

New Records of *Aschersonia* from Forests of Western Ghats, India

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Accepted for publication: 20 October 2003

Abstract

The genus *Aschersonia* is characterized by globose pycnidia formed in hemispherical or cushion shaped stroma, slender branched conidiophores, hyaline, mostly fusoid, smooth, one-celled conidia and parasitic on homopteran insects. Survey, isolation and documentation of entomogenous fungi on insects, spiders and mites were carried out in the hinterland forests of Western Ghats in Goa State during the year 1999-2001. This paper provides taxonomic description and illustrations of three entomogenous fungi, viz., *Aschersonia aleyroides*, *A. badia* and *A. brunea*, isolated from Homopteran insect hosts, for the first time from India.

Key words: Biodiversity, Fungi, *Aschersonia*, Biocontrol, Taxonomy

Entomogenous fungi are known to cause considerable mortality of many insect pests in different parts of the world and considered as an important natural control factor (Steinhaus, 1949). Comparative ease in handling, recycling ability in nature, overwintering and aestivating during unfavourable seasons, specific target suppression and safety towards non-target organisms and humans have been some of the factors considered to recognise entomogenous fungi as biocontrol agents and to advance studies in the field of mycoinsecticides (Hall, 1979, 1980; Butt *et al.*, 2001).

Originally described as either parasitic or superficial colonizers of live, green leaves, species of *Aschersonia* Montagne have been recognized as active parasites of white-fly by Webber who observed abundant infections of larval and pupal populations of white flies by *Aschersonia* spp in 1897 (cf. Evans and Hywel-Jones, 1990). Rolf and Fawcett (1908) first described the entomogenous habit of *Aschersonia* spp. and emphasized their biological control potential. A few reports have been published on biocontrol value of these fungi (Rombach and Gillespie, 1988; Ramakers and Samson, 1984; Frasen *et al.*, 1987).

The genus *Aschersonia*, typified by *A. taitensis* Montagne (Petch, 1921) is characterized by (i) globose pycnidia formed in hemispherical or cushion shaped stroma (ii) slender, branched conidiophores with thin-walled usually awl-shaped conidiogenous cells, (iii) hyaline, mostly fusoid, smooth, one-celled conidia, and (iv) parasitic on homopteran insects (Tzean *et al.*, 1997).

Petch (1921) had examined the innumerable species till then described in *Aschersonia* and reduced them into 25 recognizable taxa. Mains (1959a,b,c) reviewed species of *Aschersonia* described from America. Although CABI Bioscience, U.K., in FunIndex displays 75 species under *Aschersonia*, but according to Evans and Hywel-Jones (1997) little has been done since the monumental review work of Petch.

Survey, isolation and documentation of entomogenous fungi on insects, spiders and mites were carried out in the hinterland forests of Western Ghats in Goa State, during 1999-2001. Niches with humid, shady and thick decomposing litter and dense vegetation along banks of streams and rivers were scanned for infected insects, spiders and mites. Live or dead leaves containing scattered conidiomata were brought to the laboratory. The conidiomata, carefully dissected using a razor blade, were mounted in water on a slide. The microscopic characters of the fungus were observed under a stereoscope (Leica Wild M10) and a compound light microscope (Olympus, CH30). Semi-permanent slides were prepared in lactophenol mountant and illustrations were drawn using a drawing tube fitted to the light microscope. Dried specimens of fungi were maintained in the Herbarium of Goa University Botany Department (GUFC).

Taxonomic Part

1. *Aschersonia aleyroidis* Webber, 1897. *U.S. Dept. Agr. Div. Veg. Phys. Path. Bull.* 13: 20. (Plates 1& 2)

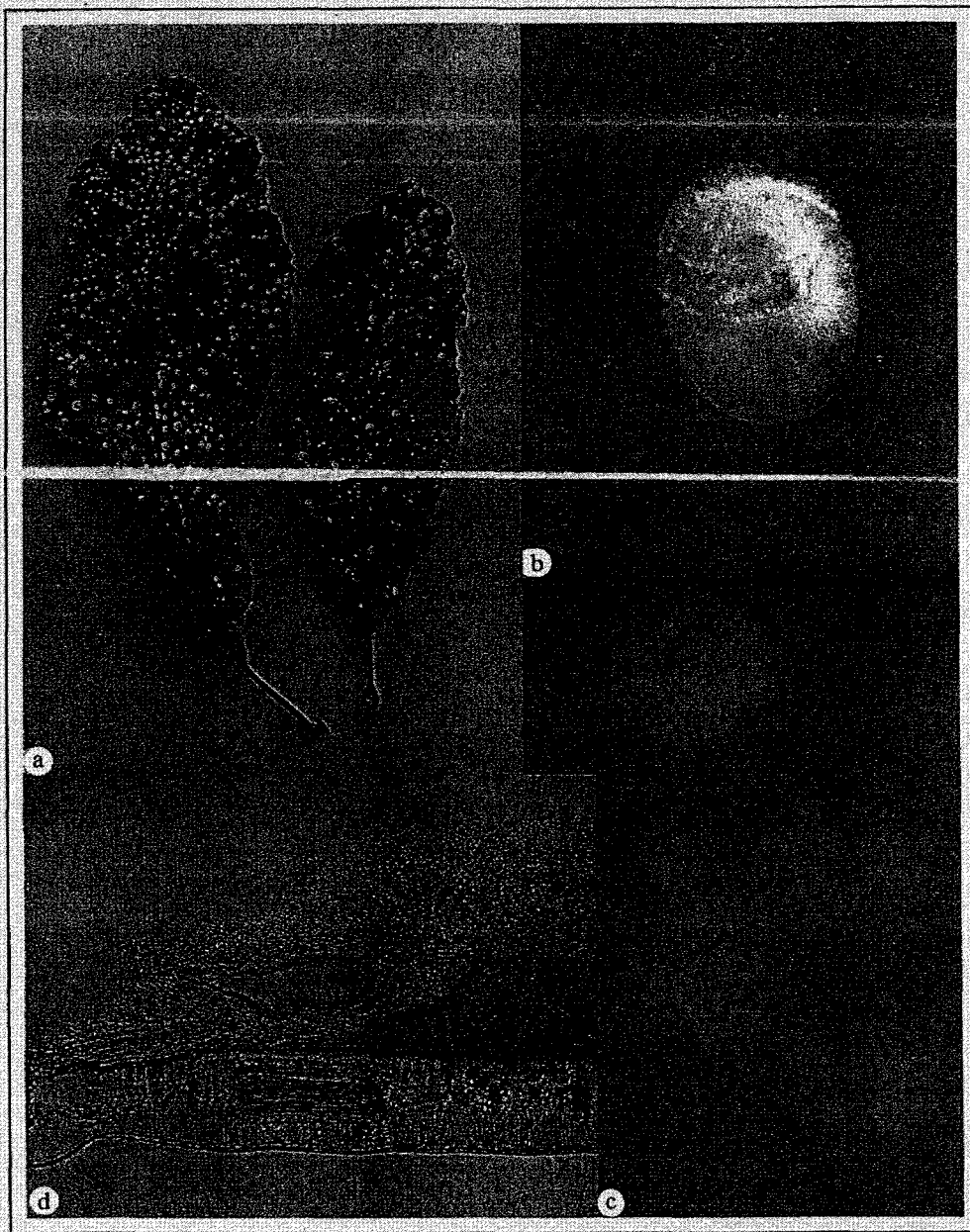


Plate 1. *Aschersonia aleyrodis* : (a–c) Stromata formed on infected insects, (a) 0.35X, (b) 50X, (c) 10X, (d) Vertical section passing through a stroma showing a pycnidium, 60X.

Stromata flattened pulvinate, white to pale yellow, 1–4 mm diam, 0.4–0.5 mm high, with a thin hypothallus of 0.2–0.5 mm consisting of densely interwoven hyphae.

Hyphae septate, branched, thick-walled, smooth, hyaline, 3–6 μm wide. *Pycnidia* embedded in stroma with the orifices located peripherally, ovoid to flattened

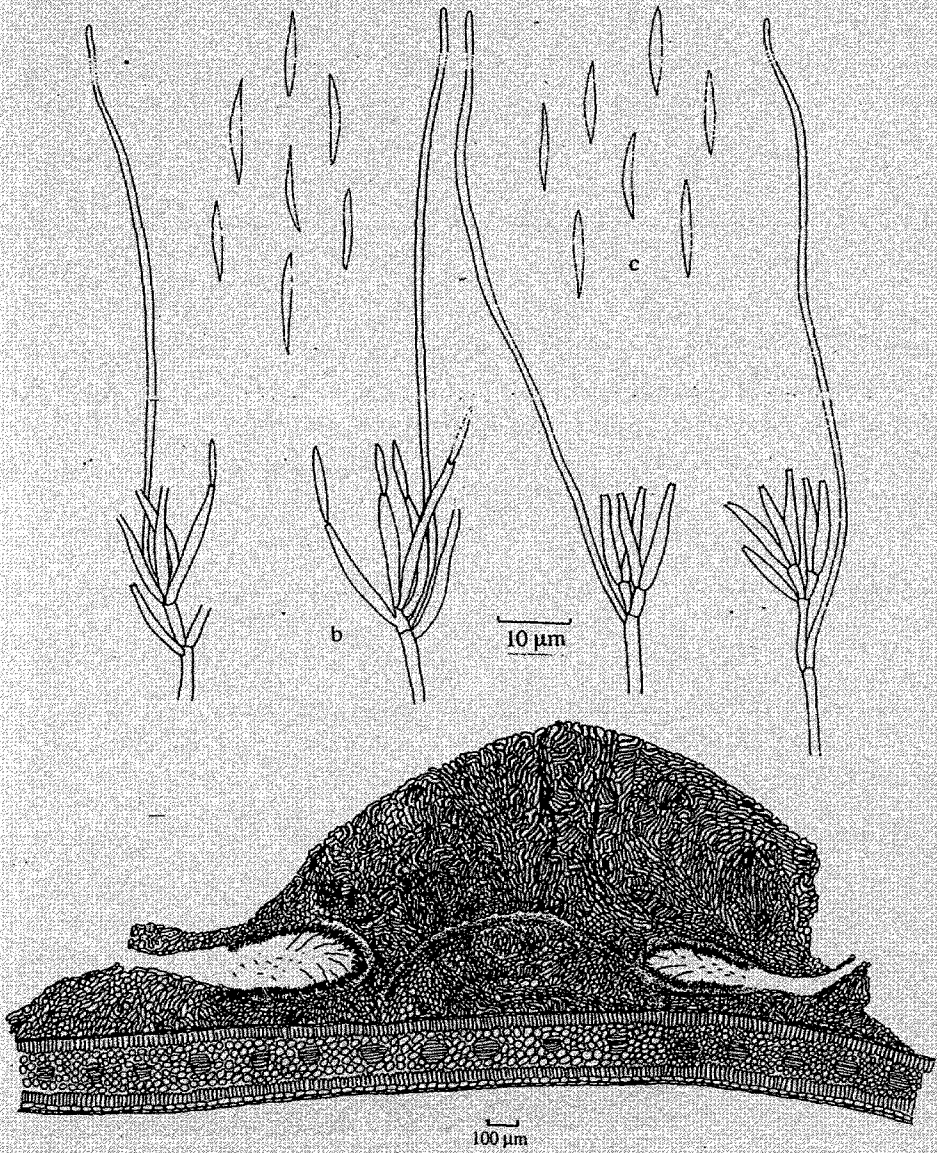


Plate 2. *Aschersonia aleyrodis* : (a) Vertical section passing through a stroma showing a pycnidium, (b) conidiophores with paraphyses, (c) conidia.

globose, sometimes irregular, 100–300 × 150–300 µm. *Pycnidiohores* penicillate, mono- or bi-verticillate, paraphysate, with whorls of 2–5 conidiogenous cells.

Conidiogenous cells phialidic, narrow cylindrical, slender, smooth, hyaline. *Paraphyses* linear, filiform, hyaline, 30–100 µm. *Pycnidiospores* fusiform, some-

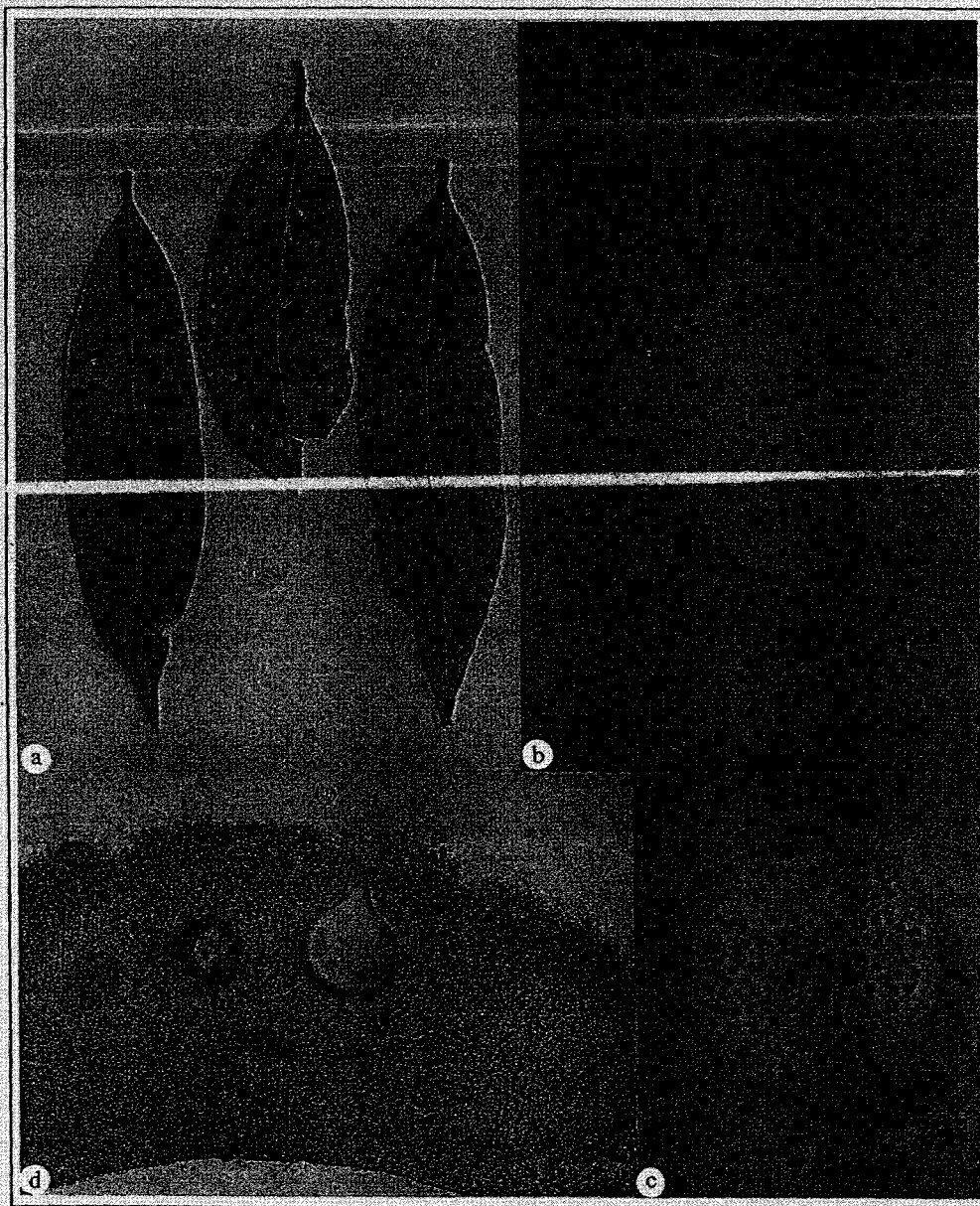


Plate 3. *Aschersonia badia*: (a-c) Stromata formed on infected insects, (a) 0.35X, (b) 30X, (c) 20X, (d) Vertical section passing through a stroma showing pycnidia, 60X.

times slightly curved, apiculate with acute ends, smooth, non-septate (amerosporous), guttulate, hyaline, pale yellow to light orange, 6-13 x 1.5-2.5 μ m.

Specimen examined. On Homopteran insect on fresh leaves of *Hopea ponga*, Sri Bhagwan Mahaveer Wildlife Sanctuary, Molem, Goa, India; 17.10.2001, leg. Keshava Prasad, Herb. No. GUFCS 5053.

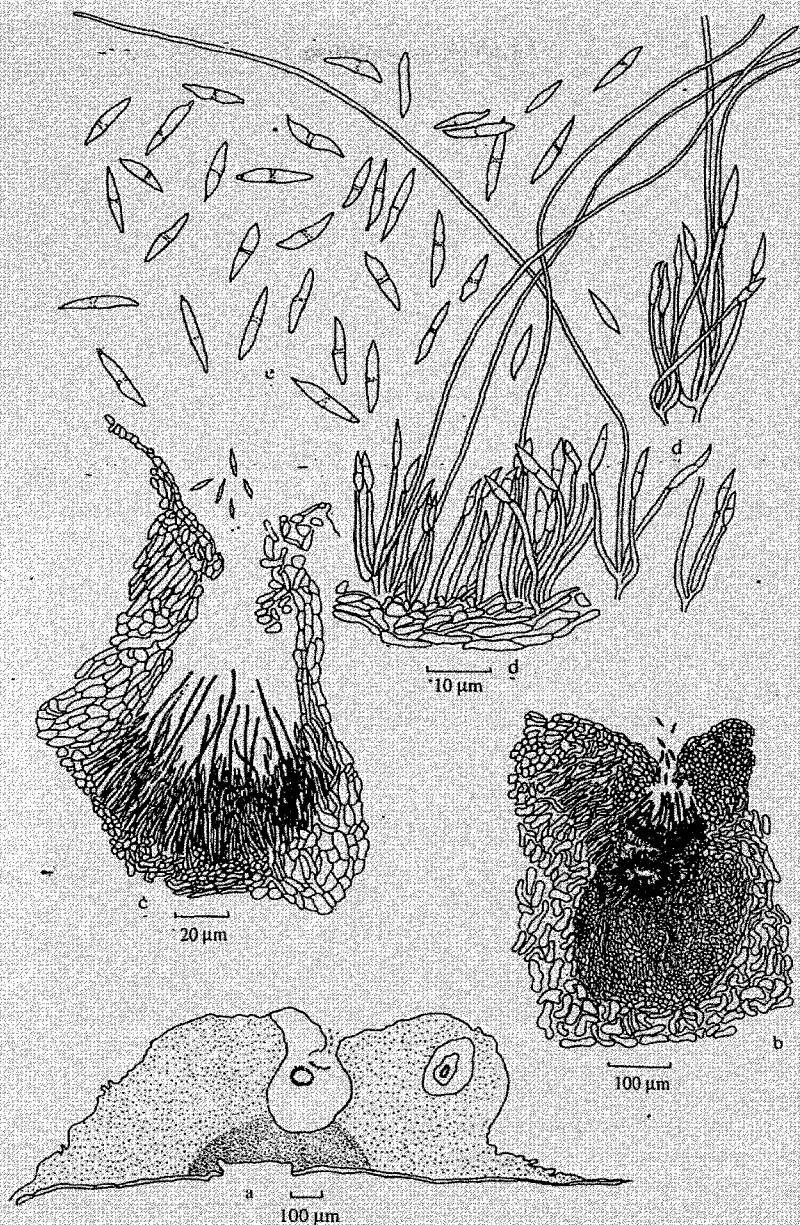


Plate 4. *Aschersonia badia*: (a-c) Vertical section passing through a stroma showing pycnidia, (d) conidiophores with paraphyses and conidia, (e) conidia

Known distribution. The fungus has so far been recorded from Florida, Trinidad, Taiwan (Petch, 1921; Tzean *et al.*, 1997).

2. *Aschersonia badia* Patouillard, 1897. *Jour. de Botanique* 11: 370. (Plate 3 & 4)

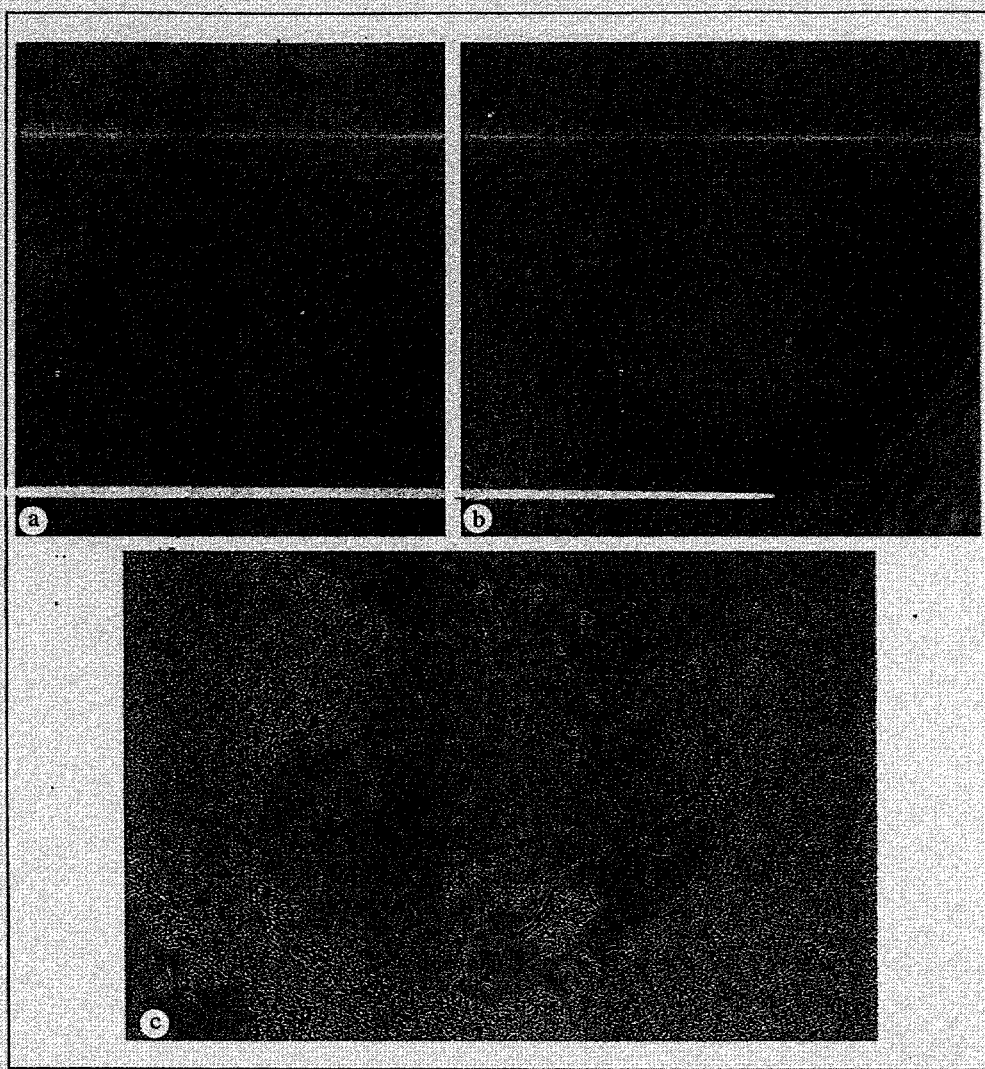


Plate 5. *Aschersonia brunnea*: (a–b) Stromata formed on infected insects, 20X, (c) Vertical section passing through a stroma showing a pycnidium, 60X.

Stromata flattened pulvinate, circularly discoid, raised, with a smooth or circinate margin, yellowish orange to deep orange, 1.8–3.0 mm in diam, 0.4–1.0 mm high consisting of densely interwoven hyphae. *Hyphae* smooth, septate, branched, thick-walled, hyaline, 4–7 μm wide. *Pycnidia* embedded in stroma with the orifices located in circular or scattered manner, ovoid to flattened globose or spherical, 250–350 \times 150–300 μm . *Pycnidiohores* penicillate, mono- or biverticillate to

irregular, paraphysate, with whorls of 2–4 conidiogenous cells. *Conidiogenous cells* phialidic, hyaline, smooth, slender, narrow cylindrical. *Paraphyses* hyaline, linear, filiform, up to 150 μm long. *Pycnidiospores* hyaline, fusoid, sometimes slightly curved, apiculate with acute ends, aseptate, amerosporous, smooth, guttulate, 8–16 \times 2–3 μm .

Specimen examined. On Homopteran insects over fresh leaves of *Hopea ponga*, Sri Bhagwan Mahaveer

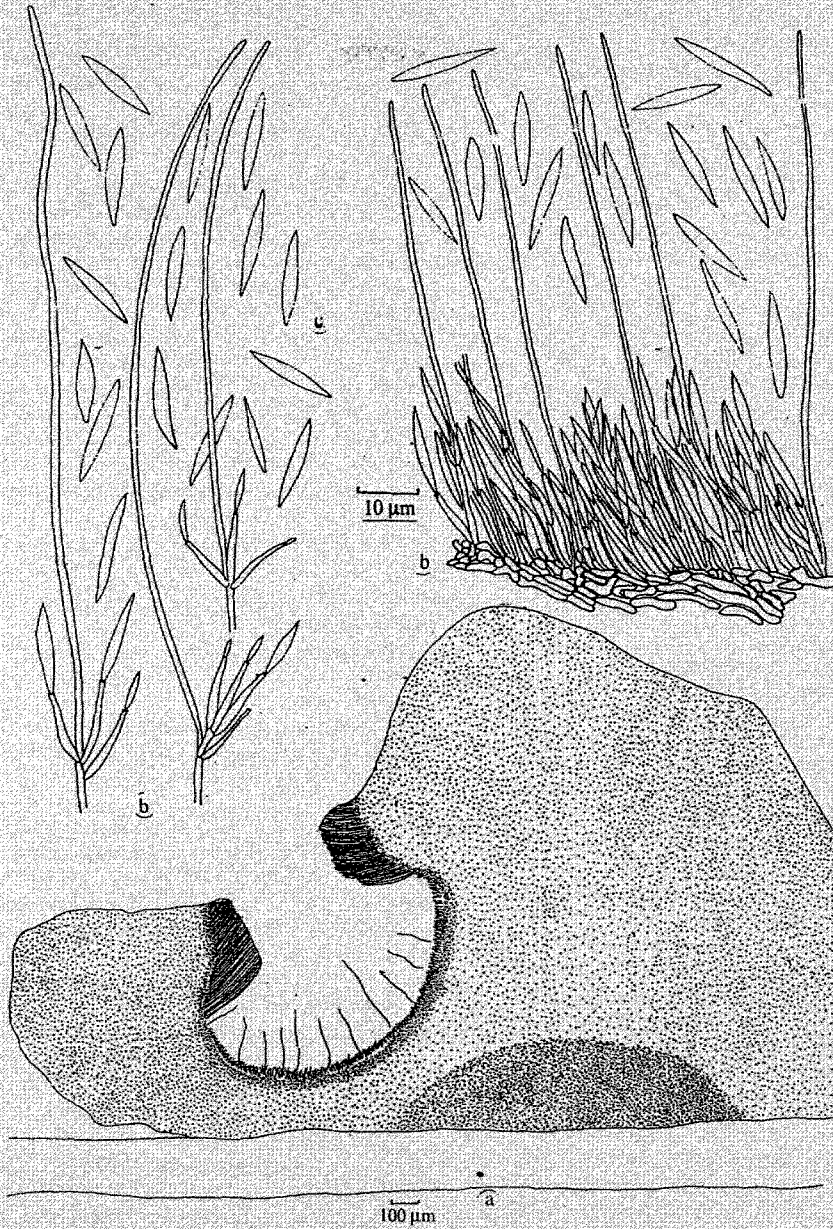


Plate 6. *Aschersonia brunnea*: (a) Vertical section passing through a stroma showing a pycnidium, (b) conidiophores with paraphyses and conidia, (c) conidia

Wildlife Sanctuary, Molem, Goa, India, 17.10.2001, leg. Keshava Prasad, Herb. No. GUFC 5050.

Known distribution. The fungus has so far been known from Sri Lanka, Philippine, Pegu, Taiwan (Petch, 1921; Tzean *et al.*, 1997).

3. *Aschersonia brunnea* Petch, 1921. *Ann. Roy. Bot. Gard., Peradeniya* 7: 251. (Plate 5 & 6)

Stromata circular, discoid, dark orange to brown, 2.0–3.0 mm in diam, 1.2–1.5 mm high, consisting of densely interwoven hyphae. *Hyphae* hyaline, smooth, thick-walled, 3–9 µm wide. *Pycnidia* embedded in stroma, peripheral, circular, ostiole depressed, inconspicuous, pycnidia spherical to flattened globose, 600–700 x 500–650 µm. *Pycnidiohores* penicillate, mono- or biverticillate, paraphysate, with whorls of 2–6 conidiogenous cells. *Conidiogenous cells* phialidic, hyaline, smooth, slender, narrow cylindrical. *Paraphyses* hyaline, linear, filiform, up to 100 µm. *Pycnidiospores* hyaline, fusoid, sometimes slightly curved, apiculate with acute ends, aseptate, amerosporous, smooth, guttulate, 6–13 x 1.5–2.5 µm.

Specimen examined. On Homopteran insects over fresh leaves of *Hesperis matronalis* Sri Bhagwan Mahaveer Wildlife Sanctuary, Molem, Goa, India, 17.10.2001, leg. Keshava Prasad, Herb. No. GUF 5051.

Known distribution. The fungus has so far been described from Brazil and Taiwan (Petch, 1921; Tzean *et al.*, 1997).

Acknowledgements

This work was supported by research grants to Dr. D. J. Bhat and Dr. Ashwani Kumar from Indian Council of Medical Research and the Ministry of Environment & Forests, Government of India, New Delhi. We are indebted to the Director, Malaria Research Control, ICMR, New Delhi, for encouragement.

References

- Butt, T. M., C. Jackson and N. Magan. 2001. Introduction—Fungal biological control agents: progress, problems and potential. In: T. M. Butt, C. Jackson and N. Magan (eds.). *Fungi as Biocontrol Agents: Progress, Problems and Potential*. CAB International, London, pp 1–8.
- Evans, H.C. and N. L. Hywel-Jones. 1990. Aspects of genera, *Hypocrella* and *Aschersonia* as pathogens of coccids and whiteflies. In: *Proc. 5th Int. Collo. Invertebr. Pathol. Microb. Cont.* (Eds. D. J. Cooper, J. Drummond, & D. E. Pinnoch), Soc. Invertebr. Pathol., Adelaide, Australia. pp. 111–115.
- Evans, H.C. and N. L. Hywel-Jones. 1997. Entomopathogenic fungi. In: Y. Ben-Dov and C. J. Hodgson. (eds.). *Soft Scale Insects— Their Biology, Natural Enemies and Control* (7B). Elsevier Science, B.V. pp 3–27.
- Frasen, J. J., K. Winkelmann and Van J.C. Lenteren. 1987. The different mortality at various life stages of the green house white fly, *Trialeurodes vaporariorum* (Hymenoptera: Aleyrodidae), by infection with the fungus *Aschersonia aleyrodis* (Deuteromycotina: Coelomycetes). *J. Invertebr. Pathol.* 50: 158–165.
- Hall, R. A. 1979. Pathogenicity of *Verticillium lecanii* conidia and blastospores against the aphid, *Macrosiphoniella sanborni*. *Entomophaga* 24: 191–198.
- Hall, R. A. 1980. Control of the aphid by the fungus *Verticillium lecanii*: effect of spore concentration. *Entomologia Experimentalis et Applicata* 27: 1–5.
- Mains, E.B. 1959a. Species of *Hypocrella*. *Mycopathologia et Mycologia Applicata* 11: 311–326.
- Mains, E. B. 1959b. North American species of *Aschersonia* parasitic on Aleyrodidae. *J. Insect Pathol.* 1: 43–47.
- Mains, E. B. 1959c. Species of *Aschersonia* (Sphaeropsidales). *Lloydia* 22: 215–221.
- Petch, T. 1921. Studies in entomogenous fungi II. The genera *Hypocrella* and *Aschersonia*. *Ann. Roy. Bot. Gard., Peradeniya* 7: 167–278.
- Ramakers, P. M. J. and R. A. Samson. 1984. *Aschersonia aleyrodis*, a fungal pathogen of whitefly. II. Application as a biological insecticide in glasshouses. *Z. Ang. Ent.* 97: 1–8.
- Rolf, P.H. and H.S. Fawcett. 1913. *Fungus diseases of scale insects and white fly*. University of Florida, Agriculture Experiment Station (Gainesville) Bulletin 119: 71–82.
- Rombach, M.C. and A.T. Gillespie. 1988. Entomogenous Hyphomycetes for insect and mite control on greenhouse crops. *Biocont. News Inf.* 9 (1): 7–18.
- Steinhaus, E.A. 1949. *Principles of Insect Pathology*. McGraw-Hill, New York.
- Tzean, S. S., L. S. Hsieh and W. J. Wu. 1997. *Atlas of Entomopathogenic Fungi from Taiwan*. Council of Agriculture, Executive Yuan, Taiwan, R.O.C., 214 pp.