

Ascohyalinospora aquaticum gen. et sp. nov., a new freshwater ascomycete from submerged wood from Maharashtra, India

Borse B. D.¹, S. Y. Patil² and N. S. Pawar³

¹ Navoday Shikshan Sanstha Dhule's Uttamarao Patil Arts and Science College, Dahiwel, 424304. Dhule, M.S. India.

² S.S.V.P. S's L. K. Dr. P. R. Ghogrey Science college Dhule M.S. India

³ S.S.V.P. S's Arts, Comm. and Sci. College, Sindkheda, 425404., Dhule, M.S. India.

A new genus of freshwater ascomycete *Ascohyalinospora aquaticum* collected on submerged decorticated woody debris from the freshwater reservoir (Yashawant Lake, Toranmal, Nadurbar) in Maharashtra state, India, is described and illustrated. It is characterized by having superficial, hyaline, and gregarious, shining (glistening) ascomata with basal pointed spines and hyaline, gattulate, 3-septate appendaged and non-appendaged ascospores (dimorphic).

Keywords: Ascomata, Ascospores, Appendages, taxonomy Yashwant lake.

Freshwater ascomycetes are defined as ascomycetous fungi which have been recorded in freshwater lentic and lotic habitats and which complete part, or the whole of their lifecycle within freshwater environment, playing an important role in recycling of organic matter (Shearer 1993, Wong et al. 1998), and include ascomycetes and their anamorphs that grow on submerged wood (Cai et al. 2006, Vijaykrishna et al. 2006). Shearer (1993) listed 288 species of ascomycetes that had been recorded from freshwater habitats; this number has grown to 622 (Shearer et al. 2014, Cai et al. 2014). In India, studies on freshwater ascomycetes (69 sp.) were compiled by Borse et al. (2016, 2017). In this paper, we describe and illustrate a new genus *Ascohyalinospora* with its type species *A. aquaticum* which was found on decorticated submerged woody debris from a freshwater lake in India.

Materials and Methods

The present fungus was collected on decorticated, decayed, unidentified, woody debris from freshwater reservoir (Yashawant Lake, Toranmal). After collection samples were carried wet in plastic bags to the laboratory and incubated in plastic boxes. After 6-8 days of incubation, a fungus with hyaline shining ascoma and characteristic dimorphic ascospores were produced on the woody samples. Ascoma were observed under a stereo-zoom microscope. Ascoma, asci and ascospores were mounted in lactic acid with cotton blue and

measured using an ocular micrometer with 25 observations per structure. The holotype specimen (slides) were deposited in the Herbarium Cryptogamiae Indiae Orientalis (H.C.I.O.), Division of mycology and plant Pathology, I.A.R.I. Pusa Campus, New Delhi, India (HCIO 52059).

Taxonomy

Ascohyalinospora Borse, S.Y. Patil and N.S. Pawar, gen. nov. Figs 2

Mycobank No. : MB 829943

Etymology: Referring to the hyaline ascoma and ascospores.

Diagnosis: Ascoma: erect, gregarious, hyaline, shining, pyriform, ostiolate, papillate, superficial, at the basal region provided with septate pointed hairs (rhizoidal hairs) in the substratum, 155-215 µm high, 80-115 µm in diam. Necks: 35-75 µm long, 45-50 µm diam., cylindrical or conical, ostiolate, periphysate. Peridium: 5-11 µm thick, composed of several layers. Paraphyses: 1-2 µm wide, extending beyond the asci, aseptate, hypha-like, numerous. Asci: 65-80 x 7-11 µm, 8-spored, cylindrical to clavate, pedunculate, unitunicate, numerous, with a thin apical ring, persistent. Ascospores: 15-23 x 3.5-7 µm, biseriate, fusiform, straight or slightly curved, hyaline, ends rounded, 3-septate, septa occasionally oblique, gattulate, bipolar appendages present or absent; polar appendages unfurling in water to form fusiform elongated structures or becoming elongated and diffuse in water; appendages up to 20 µm long, 2 µm wide at the base.

Type: *Ascohyalinospora aquaticum* Borse, S.Y. Patil and N.S. Pawar

Asexual morph: not observed.

Material Examined Type: INDIA (Yashawant lake, Toranmal, Nandurbar, Maharashtra), on submerged decorticated wood, 12 June 2005, B. D. Borse (HCIO 52059), holotype.

Ascohyalinospora aquaticum Borse, S.Y. Patil and N.S. Pawar, sp. nov. Figs 1-2

Mycobank No.: MB829944

Etymology: 'aquaticum' referring to aquatic habitat of this fungus.

Diagnosis: Ascoma: erect, gregarious, hyaline, shining, pyriform, ostiolate, papillate, superficial, at basal region provided with septate pointed hairs (rhizoidal hairs) in the substratum, 155-215 µm high, 80-115 µm in diam. Necks: 35-75 µm long, 45-50 µm diam., cylindrical or conical, ostiolate, periphysate. Peridium: 5-11 µm thick, composed of several layers. Paraphyses: 1-2 µm wide, extending beyond the asci,

hypha-like, numerous. Asci: 65-80 x 7-11 μm , 8-spored, cylindrical to clavate, pedunculate, unitunicate, numerous, with a thin apical ring, persistent. Ascospores: 15-23 x 3.5-7 μm , biserriate, fusiform, straight or slightly curved, hyaline, ends rounded, 3-septate, septa occasionally oblique, gattulate, bipolar appendages present or absent; polar appendages unfurling in water to form fusiform elongated structures or becoming elongated and diffuse in water; appendages up to 20 μm long, 2 μm wide at the base.

Asexual morph: not observed.

Type: INDIA (Yashawant lake, Toranmal, Dhadgaon, Nandurbar, Maharashtra), on submerged decorticated wood, 12 June 2005, B. D. Borse (HCIO 52059), holotype.

Description: *Ascoma:* erect or horizontal, gregarious, hyaline, shining, pyriform, ostiolate, papillate, superficial with partially immersed base, provided with septate pointed hairs (rhizoidal hairs) in the substratum, 155-215 μm high, 80-115 μm in diam. *Necks:* 35-75 μm long, 45-50 μm diam., cylindrical or conical, ostiolate, periphysate. *Peridium:* 5-11 μm thick, more thick around the neck, composed of several layers of compressed shining cells. *Paraphyses:* 1-2 μm wide, extending beyond the asci, hypha-like, numerous. *Asci:* 65-80 x 7-11 μm , 8-spored, cylindrical to clavate, pedunculate, unitunicate, numerous, apically flattened, with a thin apical ring, persistent. *Ascospores:* 15-23 x 3.5-7 μm , overlapping biserriate, fusiform, straight or slightly curved, hyaline, smooth-walled, ends rounded, 3-septate, septa occasionally oblique, gattulate, bipolar appendages present or absent; appendaged unfurling in water to form fusiform elongated structures or becoming elongated and diffuse in water; appendages up to 20 μm long, 2 μm wide at the base.

DISCUSSION

The aim of this paper is to describe new genus *Ascohyalinospora* with its type species *A. aquaticum* as a new taxon. The genus differs among other freshwater genera of ascomycetes because of its unique combinations of characteristics. These include: (i) hyaline, superficial, glistening, and gregarious (in hundreds) ascomatas with conical necks and easily seen on submerged decorticated wood; (ii) septate pointed hairs (rhizoidal hairs) at the basal region of ascomata; (iii) persistent and unitunicate asci with a refractive apical ring; (iv) 3-septate, hyaline, and gattulate (lipid globules) ascospores and with or without amorphous polar gelatinous long appendages.

It is also possible that in adapting to the harsh environment this fungus have septate pointed hairs (rhizoidal hairs) inserted in the substratum at the basal region of the ascomata to avoid detachment from the substratum by turbulent water currents at the stream / lake shore of water or by harsh air currents when the substratum exposed to air in summer seasons (dry up of water). Furthermore, rhizoidal hairs may absorb nourishments from deep regions of the substrata as the most of the mycelium with wide hyphae are superficial which bear hundreds of ascomatas.

The presence of appendages that exposed in water occurs in many freshwater (Shearer, 1993) and marine (Kohlm. and Kohlm., 1979) ascomycetes. It is thought to be an adaptation that allows ascospores to attach to substratum in turbulent moving water.

It is also possible that in adapting to the aquatic environment this fungus might have lost the ability to form pigmented, thick-walled ascomata, pigmented ascospores and adapted for dispersal of ascospores with bipolar appendages when the substratum is submerged and non- appendaged when substratum is exposed to air in dry seasons. The bipolar appendages may add in their attachment to the substratum. Furthermore, the presence of lipid globules in the ascospores may facilitate its flotation.

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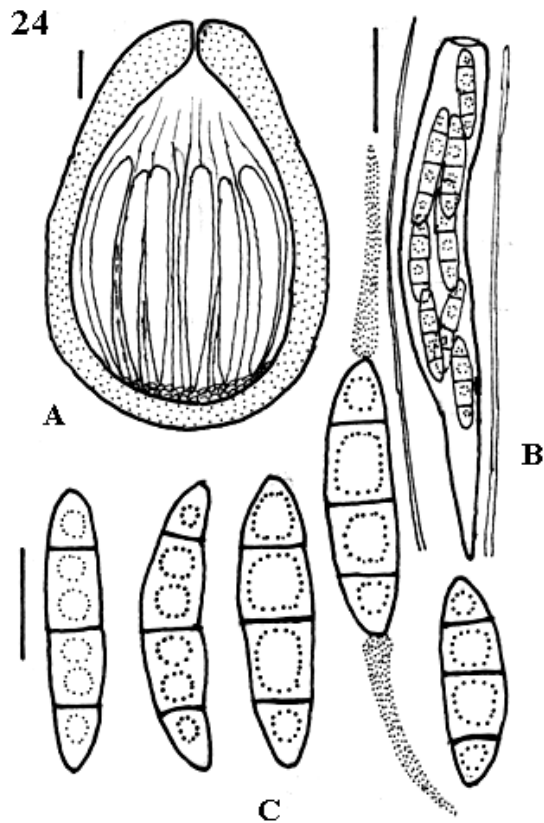
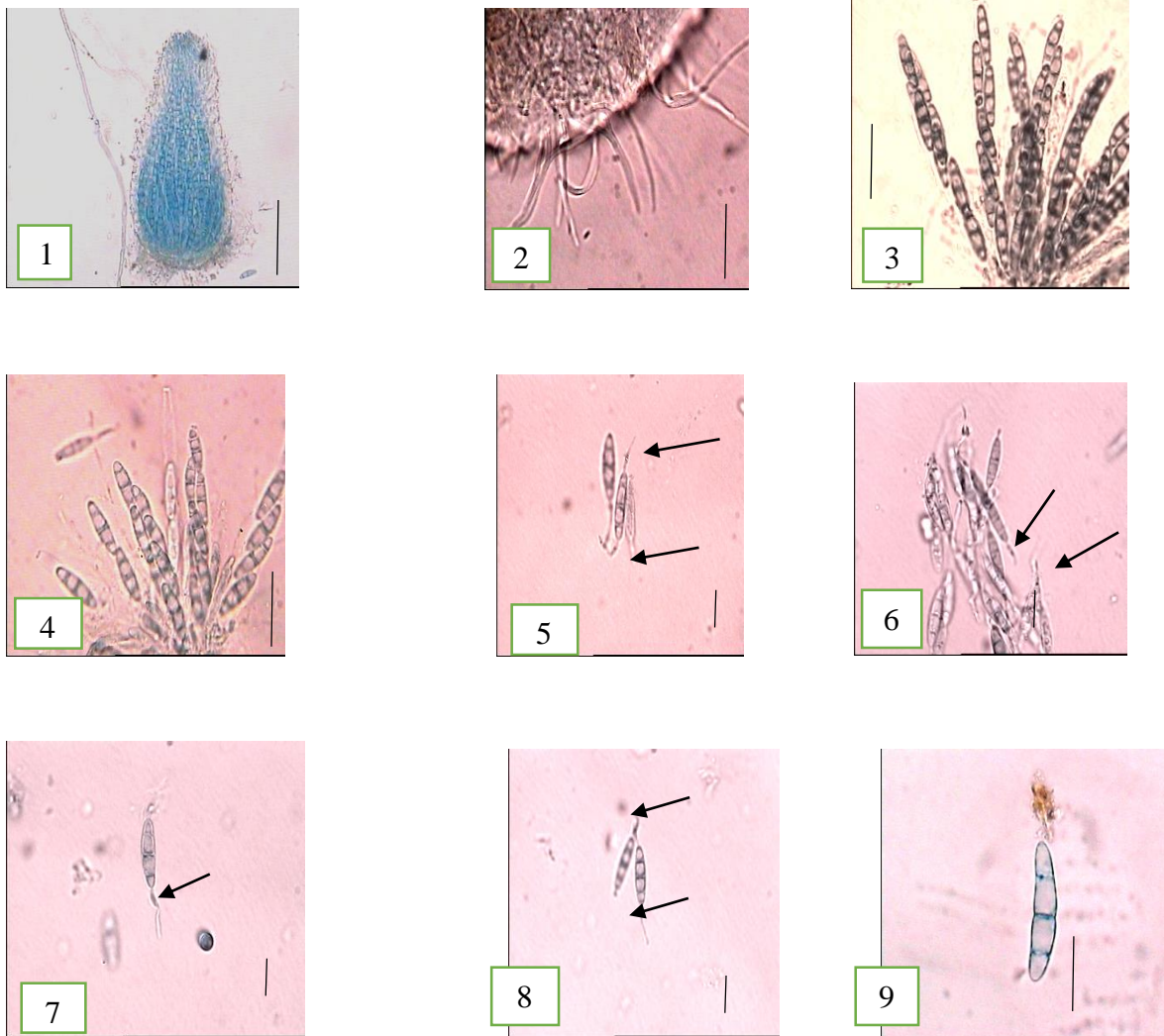


Fig. 1. *Ascohyalinospora aquaticum*: a- Ascomata, b-Ascus and paraphyses, c- Ascospores (scale bars: A- 10 µm; B- 10 µm; C- 10 µm)

Fig. 2.



1) Hyaline glistening ascoma, (Scale bar = 50 µm) 2) Ascoma basal spine, (scale bar= 10 µm)
 3) Asci scale bar= 40 µm 4) Asci showing apical ring (arrow), Scale bar= 40 µm
 5,6) Spores with polar appendages (arrow) Scale bar= 10 µm
 7,8) Spores with polar appendages (arrow), 9) Non appendaged spores Scale bar= 10 µm