

Studies on Indian Laboulbeniales III. Three unrecorded dioecious genera

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Three dioecious Laboulbeniomyces are reported for the first time from India. These are *Aporomyces uniflagellatus* on limnichid beetle, *Dimeromyces anisolabis* on *Labidura riparia* (Dermaptera) and *Dioicomycetes anthici* on anthicid beetles.

Key Words—ascomycete; dioecious; obligate exoparasite; primary appendage.

The members of the order Laboulbeniales (Ascomycotina) are very interesting and unique fungi. They are obligate exoparasites of living arthropods, especially insects and, very rarely mites and millipedes. Although they are widely distributed in different parts of the world, they are almost unstudied from India, where few reports have appeared (Thaxter, 1908; Batra, 1963). The present report is a continuation of previous work (Kaur et al., 1993; Kaur and Mukerji, 1995a, b), and three dioecious genera of Laboulbeniales are described here for the first time from India.

Materials and Methods

Insects were collected from different habitats of Delhi, belonging to different groups. They were killed and preserved in 70% alcohol. Collection data are given following the descriptions in the taxonomic section.

The insects were screened under the binocular microscope for the presence of these fungi. The fungi were separated with the help of fine needles and mounted on slides in glycerine containing a trace of cotton blue, using techniques given by Benjamin (1971, 1986).

Description of Species

Aporomyces uniflagellatus Thaxter, Mem. Amer. Acad. Arts Sci. 16: 75. 1931; Benjamin, Aliso 12: 33. 1989. Figs. 1, 5, 6

Male thallus: Nearly hyaline, consisting of three-celled receptacle, and a terminal antheridium, usually more or less curved; basal cell of receptacle elongate, $12.5\text{--}18.7 \times 6.2 \mu\text{m}$ distally, median and upper cells are subequal, upper cell is slightly longer than the median cell, antheridium is long and wide, total length is $112\text{--}137 \mu\text{m}$.

Female thallus: Receptacle below the perithecium is $187\text{--}212 \mu\text{m}$ long, nearly hyaline, usually long, rather slender and relatively uniform in width, becomes only moderately widened distally, where it joins the peritheci-

um, the foot is broad, opaque and flat. Perithecium proper is yellowish brown, slightly more than twice as long as broad, nearly symmetrical, $56 \times 175 \mu\text{m}$, the lower margins parallel or slightly convex, abruptly tapered to the blunt apex, posterior margin bearing usually only one persistent receptacular cell which is more or less embedded in the perithecial wall above the middle of the perithecium. Primary appendage is simple, variable in length, $275\text{--}337.5 \mu\text{m}$, consists of variable number of elongate cells. Total length from base to the tip of perithecium is $182\text{--}362 \mu\text{m}$.

Specimens examined: Delhi, Sep. 22, 1992, DU/MSK/884; Oct. 27, 1992, DU/MSK/885; Nov. 6, 1992, DU/MSK/886.

The species has been isolated from limnichid beetles. They were mostly collected from wet soil. The fungus was found mostly on the abdomen of the host insect and the number of thalli varied from 5–7 per insect.

The genus *Aporomyces* was reviewed and amended by Benjamin (1989). He not only amended Thaxter's original circumscription of the genus, but also provided a key to the species and descriptions and illustrations of eight taxa, three of them new. According to him, *A. uniflagellatus* is very similar to *A. szaboi* Bánhegyi. However, it is readily distinguished by its more inflated perithecium and the several-celled remnants of the upper part of the receptacle, which often bears the broken remains of secondary appendages and the branched primary appendage.

The presently known distribution of *A. uniflagellatus*, southward from Okinawa through the Philippines and westward Sumatra into Africa, indicates that the species is probably widespread throughout the warmer regions of the old world. However, this is the maiden report from India.

Dimeromyces anisolabis Thaxter, Mem. Amer. Acad. Arts. Sci. 14: 375. 1924; Sugiyama and Majewski, Trans. Mycol. Soc. Japan 26: 449. 1985.

Figs. 2, 3, 7

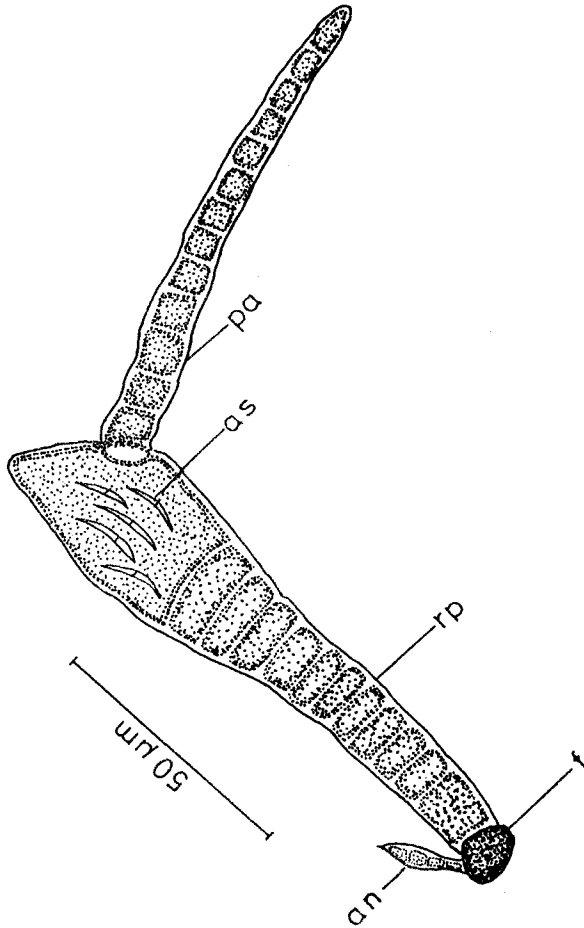
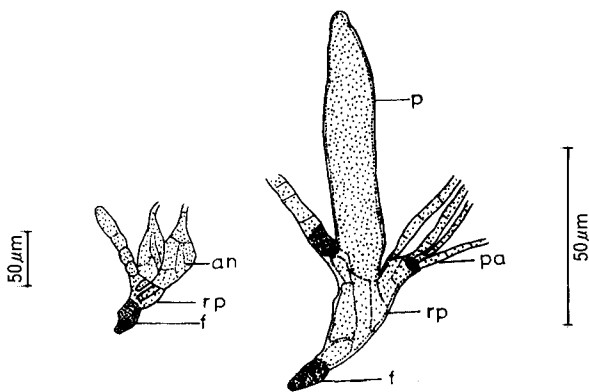


Fig. 1. *Aporomyces uniflagellatus*.
Young thallus showing primary appendage.

Male thallus: consists of receptacle and two antheridia, 56–62.5 μm long to the top of upper antheridia. Receptacle consists of 3–4 superposed one-celled layers forming basally a blackish foot, 9–12.5 \times 6.25 μm . The first layer is longest and widest, tapering to the foot, the



Figs. 2, 3. *Dimeromyces anisolabis*.
2; Male thallus showing two lateral compound antheridia.
3; Female thallus showing lateral perithecium and primary appendage.

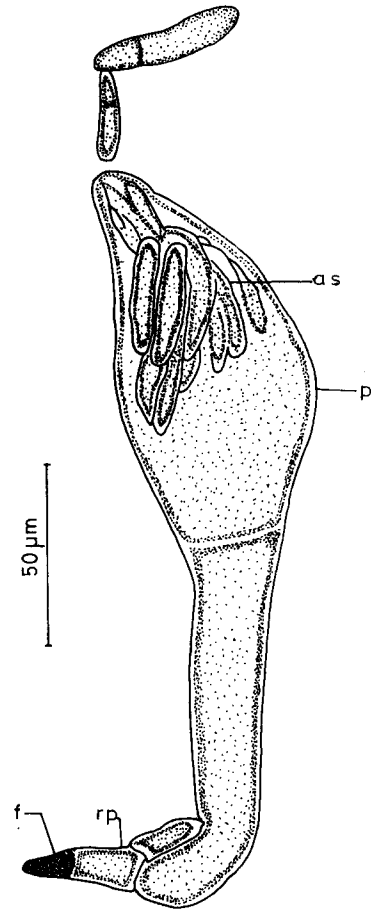


Fig. 4. *Dioicomyces anthici*. Female thallus showing ascospores inside the perithecium.

second layer is flattened, situated obliquely, the third layer is tapering distally, the fourth layer is swollen, separated by a thick blackish septum from the remaining layers, which are cylindrical and elongated. The compound antheridia are 25–31 \times 6–9 μm , rather stout. The discharge tube was found to be bent anteriorly.

Female thallus: brownish, 113–125 μm long to the top of the perithecium. Receptacle consists of basal and distal portions. The former is composed of five superposed one-celled layers forming a blackish foot, 12.5 \times 6.2–9.3 μm . The first layer is 12.5–18.7 μm long, separated by an oblique septum from the second layer, the two superposed layers flat, situated obliquely; the fourth layer is thicker, separated from the fifth layer by a horizontal septum, the fifth layer is bell-shaped, the distal part of the receptacle is almost cylindrical, forming on the third layer of the receptacle, slightly tapering to the short hyaline apex and rounded top. Appendages are almost cylindrical, 43–62.5 μm long, composed of 5–6 superposed cells which are isodiametric or slightly elongated, constricted near the thick, blackish septum separating the basal and subbasal cells. The solitary anterior appendage widely blackened near the subbasal septum having basal cell swollen, the remaining one or two append-

ages situated on the opposite side of the perithecium, slightly blackened near the subbasal septum, having comparatively slender basal cells.

Specimens examined: Delhi, Dec. 12, 1992, DU/MSK/889.

The present form was isolated growing on *Labidura riparia* (Dermaptera), collected from Delhi University Botanical Garden.

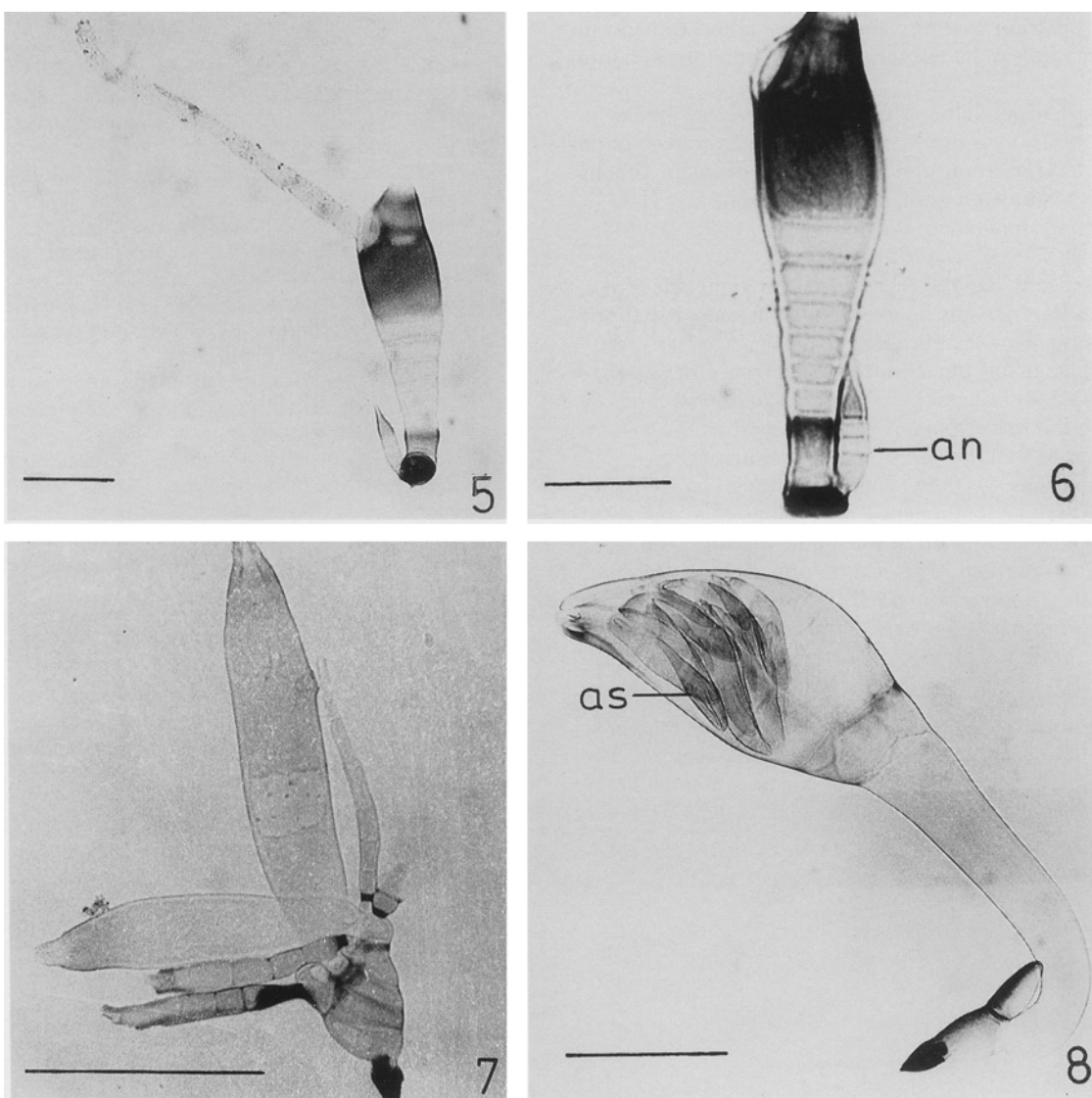
The genus *Dimeromyces* is cosmopolitan and found on diverse insect orders (Coleoptera, Dermaptera, Diptera, Orthoptera) and those of Acarina. It is very similar to the genus *Dimorphomyces*. According to Lee and Sugiyama (1984), these genera are distinguished in that the genus *Dimorphomyces* never forms the secondary axis of the receptacle, on which the perithecia are formed

in the *Dimeromyces*.

Dimeromyces anisolabis is very variable in size (Thaxter, 1924). The present species, however, agrees with the type species. It was identified by the rounded basal cell of the lower secondary appendage of which the septum between the basal and subbasal cells is conspicuously narrowed and blackened in females and in having only one blackened septum in male.

This was reported earlier from Peninsular Malaysia (Sugiyama and Majewski, 1985). From India, this is the first report of its occurrence.

Dioicomycetes anthici Thaxter, Proc. Amer. Acad. Arts Sci. **37**: 33. 1901; Spegazzini, An Mus. Nac. Hist. Nat. Buenos Aires **26**: 454. 1915; Balazuc, Bull.



Figs. 5, 6. *A. uniflagellatus*. 5; Young thallus. 6; Mature female thallus with male at its base.

Fig. 7. *D. anisolabis*. Female thallus showing perithecia and primary appendage.

Fig. 8. *D. anthici*. Female thallus showing ascospores in the perithecium.

Abbreviations as used in the Figs. 1–8: an antheridium; as ascospores; f foot; p perithecium; pa primary appendage; rp receptacle. (All scales 50 μ m.)

Soc. Linn. Lyon **43**: 357. 1974; Balazuc, Espadaler and Girbal, Collect. Bot. **13**(2): 415. 1982; Lee and Sugiyama, Trans. Mycol. Soc. Japan **25**: 249. 1984a. Figs. 4, 8

Female thallus, 237–250 μm long, yellowish brown, receptacle is cylindrical, consisting of two one-celled layers, 37–50 μm long. The first layer is stalk-like, tapering gradually towards the base, forming a blackish foot, the second layer rather flat, appendages are not found. Perithecial stalk is cylindrical, longer and thicker than the receptacle, becoming thicker upwards, curved near the base, composed of a single cell, 112–125 \times 12.5 μm . Perithecium proper is cylindrical, more or less inflated laterally, thicker than the stalk, narrowly rounded at the apex, 125–137.5 μm long and 50–62.5 μm wide. Ascospores are 37.5–43 μm long.

The male thallus consists of four superposed cells, gradually tapering towards the narrow apex, the fourth layer forming a simple antheridium and a distal discharge tube.

The Indian specimens contained several female individuals, but only a few males, which were not in good condition. Therefore, the description of male thallus given above is written after Thaxter's description (1901).

Specimens examined: Delhi, Aug. 17, 1992, DU/MSK/887; Sep. 20, 1992, DU/MSK/888.

The present isolate resembles the type specimen, but slight difference has been observed in some isolations in possessing slender perithecia.

The species has been encountered from *Anthicus* sp. (Coleoptera, Anthicidae). The fungus was mostly present on the lower part of the abdomen of the insect. The number of thalli varied from 5–8 per insect.

Dioicomycetes anthici was described by Thaxter (1901), when he established this dioecious genus of Laboulbeniales. Later on, it was reported from Amazon, Argentina, Guatemala, USA, Cameroon, France (Balazuc, 1974), Italy (Spegazzini, 1915), Korea (Lee and Lee, 1982) and Indonesia (Lee and Sugiyama, 1984b). The present report is the maiden report of its occurrence from India.

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