

Original Research Article

Fresh Water Fungi from Pachmarhi (Madhya Pradesh)

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Abstract: The present paper deals with four species of fungi encountered on submerged woody debris in freshwater habitats. Among them *Trinacrium subtile* Riess *Varicosporium elodeae* W. Kegel, *Canalisporium pallidum* Goh et al., and *Delortia palmicola* Pat. are new records for the fungi of India Chen et al., *Sporoschisma saccadoi* Mason and Hughes, and *Sporoschisma uniseptatum* Bhat and Kendrick are being recorded for the first time from Maharashtra state. The data provides information on the distribution of these fungi in India, apart from their description and illustrations.

Key words: Freshwater, Hyphomycetes, submerged wood

Introduction

The "Submerged freshwater Hyphomycetes" is one of the ecological groups of freshwater mitosporic fungi, first addressed by Ingold (1975), represent a heterogeneous assemblage of fungi growing on submerged decaying plant materials. These fungi can be classified into two main types based on Park (1972), namely indwellers and immigrants. Species in several genera of freshwater mitosporic fungi like *Aquaphila*, *Camposporidium*, *Canalisporium* etc., can be classified as indwellers because they have been reported only from freshwater habitats. Whereas, species that belong to genera such as *Delortia*, *Dictyosporium*, *Sporochisma*, etc. can be classified as immigrants because they are reported from terrestrial as well as freshwater habitats. Goh and Tsui (2003) provide a key to some common genera of freshwater dematiaceous mitosporic fungi that have been reported from worldwide.

Recent biodiversity studies have revealed a number of undiscovered "Submerged freshwater Hyphomycetes" from different parts of the world (Su et al., 2011; Yang et al., 2012; Liu and Cai, 2013). The present paper deals with six species of fungi encountered on submerged woody debris in freshwater habitats. Among them *Canalisporium pallidum* Goh et al., and *Delortia palmicola* Pat. are being recorded for the first time from India. *Sporoschisma saccadoi* Mason and Hughes, and *Sporoschisma uniseptatum* Bhat and Kendrick are new addition to the fungi of Maharashtra state which are described and illustrated in the present paper.

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Materials and Methods

Samples of submerged woody debris were collected randomly during 2013-14 from different lentic and lotic habitats from Pachmarhi region. The samples were placed in plastic bags. On returning to the laboratory, samples were incubated in plastic boxes and kept moist by spraying with distilled water and periodically examined for presence of fungal growth. Permanent voucher slides of fungi were prepared according to the method "double cover glass" provided by Volkmann-Kohlmeyer and Kohlmeyer (1996). Identifications of isolated fungi were confirmed with the help of Nawawi & Kuthubudeen (1989), Goh et al., (1998), Goh and Hyde (1997), Chan et al., (1991), Goh et al., (1997), and Bhat and Kendrick (1993). Reports of fungi studied were confirmed with the help of Bilgrami et al., (1991), Jamaluddin et al., (2004) and relevant literature.

Systematic account:**1) *Varicosporium elodeae* W. Kegel***Ber. Dtsch. Bot. Ges.*, **24**: 213 (1906).

Conidia: consisting of a main axis 60-100µm long, 3µm wide, with one to three laterals of the same width developed on one side only of the main axis. Each of these laterals may branch again usually in the same one-sided manner. The degree of branching of the conidia varies considerably. At the point of origin of each branch of the conidium, is a narrow constriction or isthmus. The conidia may fragment to some extent by a part of the conidium breaking off at an isthmus.

Habitat: Conidia in foam samples; On submerged wood; Apsara vihar (Pachmarhi, M.P.); 11 Nov., 2014; Leg., S.A.chaudhari

Distribution in India: Assam: On submerged leaves (Bhattacharya and Baruh, 1953); Karnataka: Conidia in foam samples (Sridhar and Kaverippa, 1984); Andhra Pradesh: Conidia in water samples (Manoharachary and Galiah, 1987); Madhypardesh: Conidia in foam samples (Present studies).

2) *Trinacrium subtile* Riess

Beitrage zur mykologie, Haft. **2:** (1852).
Conidia: Y-shaped, hyaline, main axis 30-47µm long, 3-4µm thick, 2-4-septate; two divergent arms, 1-5-septate, 20-45µm long. Ando (1992) noted that *T. subtile* has an affinity for aquatic environment.

Habitat: Conidia in foam samples; On submerged wood; Denva river (Pachmarhi, M.P.); 11 Nov., 2014; Leg., S.A. Chaudhari

Distribution in India: Karnataka: On bracket leaves of fern *Drynaria quercifolia* (Sridhar et al., 2006); Madhypardesh: Conidia in foam samples (Present studies).

3) *Canalisporium pallidum* Goh, Ho & Hyde *Can. J. Bot.*, **76:** 148 (1998).

Sporodochia: scattered, punctiform, granular, dark grey, up to 200µm diam. **Mycelium:** mostly immersed in the substratum, composed of branched, septate, subhyaline, 1.5-2.5µm wide, smooth hyphae. **Conidiophores:** macronematous or semi-macronematous, mononematous, fasciculate, simple or sparsely branched, smooth, hyaline or subhyaline, up to 25µm long x 2-3µm wide. **Conidiogenous cells:** integrated, terminal, determinate, cylindrical and slightly vescculate. **Conidial secession:** schizolytic. **Conidia:** 25-39µm long x 16-20µm wide x 8-10µm thick, acrogenous, solitary, one-cell thick and flattened, smooth, more or less ellipsoidal or obovoid in surface view, slightly curved, cylindrical or broadly clavate in lateral view, pale olivaceous or very pale olivaceous brown, muriform, mostly with a slightly curved column of vertical septa and 4-5 rows of transverse septa, occasionally one or two of the central rows of cells may have additional 1-2 vertical septa, septa unpigmented, thin and canals visible, basal cell cuneiform, 2.5-3.5µm wide, thin-walled. Canals are also present in the transverse septa, only those on the concave side of the conidium, those on the convex side are not perforated.

Habitat: On submerged wood; Denva river (Pachmarhi, M.P.); 11 Nov., 2014; Leg., S.A.chaudhari

Distribution in India: Madhya Pardesh: Present work

Remarks: The present fungus is rare in occurrence. The descriptions and measurements of conidia and conidiophores are completely agreed with that of *Canalisporium pallidum* Goh, Ho & Hyde (1998). Therefore, it is assigned to that species. It is an addition to the fungi of M.P.

4) *Delortia palmicola* Pat.

Bull. De la Soc. Mycol. De France, **4:** 7-46 (1888).

Conidiomata: sporodochial, tuberculiform, gelatinous and milky white when fresh, up to 1 cm diam. becoming much smaller, amber-coloured, hard and inconspicuous when dried, composed of hyaline, septate, branched hyphae embedded in a gelatinous matrix.

Conidiophores: arise laterally as alternate or opposite branches of the vegetative hyphae near the surface of the sporodochium, multiseptate, hyaline thin-walled, determinate to indeterminate, 1.5-3µm wide, up to 100µm long, bearing terminal or lateral conidiogenous cells. **Conidiogenous cells:** intergrated, terminal or lateral, slightly inflated, clavate to ampulliform, 8-13 x 4-5µm, each producing a single conidium. **Conidia:** holoblastic, acrogenous, thin-walled, hyaline, surrounded by hyaline gelatinous sheath, (2-) 3 (-4) septate, 8-12µm wide, tightly coiled, U- or horseshoe-shaped, 15-22µm diam., the distal end rounded and the proximal end somewhat towards a wide flat, thin-walled, basal scar ca. 1.5µm diam.

Habitat: On submerged wood; Apsara river (Pachmarhi, M.P.); 11 Nov., 2014; Leg., S.A.chaudhari

Distribution in India: Maharashtra, M.P: On submerged wood

Remarks: The present fungus is occasional in occurrence. The descriptions and measurements of conidia and conidiophores are completely agreed with that of *Delortia palmicola* Pat. as provided by Goh and Hyde (1997). Therefore, it is assigned to that species. It is being reported for the first time from M.P.

5) *Sporoschisma saccadoi* E.W. Mason & S. Hughes

Mycolo. Pap., **31:** 20 (1949).

= *Sphaeria hemipsila* Berk. & Br., *Fungi of Cylon*, Thwaites, Nr. 1098 (1875).

= *Lasiosphaeria hemipsila* (Berk. & Br.) Sacc., *Syl. Fung.*, **2:** 198 (1883).

= *Chaetosphaeria hemipsila* (Berk. & Br.) Petch, Am. R. Bot. Gard., Peradenija, **6**: 336 (1917).

= *Chaetosphaeria coelestina* Hohn., Akad. Der Wissens. In Wein, **118**: 275-452 (1909).

Colonies: effuse, velutinous, composed of mixed tufts of conidiophores and sterile capitate hyphae. **Mycelium:** immersed, composed of pale to dark brown hyphae 2.5-4 μ m wide. **Capitate setae:** pale brown, becoming paler towards the apex, straight or slightly flexuous, 1-3-septate, 150-200 μ m long and 5-6.5 μ m wide below the terminal swelling which is 10-12 μ m wide and subhyaline, arising from a bulbous stroma 45-60 μ m diam. **Conidiophores:** solitary or rarely in groups of 2-3, also arising from stroma, often with one or two capitate hyphae, 250-270 μ m long, 9-13 μ m wide below and 17-21 μ m wide above, ventral up to 22 μ m wide, dark brown, paler at the torn apex. **Conidia:** formed enteroblastically inside the tubular collarette of the conidiogenous cell and emerging in a 'false chain', doliform, (-32) 42-48 x (10-) 12.5-15 μ m, 5-septate, often constricted at the septa, the four inner cells dark brown and the two end cells much paler, shorter and somewhat truncate, giving the appearance of constriction between successive conidia of a chain. Two central cells are 6.5-8 μ m long, penultimate cells 6.5-9 μ m long. Thus the four inner cells are of almost equal length, but penultimate once are often slightly longer than the two central ones.

Habitat: On submerged wood; Denva river (Pachmarhi, M.P.); 11 Nov., 2014; Leg., S.A.chaudhari

Distribution in India: Karnataka: On submerged wood (Sridhar et al., 2010). M.P

Remarks: The present fungus is occasional in occurrence. The descriptions and measurements of conidia and conidiophores are completely agreed with that of *Sporoschisma saccadoi* Mason & Hughes as given by Goh et al., (1997). Therefore, it is assigned to that species. It is an addition to the fungi of M.P. state.

6) *Sporoschisma uniseptatum* Bhat & W.B.

Kendrick

Mycotaxon, **49**: 71 (1993).

Colonies: effuse, black, velvety. **Capitate setae:** arising from the same stromat, erect, flexuous, medium brown, smooth, up to 175 μ m tall, 8-10 μ m wide, up to 12.5 μ m wide at the flared apex, 3-6-septate, regenerating precurrently 2-3 times. **Conidiophores:**

mononematous, differentiated, erect, straight or flexuous, 140-205 μ m tall, 10-12.5 μ m wide, 1-2-septate, unbrached, thick-walled, dark brown, arising from dark brown stromata up to 65 μ m acros. **Conidiogenous cells:** phialids, up to 160 μ m long, terminal, integrated, thick-walled, dark brown, consisting of a slightly swollen ventre up to 22 μ m wide and a tubular collarette 70-80 x 12-16.5 μ m. **Conidia:** blasic-phialidic, cylindrical, truncate at both ends, 1-septate, very rarely 2-septate, thick-walled, verruculose, pale brown, 27-32 x 11-12.5 μ m, often in slimy false chains of 10-15 conidia.

Habitat: On decaying twigs; Denva river (Pachmarhi, M.P.); 11 Nov., 2014; Leg., S.A.chaudhari

Distribution in India: Karnataka: On submerged wood (Sudheep and Sridhar, 2011); M.P.: Present work

Remarks: The present fungus is occasional in occurrence. The descriptions and measurements of conidia and conidiophores are completely agreed with that of *Sporoschisma uniseptatum* Bhat & Kendrick (1993). Therefore, it is assigned to that species. It is being recorded for the first time from M.P.



Fig.1: *Trinacrium subtile* Riess



Fig.2: *Varicosporium elodeae* W. Kegel.

**Fig. 3:** Conidium of *Canalisporium pallidum***Fig. 4:** Conidium of *Delortia palmicola***Fig. 5:** Conidia of *Sporoschisma saccadoi***Fig. 6:** Conidia of *Sporoschisma uniseptatum*

Acknowledgments

Authors are thankful to the Principal of the G.D.Bendale Mahila Mahavidyalaya, Jalgaon-425501, Principal of the S.V.S. Naik Arts, Comm. and Sci. College, Raver - 425508; for providing laboratory and library facilities.

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Source of support: Nil

Conflict of interest: None Declared