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Lithomucorites tripuraensis sp. nov. (Mucorales) from the Bhuban Formation (Early Miocene) of Maharanicherra, Tripura, India

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ABSTRACT

Mandaokar B. D. & Saxena R. K. 2014. *Lithomucorites tripuraensis* sp. nov. (Mucorales) from the Bhuban Formation (Early Miocene) of Maharanicherra, Tripura, India. Geophytology 44(1): 25-29.

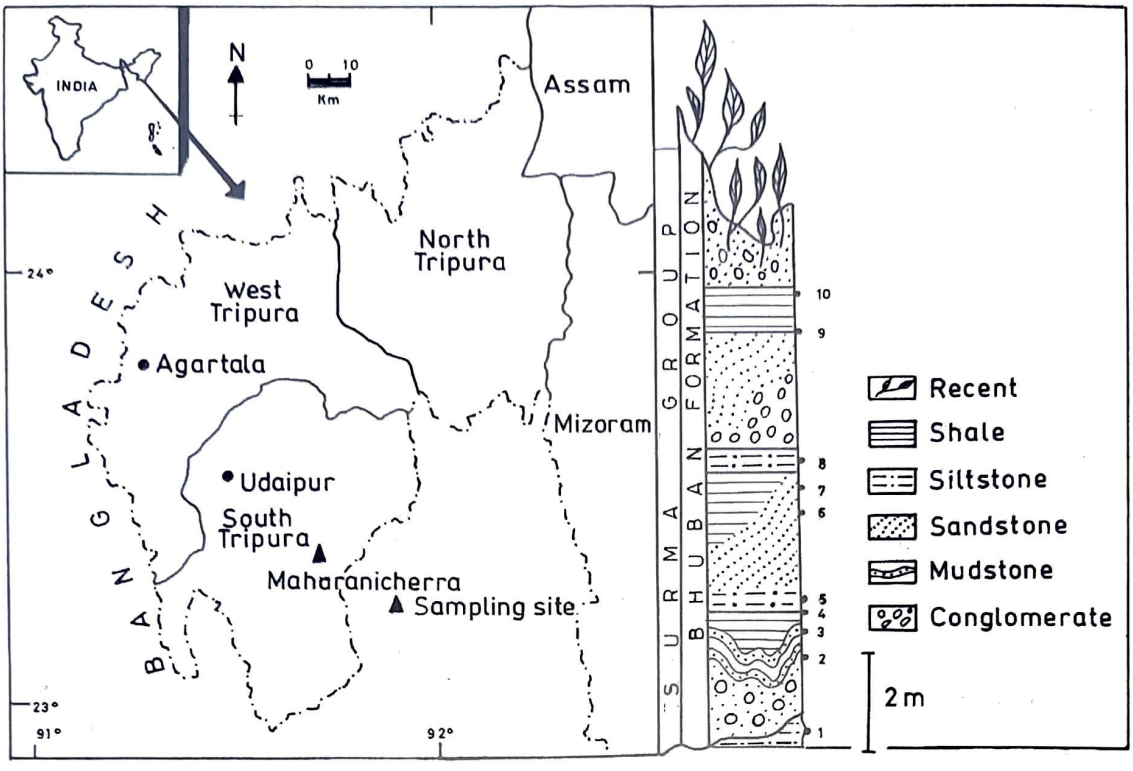
A new species of *Lithomucorites* Kar et al. (*L. tripuraensis* sp. nov.) has been described from the Bhuban Formation (Early Miocene) of Maharanicherra, Tripura. Different phases of its life cycle are examined. The hyphae, auxiliary cells, chlamydospores and zygospores develop within a zygosporangium formed after the fusion of two gametangia. Accessory multiplication is by non-motile spores developed within sporangium. Usually, the sporangium contains large number of spores. The recovery of fungal remains suggests that the region experienced a humid tropical climate during the course of sedimentation with thick vegetation providing suitable substrates for the growth and proliferation of fungi.

Key-words: Fungal remains, Mucorales, *Lithomucorites tripuraensis* sp. nov., life cycle, Bhuban Formation, Early Miocene, Maharanicherra, Tripura, India.

INTRODUCTION

The occurrence of fungal remains in sedimentary deposits provides reliable information in order to unravel the depositional environment of the sediments, nature of substrata, and the host plants upon which the fungi flourished prior to getting buried in the sedimentary deposits as well as their habits and local habitats during the past. During last seven decades, considerable information on Indian Tertiary fungi has been published (Saxena & Tripathi 2011). Studies on the fungal remains from the Tertiary sediments of north-eastern India have been carried out by Kar et al. (1972), Jain and Dutta (1978), Mehrotra (1983), Hait & Banerjee (1994), Kar et al. (2005, 2006, 2010). These studies provide an insight into palaeoclimatic trends in different sedimentary basins during the Tertiary and help to ascertain the relationship with host plants which fungi lived on. In view of this, the life cycle of Mucorales has been studied, for the first time.

The palynology of the Miocene sediments in Tripura has been investigated by Kar (1990). However, saprophytic fungi and their life cycle from these sediments have not been reported so far. The samples are rich in fungal remains, pteridophytic spores and pollen of gymnosperms and angiosperms. The presence of *Abiespollenites, Alsophilidites, Bombacacidites, Cedrus, Dictyophyllidites, Gleicheniidites, Hammenisporis,*



Text-figure 1. Locality and litholog from where samples were collected.

Hibisceaepollenites, Malvacearumpollis, Piceaepollenites, Pinuspollenites, Podocarpidites, Polyadopollenites, Pteridacidites and *Retitrescolpites* in the samples indicates Miocene age. The fungal remains are about 25% of the total assemblage and consist of fragments of hyphae, spores and other forms such as *Arthrocladiella, Erysiphe, Multicellaesporites, Pleochaeta, Phragmothyrites, Uncinula,* etc.

The Bhuban Formation in Tripura is more than 1000 m thick and consists of indurated sandstone with grey to olive clay rocks, generally earthy grey in colour. The variation in colour, e.g. yellow and brown cream, may also be found at some places. It is predominantly arenaceous containing fine-grained, compact, well bedded sandstones in eastern and central part. In addition, there are current bedded sand lenses, dark olive shale, sandy shale/ mudstone, siltstone occurring repeatedly.

MATERIAL AND METHOD

The fungal hyphae, auxiliary cells, chlamydospores, ascospores, amerospores and dictyospores were recovered from the Bhuban formation (Early Miocene) exposed along a road cutting near Maharanicherra (Latitude 23°15′N; Longitude 91°28′E), about 45 km south-east of Amarpur in South Tripura District, Tripura. The samples were macerated with commercial nitric acid (40%) followed by a wash with potassium hydroxide solution (5%). Slides were prepared in polyvinyl alcohol and mounted in canada balsam. The sample horizons, lithological details and position of the productive samples have been shown in Text-figure 1.

DESCRIPTION

Genus: *Lithomucorites* Kar et al. 2010

Type species: *Lithomucorites miocenicus* Kar et al. 2010

***Lithomucorites tripuraensis* Mandaokar & Saxena, sp. nov.**

Plate 1, figures 1-9

MycoBank no: MB 808498.

Holotype: Plate 1, figure 1, BSIP slide no.14985, Birbal Sahni Institute of Palaeobotany, Lucknow.

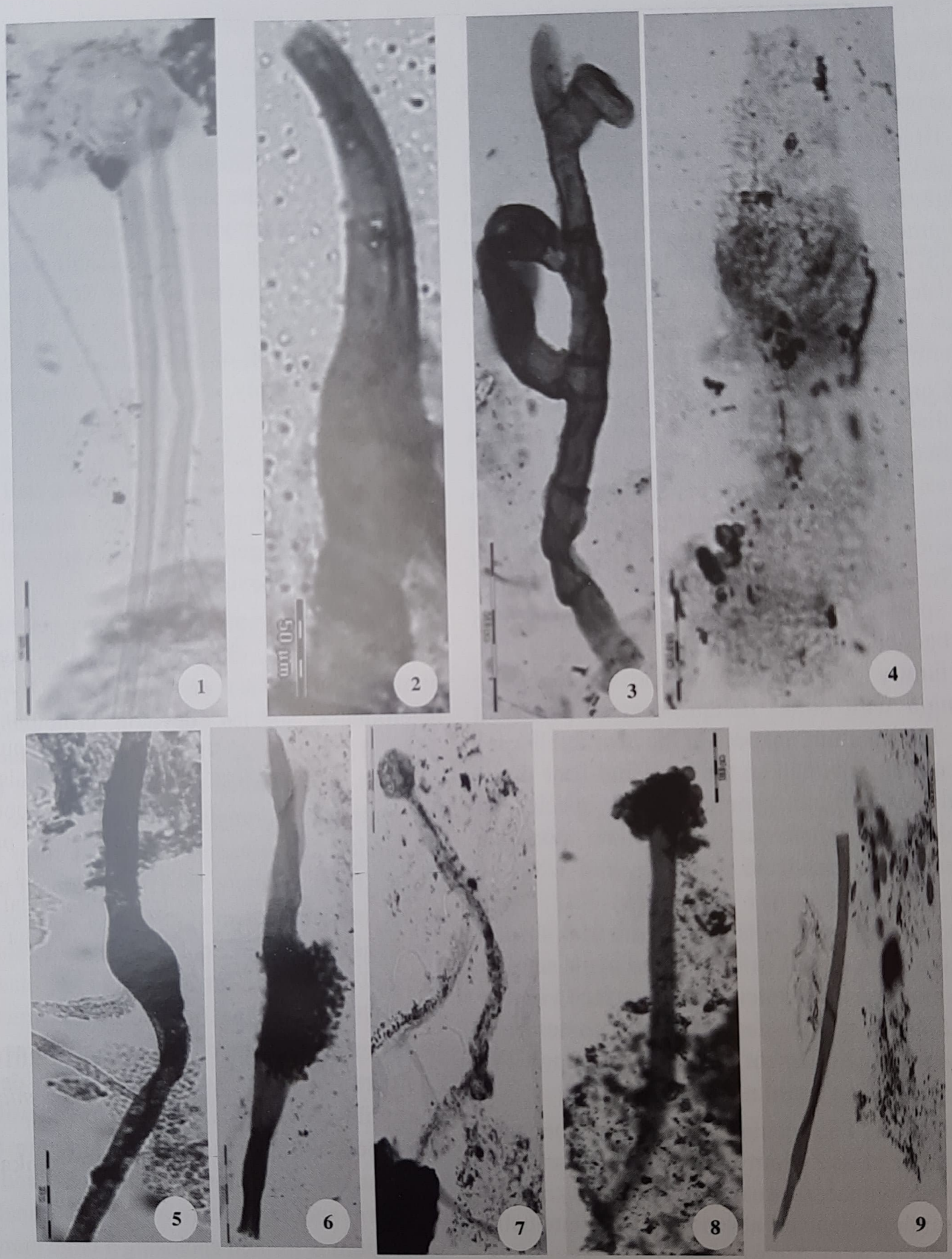


Plate 1

1-9. *Lithomucorites tripuraensis* sp. nov. 1. *Lithomucorites tripuraensis* sp. nov. Slide no. BSIP/14985. 2. Connecting reproductive mating hyphae. Slide no. BSIP/14986. 3. Protogametangial contacts. Slide no. BSIP/14987. 4. Formation and fusion of gametangia. Slide no. BSIP/14988. 5. Occurrence of protozygosporangium. Slide no. BSIP/14986. 6. Formation of zygosporangium with suspensor hyphae. Slide no. BSIP/14989. 7. Production of germsporangia. Slide no. BSIP/14990. 8. Dehiscence of zygospores. Slide no. BSIP/14991. 9. Burst sporangiophore with disperse spores. Slide no. BSIP/14990.

Type locality: Maharanicherra, South Tripura District, Tripura, India.

Horizon and age: Bhuban Formation, Early Miocene,

Diagnosis: Sporangiophore apophysate, flask shaped, circular to subcircular in shape with serrate margin due to heavy ornamentation, 6.5–12.2 μm in diameter. Sporangia globose, brownish yellow 28–35 x 30–45 μm, sporangial wall smooth, incrusted, fragile, persistent at the base, hyaline, larger ones deliquescent, 35–42 μm in diameter, sometimes filled with brownish contents.

Comparison: Dicranophoraceae and Absidiaceae have apophysate type of sporangia and thus resemble the fossil species. In the present species, the sporangial wall generally dissolve with maturity and when persistent lack the sculptural elements. The *Dicranophora, Sporodiniella* and *Syzygites* of the Dicranophoraceae produce large sporangia and are mostly ornamented with pila, bacula and spines (Ekpo & Young 1979). The family Absidiaceae produces apophysate sporangia with either deliquescent or persistent walls. The sporangiophores in the Mortierellaceae are generally swollen at the base and bear dome shaped columellate sporangia. All species of Pilobolaceae produce dark columellate sporangia with persistent cutinized walls covered with the crystals. *Lithomucorites miocenicus* Kar et al. (2010) is comparable in its apophysate flask shaped sporangia but it can be differentiated by its smaller in size and negative reticulum on surface view. It seems that the species described here comes very close to the members of this family though the generic affiliation could not be ascertained.

Remarks: The species referred here seems to belong to the class Zygomycetes for the presence of coenocytic hyphae, asexual reproduction by means of sporangiophores and absence of flagellate cells (Alexopoulos et al. 1996). Numerous zygospores are formed in decaying organic matter or dung close to the substratum.

DISCUSSION

Mucor is essentially a saprophytic fungus growing on dead and decaying organic matter. It is reddish, dark brown, cottony bunch with long, stout, creeping-runner like hyphae that spread horizontally on the substratum. The hyphae also enter the substratum and form the absorptive system. Vertically erect sporangiophores arise from the aerial hyphae, each of which develops a terminal sporangium (Plate 1, figure 1). The young sporangium is full of nutrients and has numerous nuclei. At maturity, a columella develops in the centre of the sporangium and the dense contents of the remaining portion form a large number of spores by cleavaging that have a dark wall and are usually ovoid to elliptical in shape. On germination, spores develop a germ tube which again gives rise to new hyphae asexually.

For sexual reproduction, two neighbouring hyphal branches, either of the same hyphae in homothallic species or of different hyphae in heterothallic species, develop protogametangia (Plate 1, figures 2, 3). These protogametangial contacts are delimited and fused together to form the protozygosporangium (Plate 1, figure 4) and are subjected to nuclear fusion to form diploid nuclei (Plate 1, figure 5). The remaining unfused nuclei probably disintegrated. In the meantime, the zygosporangium enlarges considerably and its wall thickens, surface becomes black and warty (Plate 1, figure 6). The heavy structure in the zygosporangium contains zygospores (Plate 1, figure 7). The zygospore further develops a multilayered, thick, dark brown wall and undergoes resting period (Plate 1, figure 8). On germination, the outer wall ruptures and on a long germ sporangiophore a single terminal germ sporangium is formed enclosing a large number of spores (Plate 1, figure 9). These spores germinate and give rise to the new hyphae.

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