



Occurrence of an Oömycete in water body of Gorakhpur, India with unusual affinities

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ABSTRACT

A watermould, isolated from the water samples taken from a ditch near the Botany Department in the campus of M.G. Postgraduate College, Gorakhpur (India), has been identified to be an oömycete having unusual affinities with other groups. The life cycle studies have shown certain typical features and indicated this member to be quite different from the existing seventeen genera of Saprolegniaceae. A stability of the characteristic features has been observed under variable cultural conditions with $\pm 5\%$ variations.

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Introduction

Water harbours a vast majority of microorganisms, especially in embankment areas of freshwater ponds and rivers. Watermoulds, particularly the members of family Saprolegniaceae, form part of the rich aquatic fungal flora of ponds and rivers and the soils of nearby areas. There have been several reports by a vast array of aquatic mycologists (Johnson, 1956; Srivastava, 1967; Seymour, 1970; Prabhuji, 1979; Sinha, 1985; Johnson et al., 2002; and Prabhuji, 2005, 2010, 2011; Prabhuji et al., 2009; 2010) to this effect.

During an investigation on the members of Saprolegniaceae occurring in the water bodies of Gorakhpur (India) the water samples taken from a ditch near the Botany Department in the campus of M.G. Postgraduate College, Gorakhpur, yielded a watermould exhibiting an alliance with the members of Saprolegniaceae. The present paper deals with the description of a member of family Saprolegniaceae (Isolate 1102) and its comparative analysis with other allied genera and species.

Description of the fungus: Isolate 1102 (Figs. 1: A-C; 2: A-J, 3: A-J; 4: A-C)

Monococcus. Zoosporangia spherical, rarely oval, mostly terminal, but in rare cases laterally positioned near the sporangial base; hyphal cytoplasm streams towards the gradually swelling hyphal tip taking the shape of spherical zoosporangium which, at maturity cuts off by transverse basal septum; the zoospores are quickly differentiated; 120 – 340 μm in diameter. **Zoospores** monomorphic, pyriform, 10 – 15 μm in diameter; emerging from the zoosporangium by deliquescence of the sporangial wall and swimming immediately; following the release of zoospores there remains no trace of any empty zoosporangium, only the fragments of sporangial wall visible at base or hyphal tip which, proliferates into new zoosporangium by cytoplasmic streaming again. **Gemmae** completely lacking. **Oögonia** lateral or terminal; spherical, rarely oval or pyriform; 25 – 45 μm in diameter. Oögonial wall unpitted; smooth. Oögonial stalks usually simple, short, unbranched. **Oöspores** eccentric, one per oögonium and completely filling it; 20 – 40 μm in diameter. **Antheridial branches** monoclinal,

androgynous or rarely declinous; simple, short. Antheridial cells clavate, small and apically appressed.

Materials examined: The cultures obtained by isolations from the water samples taken from a ditch near the Botany Department in the campus of M.G. Postgraduate College, Gorakhpur; pH 7.8, temperature 20°C; on November 2, 2010 and January 07, 2012.

Johnson et al. (2002) have identified seventeen genera in family Saprolegniaceae, viz., *Achlya* Nees von Esenbeck, *Aphanodictyon* Huneycutt ex Dick, *Aphanomyces* deBary, *Aplanopsis* Höhnk, *Brevilegnia* Coker & Couch, *Calyptralegnia* Coker, *Couchia* W.W. Martin, *Dictyuchus* Leitgeb, *Geolegnia* Coker, *Leptolegnia* deBary, *Phragmosporangium* Seymour, *Plectospira* Drechsler, *Protoachlya* Coker, *Pythiopsis* deBary, *Saprolegnia* Nees von Esenbeck, *Sommerstorffia* Arnaudow and *Thraustotheca* Humphrey. On comparison, the Isolate S-1102 has been found to be different from the existing afore-said genera due to its certain typical characteristics.

The asexual reproductive characteristics observed in the cultures of Isolate S-1102 are quite different from all the existing members of family Saprolegniaceae. It has been found to exhibit a certain degree of alliance with *Thraustotheca* in the sense that the zoospores are being released on the deliquescence of the sporangial wall, however, in *Thraustotheca* primary zoospores encyst within the sporangium whereas the Isolate S-1102 shows an active release of zoospores. Other differences are – presence of gemmae, oögonial wall pitting, one to several oöspores per oögonium and presence of abundant, declinous, branched antheridia in *Thraustotheca*. Another genus, exhibiting minor alliance with the Isolate S-1102, is *Aphanodictyon*, but, the differences are more significant. In *Aphanodictyon* zoospores encyst within the zoosporangium and emerge individually as laterally biflagellate planonts, leaving the cysts intact in sporangium in a dictyuchoid fashion and the oögonial wall is ornamented; which differ from the Isolate S-1102.

The cultures of Isolate S-1102 distinctly indicate the characteristics of family Saprolegniaceae – the zoospores are

cleaved within the zoosporangium in precisely the typical saprolegniacean fashion and the sexual apparatus is undeniably of oömycetous nature and is not different in its configuration from the usual water moulds. The most important and characteristic feature of Isolate S-1102 is the active release of biflagellate planonts from the zoosporangium and, following the release of zoospores, there is no trace of sporangial wall except a few fragments attached at its base as if it is just a thin membrane-like vesicle as found during the zoospore release in *Pythium* of family Pythiaceae. The phylogenetic tree based in ITS rDNA shows that all *Pythiogeton* are a solid species and the closest are members that belong to *Pythium* (*P. grandisporangium*) than *Phytophthora*. However, the characteristic difference is the formation of eccentric oöspores in oögonia although single filling each oögonium.

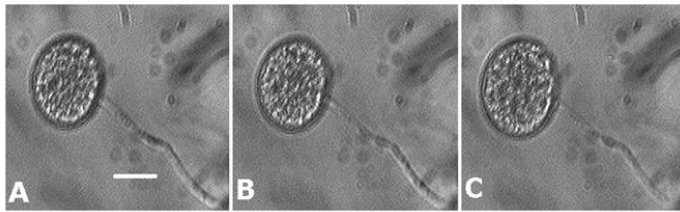
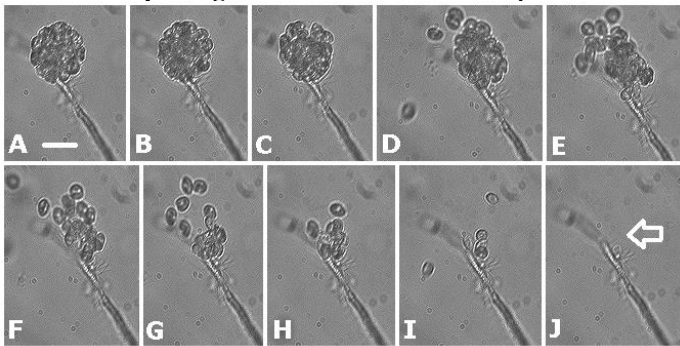
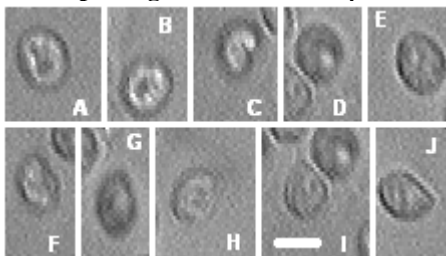


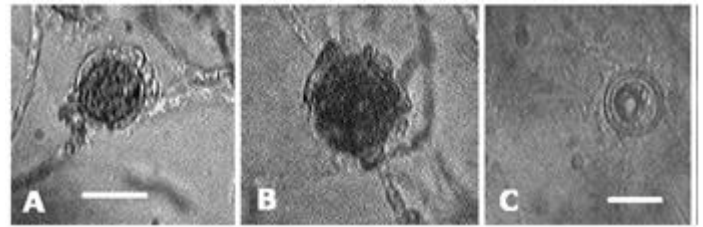
Fig. 1: A – C: Photomicrographs of the developmental stages of zoosporangium of Isolate S-1102. With the streaming of cytoplasm from the base of hypha towards the tip, the sporangial size increases. Bar: 50 µm



Figs. 2: A – J: Photomicrographs of successive stages of zoospore discharge from the zoosporangium in Isolate S-1102. Arrow in Fig. J indicates no evidence of empty sporangial wall. Bar: 50 µm



Figs. 3: A – J: Photomicrographs of variable shapes of the pyriform zoospores in Isolate S-1102. Bar: 10 µm



Figs. 4: A – C: Photomicrographs of sexual apparatus in Isolate S-1102. A: Spherical oögonium with attached androgynous antheridia. B: Oögonium with monoclinous and diclinous antheridia. C: Spherical oögonium with completely filling single, thick-walled eccentric oöspore. Bar: 50 µm

The Isolate S-1102 has also been cultured in different cultural conditions to assess its stability and has been found to be stable with $\pm 5\%$ variations. Therefore, we presume that the Isolate S-1102 may be a new taxon (new genus of family Saprolegniaceae) which may later be confirmed by molecular characterization.

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