



DIVERSITY OF FRESHWATER FUNGI FROM AHMEDNAGAR

DISTRICT (M.S., INDIA): INGOLDIAN FUNGI

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ABSTRACT:

The present paper deals with 11 species of freshwater Mitosporic fungi of the ecological group Ingoldian Fungi. They were isolated from submerged leaf litter and conidia in foam samples from various study sites in Ahmednagar district (Maharashtra, India). These fungi include: *Anguillospora crassa* Ingold, *A. gigantea* Ranzoni, *A. longissima* (Sacc. & P. Syd.) Ingold, *Angulospora aquatica* Sv. Nilsson, *Articulospora tetracladia* Ingold, *Brachiosphaera tropicalis* Nawawi, *Campylospora chaetoclada* Ranzoni, *C. filicladia* Nawawi, *C. leptosoma* Marvanova & Laichmanova, *Clavariana aquatica* Nawawi, and *Clavatospora tentacula* Sv, Nilsson. All these fungi are being recorded for the first time from Ahmednagar district. The data provides information on the distribution of these fungi in India, apart from description and illustrations.

Key words: Freshwater, Foam samples, Ingoldian fungi, Submerged leaves

INTRODUCTION:

Inhibitory effects of certain plants have been Aquatic Hyphomycetes (also called Freshwater Fungi or Ingoldian Fungi) commonly occur on submerged decaying leaves in fast flowing streams and sporulating underwater (Ingold, 1975). These were first highlighted by late Prof. C.T. Ingold in his monographic article (Ingold, 1942). Later, in literature they are also known as "Water-borne conidial fungi" delimited from other fungi by their well developed branched, septate, mycelia with usually thin-walled hyaline (non pigmented) asexual (mitotic) spores (conidia) having characteristic shapes – stauroform (tri- or tetracladate), scolecoform (needle shaped or sigmoid) and helicoform.

MATERIALS AND METHODS :

The submerged leaves and foam samples were collected from each study site and analysis was done by the following methods:
Leaf litter analysis: Submerged leaves of different kinds were collected randomly from sampling sites and brought to the laboratory in moist polythene bags. They were washed several times in tap water and finally in distilled water. They were cut into small bits and incubated separated in Petri dishes containing distill water at laboratory temperature (25 - 30°C). The water was replaced in Petri dishes once in two days to minimize the growth of bacteria and other organisms. The leaf bits were screened under an inverted microscope at 24 hours intervals for 60 days to detect the water borne fungi appearing on them.

Foam

analysis: Foam samples were placed in cleaned wide mouthed plastic bottles and kept for 24 hours to enable the foam to dissolve. It was prepared by adding FAA to yield 5% foam solution. Then samples were brought to laboratory and scanned under high power of a microscope using 15x eyepieces for the presence of conidia of Ingoldian Hyphomycetes.

Systematic account:

1) *Anguillospo crassa* Ingold, *Trans. Br. Mycol. Soc.*, 41: 367 (1958).
Conidia: hyaline, sigmoid, S- or L-shaped, 5-10-septate, 120-200 µm long, 15-20 µm wide in the middle region tapering to 8-10 µm at the ends.

Habitat: Conidia in foam samples, Pravara river (at Sangamner), 05 October 2014, leg. D.S. Borade.

Distribution in India: Karnataka, Uttarakhand, Maharashtra, Kerala, Andhra Pradesh, Gujarat, and Madhya Pradesh (see Borse et al. 2016, 2017).

2) *Anguillospora gigantea* Ranzoni, *Farlowia*, 4: 363 (1953).

Conidia: hyaline, sigmoid or falcate, scolecosporus, 150-750 µm long, 5-6 µm broad in the middle and tapering gradually to 2.5-3 µm broad at the tips, 6-10 celled.

Habitat: Conidia in foam samples, Mula river (at Newasa, Devgad), 08 September 2013, leg. D.S. Borade.

Distribution in India: Karnataka and Maharashtra (see Borse et al. 2016, 2017).

3) *Anguillospora longissima* (Sacc. & P. Syd.) Ingold, *Trans. Br. Mycol. Soc.*, 25: 401 (1942).

Conidia: aleuriospores, terminal, eel-like, 200-350 µm long, 5-6 µm broad in the middle region, tapering to 3-4 µm broad at the ends, 6-10-

septate, curved or sigmoid, hyaline, separating when mature by the breakdown of a small 'separating cell' at the end of the conidiophore.

Habitat: On submerged leaves, Godavari river (at Kopergaon), 08 September 2013, leg. D.S. Borade.

Distribution in India: Maharashtra, Tamil Nadu, Uttarakhand, Karnataka, Kerala, Madhya Pradesh, and Andhra Pradesh (see Borse et al. 2016, 2017).

4) *Angulospora aquatica* Sv. Nilsson, *Sv. Bot. Tidskr.*, 56: 354 (1962).

Conidia: hyaline, unicellular, 75-100 μm long, 1.5-2 μm broad, tapering to 1 μm broad at the apex, curved or sigmoid, mostly with right and sharp angles and usually in more than one plane.

Habitat: Conidia in foam samples, Pravra river (at Shrirampur), 20 November 2014, leg. D.S. Borade.

Distribution in India: Karnataka, Maharashtra and Gujarat (see Borse et al. 2016, 2017).

5) *Articulospora tetracladia* Ingold, *Trans. Br. Mycol. Soc.*, 25: 372 (1942).

Conidia: hyaline, with four long divergent arms; the first formed arm 20-35 μm long, 3 μm broad, 1-2 septate; the other three arms 50-75 μm long, 3 μm broad, 1-3 septate, each with a narrow constriction or isthmus where it joins the short arm.

Habitat: Conidia in foam samples, Pravara river (at Bhandardara), 18 August 2013, leg. D.S. Borade.

Distribution in India: Maharashtra, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, and Uttarakhand (see Borse et al. 2016, 2017).

6) *Brachiosphaera tropicalis* Nawawi, In: Descals et al., *Trans. Br. Mycol. Soc.*, 67: 213 (1976).

Conidia: The mature conidia consist of a spherical body, 46-58 μm diam, and filled with numerous small spherical globules up to 6 μm diam. The spherical body is yellowish brown and furnished with 4-7 radiating arms, 95-180 μm long, 9-11 μm wide at the widest point, tapering to 4-5 μm wide at the rounded apex, constricted to 3-5 μm at the point of origin and becoming 3-5 septate. The spherical body is multinucleate and each cell of the arms contain up to 8 nuclei.

Habitat: Conidia in foam samples, Mula river (at Mual dam at Rahuri), 9 December 2011, leg. D.S. Borade.

Distribution in India: Maharashtra and Karnataka (see Borse et al. 2016, 2017).

7) *Campylospora chaetocladia* Ranzoni, *Farlowia*, 4: 353-398 (1953).

Conidia: aleurisporous, hyaline, terminal, multicellular, each consisting of a basal cell 8-12 μm wide, 10-14 μm long, with two divergent appendages of approximately the same length, 35-50 μm long, 3-6 μm wide at the point of attachment to the basal cell and tapering to about 1.5 μm at the tips, and a lateral branch, 10-25 μm long attached perpendicularly to the transverse axis of the conidium and bearing at each end an appendage similar in appearance to those on the basal cell.

Habitat: On submerged leaves and conidia in foam samples, Mula river (at Mula dam Rahuri), 09 December 2011, leg. D.S. Borade.

Distribution in India: Uttarakhand, Karnataka, Kerala, Andhra Pradesh, Maharashtra, Gujarat, and Madhya Pradesh (see Borse et al. 2016, 2017).

8) *Campylospora filicladia* Nawawi, *Trans. Br. Mycol. Soc.*, 63: 603 (1974).

Conidia: consists of two distinct halves: The proximal half is triangular, 4-celled, 6-7 μm high and 10-12 μm wide. The distal half is allantoid, 4-celled, 9-13 μm long and 3-4.5 μm wide. Viewed either from the top or bottom, the conidium is more or less rectangular, 4-4.5 μm thick with a round or conical projections at each corner. The appendages arising from the end cells are lie along the long axis. The projection opposite the origin of each appendage is bigger and rounder. The two appendages at the top of the conidium are usually longer (15-35 μm) than the lateral appendages (7-17 μm). They are always directed opposite each other and are more or less perpendicular to the lateral appendages. Surface view of the conidium always shows these two appendages to be in a crossed position.

Habitat: Conidia in foam samples, Bhima river (at Karjat), 26 August 2012, leg. D.S. Borade.

Distribution in India: Karnataka, Kerala, Tamil Nadu, and Maharashtra (see Borse et al. 2016, 2017).

9) *Campylospora leptosoma* Marvanova & Laichmanova, *Mycosphere*, 5: 250 (2014).

Conidia: septate, slightly constricted at septa; the triangular part is 3-4-septate, 6-10 x 11-23 μm , the heel-like pedicel is typically cylindrical, widened only just below the foot of the lateral arm, 1-1.7 x 2-5 μm ; the allantoid part is 3-septate, 9-19 x 3-5 μm ; conidial end cells are apically rounded or rarely conoid, the two juxtaposed distal ones often semi-dome shaped with adjacent sides flattened and parallel; each end cell bears a single appendage; appendages are parallel-walled or slightly tapering distally, 15-35 x 1-1.5 μm , typically distinctly constricted or rarely cylindrical at insertion, straight or

gently curved, mostly terminal, but on the distal conidial ends sometimes subterminal, crossed or diverging, rarely parallel or abruptly recurved. Top or bottom view of the conidial body is fusoid. Conidial hilum is flat or somewhat bulged, slightly thickened.

Habitat: Conidia in foam samples, Godavari river (at Kopergaon), 24 December 2011, leg. D.S. Borade.

Distribution in India: Maharashtra (see Borse et al. 2016, 2017).

10) *Clavariana aquatica* Nawawi, In: Descals et al., *Trans. Br. Mycol. Soc.*, **67**: 217 (1976).

Conidia: obpyriform to broadly clavate, 5-8 µm wide at the base, broadening to 24-33 µm above; three arms are more or less of the same length develop from its crown, 53-160 µm long, 3-5 µm at its widest point and tapering to 2-2.5 µm at the apex, 0-2-septate; forth arm arises through the detachment scar with same length as the rest of the arms, with age the central body becomes highly vacuolated.

Habitat: Conidia in foam samples, Ghod river (at Shrigona), 5 December 2011, leg. D.S. Borade.

Distribution in India: Uttarakhand, Maharashtra and Karnataka (see Borse et al. 2016, 2017).

11) *Clavatospora tentacula* Sv. Nilsson, *Symb. Bot. Upsal.*, **18**: 89 (1964).

Conidia: hyaline, tetradiate; main axis clavate, elongate, 0-6 septate, 30-75 µm long, 1.5-2.5 µm wide at base, 4-7 µm wide at apex; with 3 equidistant, divergent, 30-55 x 1-2.5 µm, appendages arising from apex and unstricted at base.

Habitat: Conidia in foam samples, Pravara river (at Akola), 16 December 2012, BAFAD- 32, leg. D.S. Borade.

Distribution in India: Maharashtra, Uttarakhand, Karnataka, Kerala, and Andhra Pradesh (see Borse et al. 2016, 2017).

ACKNOWLEDGMENTS:

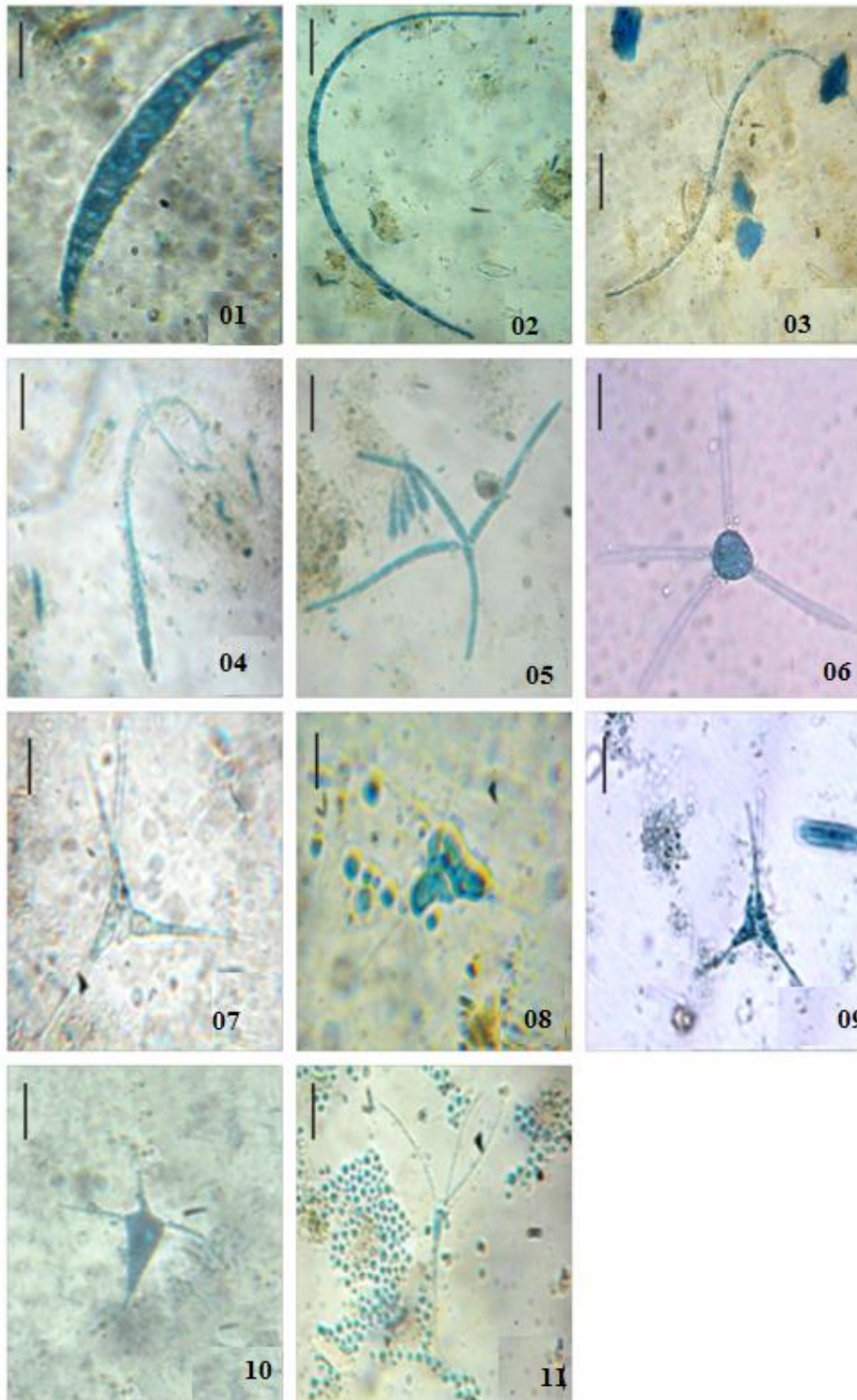
We are much obliged to the Hon' ble authorities of M. V. P. Samaj (Nashik), Hon' ble Prin. Dr. A.P. Patil, M.V.P. Samaj's Arts, Sci. and Com. College, Ozar, Dist.- Nashik (M.S.), and Hon' ble Prin. Dr.

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PHOTO PLATE



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| <p>1) <i>Anguillospora crassa</i> Ingold,
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