

FRESHWATER HIGHER FUNGI FROM MAHARASHTRA - I:



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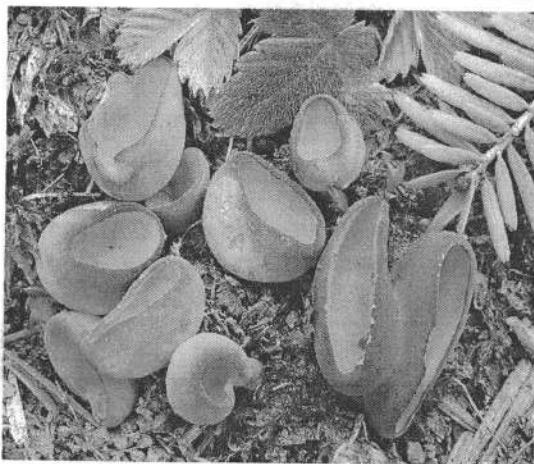
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ABSTRACT

The present paper records the occurrence of ten species of Mitosporic fungi viz., 1) *Arborispora palma* K. Ando, 2) *Chaetendophragmia africana* (Piron.) B. Sutton & Hodges, 3) *Condylospora spumigena* Nawawi, 4) *Dendrosporium lobatum* Plakidas & Edgerton ex J.L. Crane, 5) *Dicranidion gracilis* Matsush., 6) *Helicomycetes torquatus* L.C. Lane & Shearer, 7) *Laridospora appendiculata* (Anastasiou) Nawawi, 8) *Speiropsis hyalospora* Subram. & Lodha, 9) *Tridentaria tylota* Drechsler, and 10) *Trinacrium robustum* Tzean & J.L. Chen; conidia of which were encountered in foam samples collected from different

streams in Maharashtra state (India). All the fungal species are being recorded for the first time from Maharashtra state except number 2, 7 and 8. The data provides information on the range of distribution of these fungi in India. Descriptions of conidia and illustrations are provided.

Keywords: Freshwater, Hyphomycetes, foam samples,

INTRODUCTION

There are more than 3000 species of freshwater fungi with a greater number known from temperate, as compared to tropical regions. Five groups are dominant which include Ascomycetes, (622 sp.) Chytrids (500-1289 sp.), Lichens (270 sp.), Mitosporic fungi (531 sp.), and Trichomycetes (183 sp.). The fungi occurring in lentic habitats mostly differ from those occurring in lotic habitats. Freshwater fungi are thought to have evolved from terrestrial ancestors. Many species are clearly adapted to life in freshwater as their propagules have specialized aquatic dispersal abilities. These fungi are involved in the decay of wood, leaves and other organic material and also cause diseases of aquatic plants and animals (Wong et al., 1998; Jones et al., 2014)

The paper records the occurrence of ten species of Mitosporic fungi viz., 1) *Arborispora palma*, 2) *Chaetendophragmia africana*, 3) *Condylospora spumigena*, 4) *Dendrosporium lobatum*, 5) *Dicranidion gracilis*, 6) *Helicomycetes torquatus*, 7) *Laridospora appendiculata*, 8) *Speiropsis*

hyalospora, 9) *Tridentaria tyloata*, and 10) *Trinacrium robustum* conidia of which were encountered in foam samples collected from different streams in Maharashtra state (India). All the fungal species are being recorded for the first time from Maharashtra state except number 2, 7 and 8. The data provides information on the range of distribution of these fungi in India. Descriptions of conidia and illustrations are provided.

Materials and Methods:

Foam samples (10 ml) were collected from various sites and rivers (Panzara, Kan, Pravara, Tapi, and Koyana rivers) in plastic bottles and kept for 24 hours to enable the foam to subside. They were fixed in FAA to yield 5 % foam solution at the collection spot or fixed in FAA taking 4 ml foam solution and 1 ml FAA. The samples were brought to the laboratory and examined under high power of research microscope to detect the conidia. Identifications of isolated species were confirmed with the help of Ingold (1942), Subramanian and Lodha (1964), Drechsler (1964), Matsushima (1971), Crane (1972), Nawawi (1976a, b), Ellis (1976), Lane and Shearer (1984), Ando and Kawamoto (1986), and Tzean and Chen (1989). Reports of fungi studied were confirmed with the help of Bilgrami et al. (1991), Sridhar et al., (1992) and Jamaludeen et al. (2004).

Systematic account:

1) ***Arborispora palma* K. Ando** :In: Ando and Kawamoto, Trans. Mycol. Soc. Japan, 27: 120 (1986).

Conidia: (Fig. 1), hyaline, septate, staurosporous composed of a main axis and four primary branches. Main axis is 2-4 septate, 20-30 μm long, 1-2 μm broad in the basal half, and up to 1 μm wide at the truncate base. First primary branches develop from the basal or second cell of the main axis at the same level and at a right angle to the main axis, 1-4 septate, 10-20 μm long, 1.5-2 μm wide, constricted basally. Second primary branches develop from the base of the first primary branches, 0-2 septate, 9-14 μm long, 1-2 μm wide, constricted at the base.

Habitat: Conidia in foam samples; Koyna river (Mahabaleshwar), 16 August, 2015; Leg. P.E. Jagdale.

Distribution:- Karnataka: On submerged leaves in tree holes (Karamchand and Sridhar, 2008); Gujarat: Conidia in foam samples (Borse et al., 2015).

2) ***Chaetendophragmia africana* (Piron.) B. Sutton & Hodges**: Nova Hedwigia, 29: 599 (1978).

❖ *Chaetendophragmia triangularia* Matsush. var. *africana* Piron.; Mycol. Pep., 129: 42-44 (1972).

Conidia: (Fig. 2), 30-45 μm long, 7-9 μm wide in the broadest part, mostly 4-septate; rostrum usually 20-40 μm long but occasionally up to 50 μm long; lateral appendages 20-35 μm long, narrow, tapering.

Habitat: Conidia in foam samples; Koyna river (Mahabaleshwar), 16 August, 2015; Leg. P.E. Jagdale.

Distribution:- Karnataka: On submerged leaves (Rajashekar and Kaveriappa, 1992); Maharashtra: Conidia in foam samples (Ghanwat and Reddy, 2011).

3) ***Condylospora spumigena* Nawawi**: Trans. Br. Mycol. Soc., 66: 363 (1976a).

Conidia: (Fig. 7), hyaline, cylindrical. 10-15 septate, bent backward on itself just after the half-way mark and again a short distance away. Thus the distal half of the conidium forms an angle of 30-120° with the proximal half. The proximal half is straight to slightly curved and is longer (40-55 μm) than the distal half (35-50 μm); the overall length being 80-100 μm . The base is 1.5 μm wide, broadening to 2-3 μm at the widest point.

Habitat: Conidia in foam samples; Tapi river (Bhusawal), 2 August, 2015; Leg. V.R. Patil.

Distribution:- Karnataka: Conidia in foam samples (Subramanian and Bhat, 1980); Kerala: Conidia in foam samples (Subramanian and Bhat, 1980); Tamil Nadu: Conidia in foam samples (Subramanian and Bhat, 1980).

4) *Dendrosporium lobatum* Plakidas & Edgerton, : Mycologia, 28: 84 (1936); Crane, Trans. Br. Mycol. Soc., 58: 423 (1972).

Conidia: (Fig. 3), hyaline, flattened to slightly concave or convex, somewhat triangular, deeply constricted, mostly three-lobed on each side, $4 \times 8 \times 12-13 \mu\text{m}$, the basal lobe being the largest, 1-septate above the basal lobes, pointed at the apex, the two cells being of unequal length.

Habitat: Conidia in foam samples; Pravara river (Bhandardara), 9 August, 2015; Leg. D.S. Borade.

Distribution:- Karnataka: On submerged leaves (Rajashekhar and Kaveriappa, 2003); Madhya Pradesh: On submerged leaves and conidia in foam samples (Upadhyaya et al., 2012); ; Gujarat: Conidia in foam samples (Borse et al., 2015).

5) *Dicranidion gracile* Matsush: Microfungi of the Solomon Islands and Papue-New Guinea, p. 24 (1971).

Conidia: (Fig. 4), bi-lobed, forked, hyaline, basal part 1-2-septate, obovate, 8-14 μm long, at the base of up to μm wide, apex in the place of lobes 4-5 μm wide; lobes 15-25 μm long, near the base 3.5-4 μm wide, slightly reduced toward the apex, apex rounded, 4-5-septate, lobes diverging at an angle of 300 - 450, lobes sometimes parallel.

Habitat: Conidia in foam samples; Panjara river (Latipada, Dhule), 9 August, 2015; Leg. B.D. Borse.

Distribution:- Karnataka: Conidia in stem flow and through fall (Sridhar and Karamchand, 2009); Gujarat: Conidia in foam samples (Borse et al., 2015).

6) *Laridospora appendiculata* (Anastasiou) Nawawi : Trans. Br. Mycol. Soc., 66: 344 (1976b).

❖ *Dactylella appendiculata* Anastasiou, Pacific Sci., 28: 202 (1964).

Conidia: (Fig. 5), consists of a 5-6 celled main axis, 75-80 μm long with a bend in the sub-basal cell, hyaline. The basal cell is 1-2 μm wide at the base, 11-19 μm at the middle and tapers to 2-3 μm at the apex. The lateral branches are 1-4 in number, 40-90 μm long, 1-2 μm wide and 1-3-septate.

Habitat: Conidia in foam samples; Koyna river (Mahabaleshwar), 16 August, 2015; Leg. P.E. Jagdale.

Distribution:- Maharashtra: On submerged leaves (Thakur, 1977); Karnataka: Conidia in foam samples (Subramanian and Bhat, 1980); Kerala: Conidia in foam samples (Subramanian and Bhat, 1980); Tamil Nadu: Conidia in foam samples (Subramanian and Bhat, 1980); Madhya Pradesh: Conidia in foam samples (Upadhyaya et al., 2012).

7) *Helicomycetes torquatus* L.C. Lane & Shearer : Mycotaxon. 19: 291-294 (1984).

Conidia: (Fig. 8), hyaline, multiseptate, coiled 2 to 3 times, 55-130 μm diam, end cells broadly spathulate, end of basal cell bearing flattened attachment scar, $400 - 500 \times 5 - 7 \mu\text{m}$.

Habitat: Conidia in foam samples; Kan river (Dahiwel, Dhule), 16 August, 2015; Leg. B.D. Borse.

Distribution:- Karnataka: Conidia in foam samples (Ramesh, 2002); Madhya Pradesh: Conidia in foam

samples (Patil et al., 2014); Gujarat: Conidia in foam samples (Borse et al., 2015).

8) *Speiropsis hyalospora* Subram. & Lodha

Can. J. Bot., 42: 1060 (1964). Conidia: (Fig. 6), hyaline. Each conidium consists of a main axis composed of six to eight cells, each separated by a narrow isthmus and usually two lateral arms similarly composed of several cells, but fewer in number, and separated by isthmi. One of the arms arise laterally from near the distal end of the basal cell of the conidium, the second arm similarly from the second cell from the base, the first arm being longer than the second. The first arm is 5- to 6-celled and 42-60 x 5-5.5 μm ; the second arm is 3- to 4-celled and 30-40 x 4-5 μm . The arms mostly arise from opposite sides of the main axis of the spore. The main axis of the spore is widest in the middle, slightly narrower towards the base, more so toward the apex, often bent, falcate or curved, rarely straight, 60-80 μm long and 5-5.5 μm wide where it is broadest).

Habitat: Conidia in foam samples; Pravara river (Bhandardara), 16 August, 2015; Leg. D.S. Borade.

Distribution:- Maharashtra: Conidia in foam samples (Patil and Kapadnis, 1979); Karnataka: On submerged leaves (Sridhar and Kaveriappa, 1985b); Kerala: On submerged leaves, conidia in foam and water samples (Sridhar and Kaveriappa, 1985a).

9) *Tridentaria tylota* Drechsler : Sydowia, 18: 359 (1964).

Conidia: (Fig. 9), hyaline, consisting of 4-6 parts in trident-like arrangement: the basal trunk that corresponds to the shaft of a trident being club-shaped, usually divided by 3-4 septa, mostly 19-30 μm long, 1-1.5 μm thick at the base, widening gradually upward to a diam. of 3-5 μm near the broadest rounded tip, whereon are borne 3-5 divaricated prongs; the prongs invariably clavate, mostly 13-24 μm long, 3-4 μm wide near the base, 1-2 μm wide near the rounded tip, divided by 1-3 septa into 2-4 cells; the wider upper cells of the shaft and the lower cells of the prongs often becoming studded with several (1 to 6) adhesive protuberances.

Habitat: Conidia in foam samples; Koyna river (Mahabaleshwar), 16 August, 2015; Leg. P.E. Jagdale.

Distribution:- Uttara Pradesh: Parasiting oospores of *Pythium zeae* on submerged leaves of maize. (Singh, 1972).

10) *Trinacrium robustum* Tzean & J.L. Chen : Mycol. Res., 93: 391 (1989).

Conidia: (Fig. 10), Y-shaped, smooth, hyaline, main axis clavate, 1-6 but mostly 2-3-septate, 15-20 μm long, 3.8-6.3 μm wide, usually with 2 but rarely 3-4 divergent arms, 1-5 (mostly 2-3) septate, arms tattered and rounded at the ends, 10-25 μm long, 5-6 μm wide, slightly constricted at the septa.

Habitat: Conidia in foam samples; Pravara river (Bhandardara), 16 August, 2015; Leg. D.S. Borade.

Distribution:- Karnataka: On submerged leaves (Karamchand and Sridhar, 2008).

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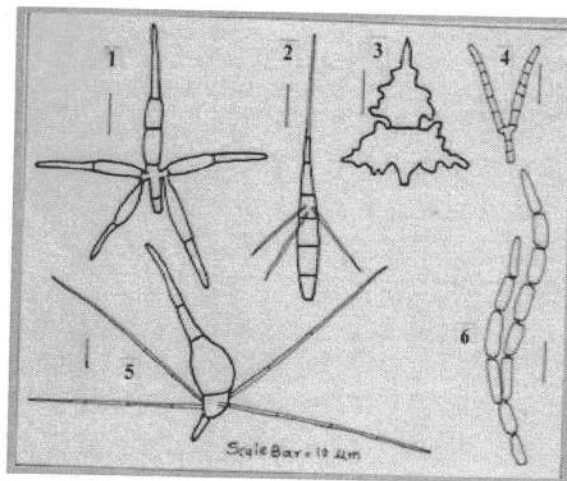
References:

- 1) Ando, K. & Kawamoto, I. (1986a) *Arborispora*, a new genus of Hyphomycetes. *Trans. Mycol. Soc. Japan*, 27: 119-128.
- 2) Bilgrami, K.S., Jamaludeen, S. & Rizwi, M.A. (1991) "Fungi of India", Today and Tomorrow's Printers and Publishers, New Delhi, pp. 798.
- 3) Borse, B.D., Patil, V.S. & Patil, V.R. (2015) Freshwater fungi from Tapi district (Gujarat, India): Stream spora. *Annals Pl. Sci.*, 4: 1131-1136.
- 4) Crane, J.L. (1972) Illinois fungi-III. *Dendrosporium lobatum* and *Sporidesmium taxodii* sp. nov. *Trans. Br. Mycol. Soc.*, 58: 423-426.
- 5) Drechsler, C. (1964) A *Tridentaria* subsisting on testaceous rhizopods and *Pythium* oospores. *Sydowia*, 18: 359-363.
- 6) Ellis, M.B. (1976) "More Dematiaceous Hyphomycetes", CAB International Mycological Institute, Kew, England, UK, pp. 1-507.
- 7) Ghanwat, S.P. & Reddy, P.G. (2011). Notes on Hyphomycetes from fresh water habitats in Ahmednagar district, Maharashtra (India). *Bioinfolet*, 8: 359-362.
- 8) Ingold, C.T. (1942) Aquatic Hyphomycetes of decaying alder leaves. *Trans. Br. Mycol. Soc.*, 25: 339-417.
- 9) Jamaludeen, S., Goswami, M.G. & Ojha, B.M. (2004) "Fungi of India (1989-2001)", Scientific Publishers (India), Jodhpur, pp. 1-308.
- 10) Jones, E.B.G., Hyde, K.D. & Pang, K.L. (eds.) (2014) Introduction. In: "Freshwater Mycology and Fungal-Like Organisms", Walter de Gruyter, GmbH, Berlin, Germany, pp. 1-22.
- 11) Karamchand, K.S. & Sridhar, K.R. (2008) Water-borne conidial fungi inhabiting tree holes of the West coast and Western Ghats of India. *Czech Mycol.*, 60: 63-74.
- 12) Lane, L.C. & Shearer, C.A. (1984) *Helicomyces torquatus*, a new Hyphomycete from Panama. *Mycotaxon*, 19: 291-297.
- 13) Matsushima, T. (1971) Microfungi of the Solomon Islands and Papua-New Guinea. Published by author, Kobe, pp. 78.
- 14) Nawawi, A. (1976a) *Condylospora* gen. nov., a Hyphomycete from a foam sample. *Trans. Br. Mycol. Soc.*, 66: 363-365.
- 15) Nawawi, A. (1976b) A new genus of Hyphomycetes. *Trans. Br. Mycol. Soc.*, 66: 344-347.
- 16) Patil, D.K., Patil, K.B. & Borse, K.N. (2014) Some Aquatic Hyphomycetes from Khandwa District of MP, India. *Int. Res. J. Biol. Sci.*, 3: 53-56.
- 17) Patil, S.D. & Kapadnis, B.P. (1979) Stream spora of Maharashtra. *M. V. M. Patrika*, 14: 59-64.
- 18) Rajashekhar, M. & Kaveriappa, K.M. (1992) New records of water-borne Hyphomycetes from India. *Indian Phytopath.*, 45: 138.
- 19) Rajashekhar, M. & Kaveriappa, K.M. (2003) Diversity of aquatic Hyphomycetes in the aquatic ecosystems of the Western Ghats of India. *Hydrobiologia*, 501: 167-177.
- 20) Ramesh, Ch. (2002) Seasonal occurrence of water borne fungi in different streams of Uttar Kannada region, Karnataka state, India. *Kavaka*, 30: 31-52.
- 21) Singh, R.N. (1972) *Tridentaria tylota* on *Pythium zae* in India. *Mycopath et Mycol. appl.*, 46: 247-248.
- 22) Sridhar, K.R. & Karamchand, K.S. (2009) Diversity of water-borne fungi in stemflow and throughfall of

- tree canopies in India. *Sydowia*, 61: 347-364.
- 23) Sridhar, K.R. & Kaveriappa, K.M. (1985a) Water-borne fungi of Kunthi river in Silent vally, Kerala. *Ind. Phytopath.*, 38: 371-372.
- 24) Sridhar, K.R. & Kaveriappa, K.M. (1985b) Water-borne Hyphomycetes of the Western Ghat forest. *Ind. Phytopath.*, 38: 557-558.
- 25) Sridhar, K.R., Chandrashekar, K.R. & Kaveriappa, K.M. (1992) Research on the Indian Subcontinent. In: "The Ecology of Aquatic Hyphomycetes" (ed. Balocher, F.), Spinger-Verlag, Berlin, pp. 182-211.
- 26) Subramanian, C.V. & Bhat, D.J. (1981) Conidia from fresh water foam samples from the Western Ghats, Southern India. *Kavaka*, 9: 45-62.
- 27) Subramanian, C.V. & Lodha, B.C. (1964) Two interesting Hyphomycetes. *Can. J. Bot.*, 42: 1057-1063.
- 28) Thakur, S.B. (1977) Survival of some aquatic Hyphomycetes under dry conditions. *Mycologia*, 69: 843-845.
- 29) Tzean, S.S. & Chen, J.L. (1989) A new species of *Trinacrium* from Taiwan. *Mycol. Res.*, 93: 391-393.
- 30) Upadhyaya, A., Singh, J., Tiwari, J. & Gupta, S. (2012) Biodiversity of water borne conidial fungi in Narmada River. *International Multidisci. Res. Journal*, 2: 20-22.
- 31) Wong, M.K.M., Goh, T.K., Hodgkiss, I.J., Hyde, K.D., Ranghoo, V.M., Tsui, C.K.M., Ho, W.H., Wong, S.W. and Yuen, T.C. (1998) The role of fungi in freshwater ecosystems. *Biodivers. Conserv.*, 7: 1187-1206.

Fig. Legends:

Figs. Conidium: 1: *Arborispora palma*, 2: *Chaetendophragmia africana*, 3: *Dendrosporium lobatum*, 4: *Dicranidion gracilis*, 5: *Laridospora appendiculata*, 6: *Speiropsis hyalospora*, (Scale bar = 10 μ m).



FRESHWATER HIGHER FUNGI FROM MAHARASHTRA - I:

- Fig. 7: Conidium of *Condylospora spumigena*,
Fig. 8: Conidium of *Helicomyces torquatus*,
Fig. 9: Conidium of *Tridentaria tylota*,
Fig. 10: Conidium of *Trinacrium robustum*

