



Figures 1-4 *Achaetomium thermophilum* sp. nov. 1. A ruptured ascocarp releasing ascospores, $\times 140$. 2. Young clavate asci in fascicle, $\times 585$. 3. A mature acus, $\times 968$. 4. Ascospores showing two distinct polar germ pores, $\times 840$.

spore whereas *A. macrosporum* has only one⁵. Besides the above characteristics, the present isolate is a strongly thermophilic fungus, having optimum temperature for both growth and fructification at 45°C , maximum at 55°C and minimum at 20°C but no ascocarps were observed below 30°C . Hence it is hereby described as a new species, *Achaetomium thermophilum* sp. nov. owing to its thermophilic nature.

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OBTURATOR IN THE CYPERACEAE

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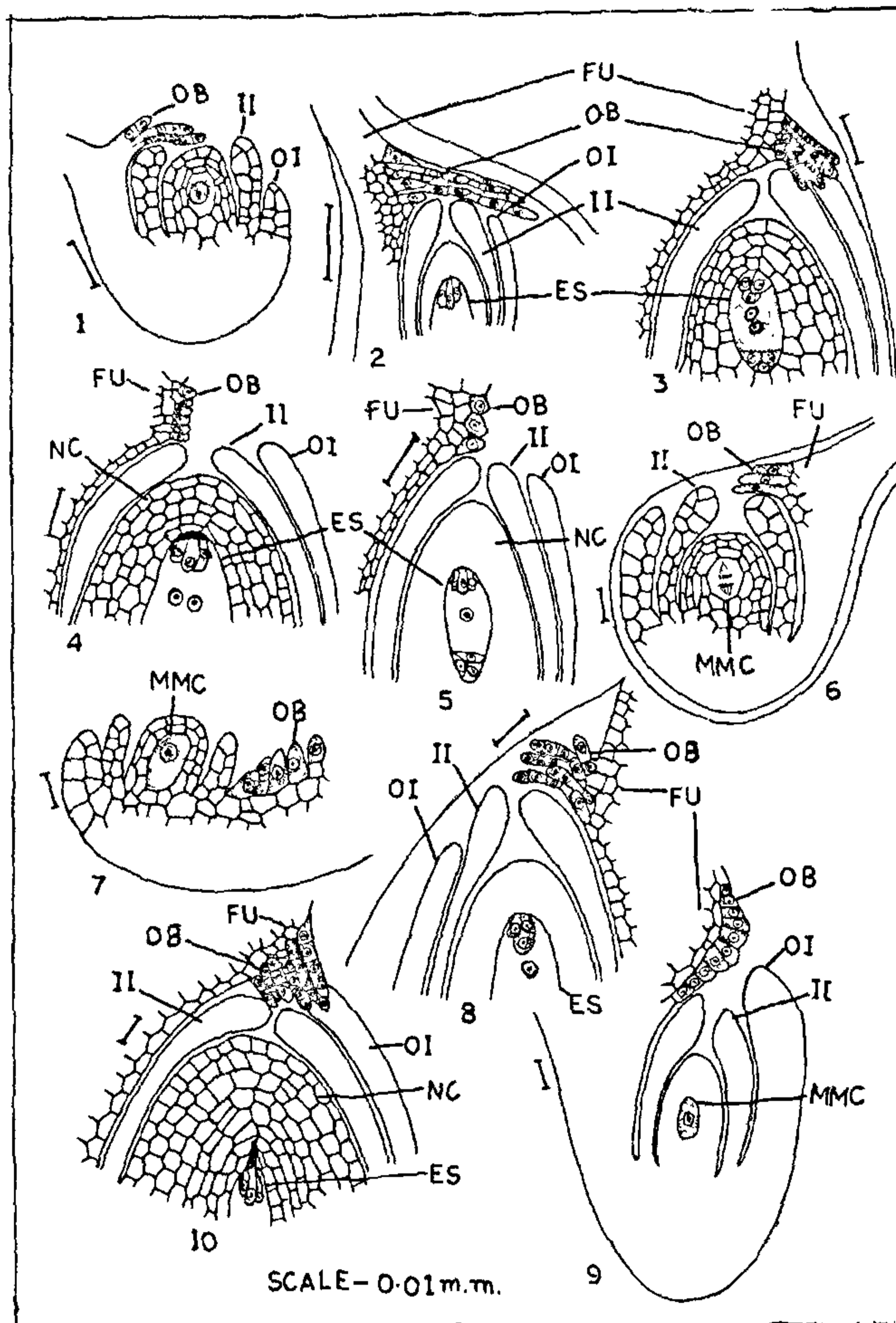
THE Cyperaceae are unique because of their peculiar mode of pollen and embryo development. Schnarf¹, Maheshwari² and Davis³ have reviewed earlier literature on the family. Padhye⁴ reported obturator to be a characteristic and uniform feature of the family. The present study covers development of obturator in 14 species under 12 genera* belonging to tribes Cypereae, Scirpeae, Sclereae and Cariceae of Koyama¹⁰. An attempt is made to classify different taxa of the family on the basis of the nature and the extent of development of obturator.

A group of superficial cells situated at the base of the funiculus enlarge during megasporogenesis and become conspicuous (figures 1, 6, 7, 9). These protrude and divide repeatedly to form tubular filamentous structure in the vicinity of micropyle (figures 2, 3, 8, 10). This is referred to as obturator. It consists of elongated, closely packed uninucleate cells with dense protoplasmic contents (figures 2, 3, 8, 10).

Normally, the development of obturator is initiated at the megaspore mother cell stage (figures 1, 6, 7, 9) and it is fully formed at the mature embryo sac stage. However, in *Kyllinga brevifolia*⁵ obturator is well developed at megaspore tetrad stage.

In *L. sphacelata* the constituent cells are short, loosely packed, and intertwined (figure 8). A similar situation exists in *Eriophorum comosum*, *Lipocarpha argentea* and *R. maritima*. In *P. pumilus*, *C. alternifolius*, *E. atropurpurea*, *F. ciliaris* and *S. lithosperma*, cells of the obturator grow beyond the micropyle to reach outer integument (figures 2, 3, 10). The situation in *Fimbristylis* is rather different where development of obturator initiated during

* *Pycnus pumilus* Nees., *Cyperus alternifolius* Willd., *Mariscus paniceus* Vahl., *Eleocharis atropurpurea* Kunth., *Fimbristylis cymosa* R. Br., *F. quinquangularis* Kunth., *Scirpus supinus* Linn., *Eriophorum comosum* Wall., *Fuirena ciliaris* Kunth., *Lipocarpha sphacelata* Kunth., *L. argentea* R. Br., *Remirea maritima* Aubl., *Scleria lithosperma* Roxb., and *Carex filicina* Nees.



Figures 1-10. Obturator in the Cyperaceae. 1, 2. L.S. Ovule of *Pycnus pumilus* showing developing and compact funicular obturator at megaspore mother cell and mature embryo sac stages respectively. 3. L.S. Ovule of *Eleocharis atropurpurea* showing compact obturator at mature embryo sac stage. 4, 5. L.S. Ovule of *Fimbristylis cymosa* and *F. quinquangularis* at mature embryo sac stage showing rudimentary obturator. 6. L.S. Ovule of *Fuirena ciliaris* showing developing obturator. 7. Same of *Lipocarpa argentea*. 8. Same of *L. sphacelata* at mature embryo sac stage showing loose obturator. 9, 10. *Scleria lithosperma*. (ES = Embryo sac, FU = Funiculus, II = Inner integument, MMC = Megaspore mother cell, NC = Nucellus, OB = Obturator, OI = Outer integument).

megasporogenesis gets arrested during further development (figures 4, 5). This results in a rudimentary obturator.

The funicular obturator was first recorded by Padhye⁶ in *Kyllinga triceps*. Subsequent investigations confirmed its presence in several taxa of the family⁷⁻¹⁴. This structure was, however, not recorded in *F. quinquangularis*¹⁷ and *F. dichotoma*¹⁵, but a reinvestigation of the former species confirms the presence, though of a rudimentary type of obturator (figures 5).

The various taxa of the Cyperaceae investigated so far are classified here on the basis of the nature and extent of development of obturator.

I-Obturator well developed

(a) Obturator compact

Cyperus niveus, *C. rotundus*, *Scirpus mucronatus*,^{4,16} *Pycnopus sanguinolentus*,¹¹ *P. puncticulatus*,¹⁸ *P. pumilus*, *Cyperus alternifolius*, *Mariscus paniceus*, *Eleocharis atropurpurea*, *Scirpus supinus*, *Fuirena ciliaris* and *Scleria lithosperma* (present work).

(b) Obturator loose

Kyllinga triceps,⁶ *K. melanospora*,¹⁶ *Fuirena wallichiana*, *Cyperus tagetum*, *C. compressus*, *Eleocharis geniculata*,⁸ *Cyperus alopecuroides*,¹³ *Eleocharis tetragona*, *E. plantaginea*, *Kyllinga monocephala*,¹⁸ and *Remirea maritima* (present work).

II-Obturator rudimentary

Fimbristylis milicea,⁴ *F. falcata*, *F. tetragona*, *F. argentea*,¹⁸ *F. cymosa* and *F. quinquangularis* (present work).

The constituent cells of filamentous obturator grow over the micropyle and in some cases even go beyond to reach outer integuments^{5,11,12}. Patel and Shah⁷ and Tiwari¹¹ reported entry of obturator into the micropyle. However, their figures do not appear convincing. This situation has never been observed in any of the taxon studied presently.

The obturator is believed to facilitate entry of the pollen tube into the embryo sac and also supply nourishment to the developing pollen tube. The present finding seems to confirm the rôle assigned to the obturator.

Schurhoff¹⁹ opined that a structure referred to above is developed on the side of the ovule towards funiculus in place of the outer integument.

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THREE INTERESTING SPECIES OF MACRO-LICHENS FROM NORTH EAST INDIA

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DURING our lichen collecting in the North East India, the following three interesting macro-lichen taxa were collected. *Psorella isidiza* is a new species and the remaining two taxa are new records for India.

1. *Psorella isidiza* Patwardhan & Nagarkar sp. nov. (figures 1, 2, 3)

Psorella isidiophora Awasthi et K. P. Singh affinis sed isidia non-ramosa, (haud coralliformia) cylindrica et ascosporae 1-septatae, parvior (2-3 × 8-12 μm) notabilis. Holotype: Meghalaya, Garo hills, Darugiri Reserved Forest, leg. M. B. Nagarkar, 5 December 1978—78.453 (AMH).