, fig. 11)

F. indicus (Pl. 1, fig. 5)

Palaeocirrenalia elegans Ramanujam & Srisailam 1980.

**Frasnacritetrus* sp. (Pl.1, fig.10).

DESCRIPTION

Genus - *Parmathyrites* Jain & Gupta 1970

Type species- Parmathyrites indicus Jain & Gupta 1970.

Parmathyrites ramanujamii Singh, Saxena & Rao (1986) Pl, 1, fig.9.

Remarks- Parmathyrites ramanujamii Singh, Saxena & Rao (1986) recovered from the sediments of Kalarakod bore-hole, Alleppey District, Kerala are bigger in size (105) µm and possess longer processes (30µm).

Genus - *Inapertisporites* van der Hammen 1954, emend Sheffy & Dilcher 1971.

Type species- Inapertisporites pseudoreticulatus Rouse 1959.

***Inapertisporites* sp. 1**

Pl.1, fig.6

Description- Fungal spore oval in shape. Size 66x55 µm. Unicellate. Inaperturate. Spore Wall 0.5 µm thick, body wall scabrate, irregularly folded.

***Inapertisporites* sp.2**

Pl.1, fig.8

Description- Fungal spore capsular in shape, Size 181 x 67 µm. Unicellate, Spore wall 2 µm thick, laevigate.

Remarks - Inapertisporites sp.2 is distinguished from all known species of *Inapertisporites* by its bigger size.

Genus- *Dyadosporonites* Elsik, 1968.

Type species - Dyadosporonites schwabii Elsik 1968.

***Dyadosporonites* sp.**

Pl.1., fig.4

Description - Fungal spore fusiform in shape. Size 87x33 µm. Dicellate, both cells equal in size and shape. Diporate, pore margin thin. Uniseptate, septa 2 um thick, complete. Spore wall less than 1 µm thick, laevigate.

Remarks- Dyadosporonites schwabii Elsik (1968) is distinct from *Dyadosporonites* sp. by having two layered spore-wall and smaller size (9x20µm).

Genus-*Frasnacritetrus* Taugourdeau 1969, emend, Saxena & Sarkar 1985.

Type species- Frasnacritetrus josettee Taugourdeau emend. Saxena & Sarkar 1985.

***Frasnacritetrus* sp.**

Pl. 1, fig. 10

Description- Main body of spore quadrangular, longer than wide. Size 20x13 µm. Longitudinally divided into 4 chambers. 4 multicellular hyphae arise from main body, hyphae wider at the base and tapering towards apices, twisted spore wall, 0.5 µm thick, laevigate.

Remarks- Frasnacritetrus josettee is distinct from the present species by its verrucate body wall.

DISCUSSION

The present assemblage of fungal remains recovered from Arthungal, Kalarakod and Nirkunnam bore-holes and Meenkunnu and adjoining areas of Cannanore district, Kerala is represented by 13 genera and 18 species. Out of these, 6 genera and 7 species belong to microthyriaceous fungi and 7 genera and 10 species belong to fungal spores. The fungal spores mostly belong to dematiaceous hyphomycetes and ascospore types.

The occurrence of epiphyllous microthyriaceous fruiting bodies and fungal spores in the bore-holes and Meenkunnu and adjoining areas is suggestive of warm and humid climatic conditions during their deposition in the sediments. This view is also supported by the presence of pteridophytic spores (*Lygodiumsporites, Striatriletes, Osmundacidites,* and *Polypodiaceaesporites).*

The genus *Palaeocirrenalia* resembling modern *Cirrenalia* indicates brackish water to marine conditions (Ellis, 1976). The dinoflagellate cysts such as *Achmosphaera, Spiniferites, Homotryblium* and *Thallasiphora* which have also been recovered in this assemblage support the above contention.

On the basis of morphotaxonomy of spore-pollen from various bore-holes and outcrops in Kerala Basin, the author recognised Eocene to Lower Miocene age to the bore-holes and Lower to Middle Miocene age to the outcrops. The fungal remains *viz., Phragmothyrites, Notothyrites, Kutchiathyrites, Parmathyrites, Inapertisporites, Monoporisporites, Dyadosporonites* and *Frasnacritetrus* have been recorded in both the bore-holes and the outcrops. However, the genera, viz, *Paramicrothallites, Lirasporis, Foveoletisporonites* and *Palaeocirrenalia,* have been recorded only in the upper part of the bore-holes and outcrop sediments. These sporomorphs are usually found along with the Miocene elements viz., *Malvacearumpollis, Compositoipollenites, Chenopodipollis* and *Quilonipollenites.*

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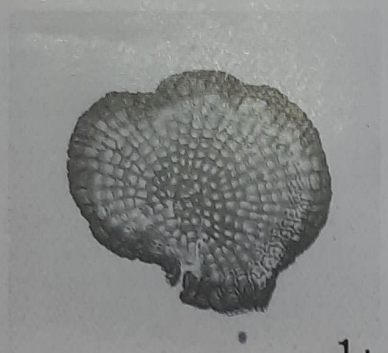

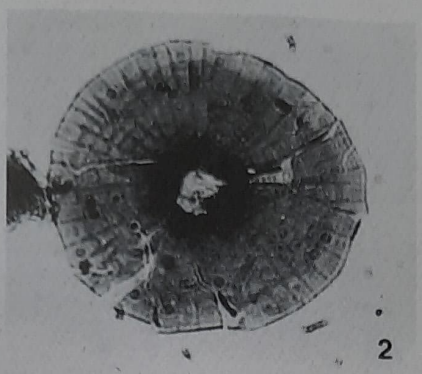

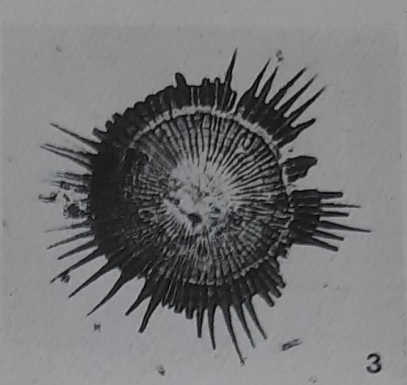

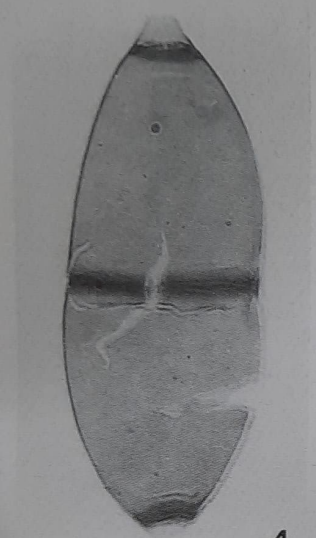

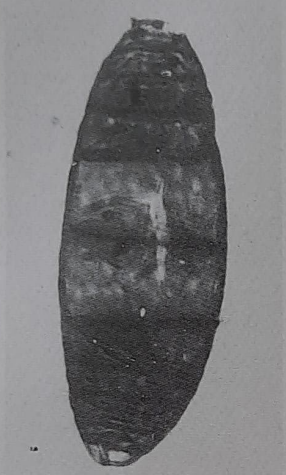

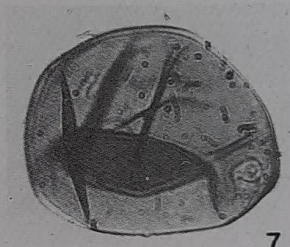

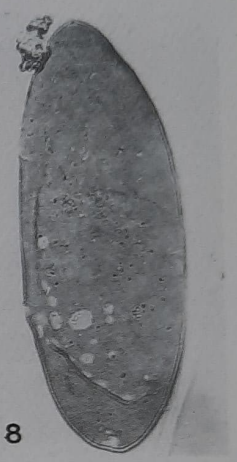

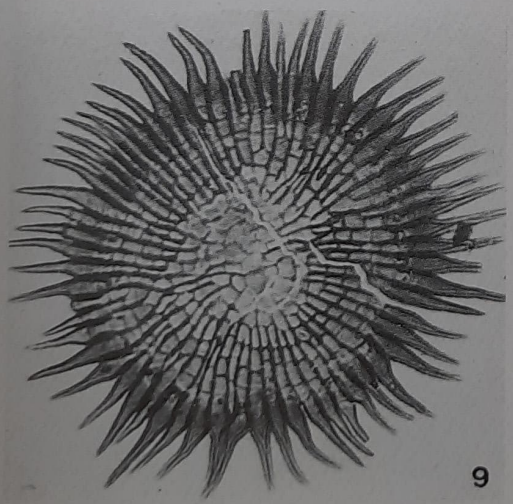

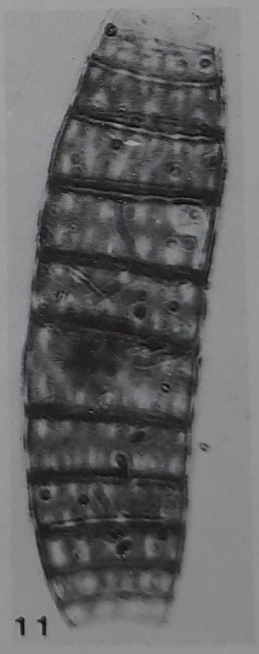

Plate 1

(All photomicrographs are enlarged *ca x 500.*, Coordinates of specimens refer to Olympus microscope no. 217267, BH 2.

1. *Phragmothyrites eocaenica.* Slide no. BSIP 11118; coordinates 10.1 x 168.0.
2. *Paramicrothallites menonii.* Slide no. BSIP 11119; coordinates, 4.5 x 162.6.
3. *Parmathyrites indicus.* Slide no. BSIP 11120; coordinates, 22.3 x 140.5.
4. *Dyadosporonites* sp. Slide no. BSIP 11125; coordinates, 20.0 x 142.5 (x750).
5. *Foveoletisporonites indicus.* Slide no. BSIP 11121; coordinates, 19.0 x 167.1.
6. *Inapertisporites* sp.1. Slide no. BSIP 11122; coordinates 6.5 x 151.0.
7. *Inapertisporites kedvesii.* Slide no. BSIP 11123; coordinates, 21.5 x 130.5
8. *Inapertisporites* sp. 2. Slide no. BSIP 10847; coordinates 16.0 x 136.0 (x750).
9. *Parmathyrites ramanujamii.* Slide no. BSIP 10857; coordinates, 12.0x 167.0.
10. *Frasnacritetrus* sp. Slide no. BSIP. 11124; coordinates, 18.5 x 161.4.
11. *Foveoletisporonites miocenicus.* Slide no. BSIP 11121; coordinatees, 5.0 x 136.0.