

數種虹鱒寄生水黴菌的分離

簡 秋 源

Some water molds isolated from rainbow trout (*Salmo gairdneri*)
associated with fish saprolegniasis*

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Abstract

Some observations on the mycology of saprolegniasis of rainbow trout (*Salmo gairdneri*) are illustrated and described in the present paper. *Saprolegnia diclina* and *Aphanomyces laevis* were isolated from examined lesions on spawning fishes, and primarily unreported in Taiwan. Some isolates of *S. diclina* were affected by the presence of *Woronina polycystis* (Family Plasmodiophoraceae) which acts as an obligate parasite and eventual destruction of host hyphae. *Pythium debaryanum* is found to be a saprophytic on dead eggs.

Introduction

Saprolegniaceous fungi occurred in rainbow trout (*Salmo gairdneri*) which reared at Ma-ling Hatchery in Tai-Chung Prefecture, Taiwan from December 15, 1979 to February 19, 1980 were examined (Table 1.) Materials including dead eggs, yolk fries and spawning fishes were collected at the hatchery. Organisms were isolated from all lesions examined at the actual position. A single spore isolation and baiting techniques by using hempseeds were employed for direct examination in the laboratory. Sabouraud dextrose agar, Emerson's YpSs agar and corn meal agar were also used for the isolation of pure culture (Chien, 1976.)

Both *Aphanomyces laevis* and *Saprolegnia diclina* are previously undescribed in this country (Sawada, 1919-1945, 1959.) It, also, is demonstrated that some isolates of *S. diclina* were heavily affected by the presence of *Woronina polycystis* (Family Plasmodiophoraceae) which acts as an obligate parasite and eventual destruction of host hyphae. Therefore, this report attempts to describe *A. laevis*, *S. diclina* and

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W. polycystis in detail.

Table 1. Some phycomycetous fungi isolated from rainbow trout (*Salmo gairdneri*) hatchery at Ma-ling in Tai-Chung Pref. during the winter of 1979

Rainbow trout	Name of fungus
Dead egg	<i>Pythium debaryanum</i> **
Yolk fry	<i>Saprolegnia diclina</i> *, Unidentified sp.
Male spawning fish	<i>Aphanomyces laevis</i>
Female spawning fish	<i>Saprolegnia diclina</i> *

* Some isolated strains were affected by *Woronina polycystis* Cornu.

** *Pythium debaryanum* is thought to be a saprophytic on dead eggs.

Description

Aphanomyces laevis deBary Jahrb. wiss. Bot., 2: 179, pl.

20, figs. 17, 18. 1860. (Figs. A-B)

Hyphae 4-10 μm in diameter, delicate, hyaline, branched and contorted. Zoosporangia filamentous, of variable length, formed from undifferentiated vegetative hyphae, isodiametric. Primary zoospores rod-shaped, 12-35 in a sporangium encysting upon emergence at the orifice. Primary zoospore cysts 7-11 μm diameter, discharge poroid. Secondary zoospores reniform, laterally biflagellate. Oogonia terminal on lateral branches of variable length, spherical to subspherical, 20-36 μm in diameter, smooth-walled, roughened due to the disintegration of the attendant antheridia. Oospores hyaline, 13-23 μm in diameter, contents finely granular with a large, central oil globule. Antheridia one to several, large and elongate, clavate or vermiform, antheridial stalk simple or branched, declinous or monoclinal in origin, fertilization tubes visible or apparently absent, oospore germination by means of a single germ tube.

Habitat: -On the male spawning fish of rainbow trout

Specimen: -Ma-ling, Tai-Chung Pref. (Chien, 11-19, 1980)

This species has been isolated by the writer from soil and water specimen, and it was found in abundance on diseased fishes and larvae of giant prawn from aquaria and ponds in this country. This organism shows well-sporulated at the low temperature (16° C). and forms well sexual structures both antheridia and oogonia at 10°C. It is the most common species of the genus.

Saprolegnia diclina Humphrey. Trans. Amer. Phil. Soc.

(N.S.), 17: 109, pl. 17, figs. 50-53. 1893. (Figs. C-D)

Hyphae slender, sparingly to abundantly branched, 15-48 μm in diameter. Gemmae variable in shape, usually pyriform, terminal or intercalary, single or catenulate, occasionally disarticulating, functioning as zoosporangia. Zoosporangia abundant,

clavate or filiform, renewed by internal proliferation. Zoospore discharge saprolegnoid. Primary zoospores 10-12 μm in diameter. Oogonia usually abundant, often forming soon after or after prolonged period of time, terminal or lateral, not rarely intercalary, spherical or pyriform; 50-72 μm in diameter. Oogonial wall variable in pitting, usually pitted under point of attachment of antheridial cell, occasionally elsewhere or unpitted. Oogonial stalks short to rather long, straight or slightly bent, unbranched. Oospheres maturing, centric or rarely subcentric, spherical, frequently filling the oogonium, (4) 8-18 (28) in number, usually 20-28 μm in diameter. Antheridial branches almost always present, declinous, rarely monoclinal, slender, irregular, infrequently branched. Antheridial cells tubular or clavate.

Habitat: -On the female spawning fish and newly hatched yolk fry on rainbow trout (*Salmo gairdneri*)

Specimen: -Ma-ling, Tai-Chung Pref. (Chien, II-19, 1980)

The most characteristics of this species are oogonial wall with pitted and antheridial branches almost declinous. It may produce sexual organs after a prolong incubation within the hempseed culture at 16°C.

Woronina polycystis Cornu Ann. Sci. Nat. Bot., V, 15:

176, pl. 7. 1872 (Figs. E-H)

Sporangia sorus terminal or intercalary in segments of the host, the segments up to 520 μm long by 88 μm in diameter. Sporangia vary in number according to the size of the sorus, spherical, 10-32, mostly 12-21 μm in diameter, wall thin, smooth, colorless, with a short discharge papilla. Zoospores 3-4 μm long by 2 μm wide, emerging through a pore formed upon the dissolution of the papilla. Cystosorus borne in older cultures, dark, variable in size and shape, predominantly somewhat ovoid or ellipsoidal. Cystosporangia golden brown, thick-walled, 4-8 μm wide, somewhat angular, loosely associated in a spherical or cylindrical group.

Host species: *Saprolegnia declina* Humphrey

Collection locality: Ma-ling rainbow trout hatchery,
Tai-Chung Prefecture, Taiwan (Chien, XII-19, 1979)

Pythium debaryanum Hesse, Inaugr. Dissert. Halle. 1874.

Hyphae branched, usually 5 to 6 μm in diam., septate in old culture. Sporangia spherical to oval, terminal or intercalary, 15-average 19 to 26 μm , in diam., germinating either by germ tubes or zoospores. Oogonia smooth, terminal or intercalary, usually spherical, 15-average 21 μm to 28 μm in diam. Antheridia 1 to 6 per oogonium, monoclinal and declinous, when monoclinal arising some distance below the oogonium, not adjacent to it. Oospores smooth, aplerotic, 12 to 21 μm , average 17 μm in diam., germinating by means of germ tubes.

Parasitic on eggs and saprophytic on a variety of plants.

This species is the species most often encountered in pond water or soils. This

fungus is easily to grow on hempseed seed in liquid culture or on corn meal agar. It was isolated from dead eggs of rainbow trout (*Salmo gairdneri*) at Ma-Ling in Tai-Chung Pref. during the winter of 1979. It is thought to be a saprophytic species.

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中 文 摘 要

虹鱒寄生水黴菌在菌類學上的觀察已被例證和記載。從罹病種魚體上的病傷部分離獲得異絲水生菌 (*Saprolegnia diclina*) 和細囊水生菌 (*Aphanomyces laevis*)。上記兩種病原菌均係臺灣的新記錄。異絲水生菌的部分菌株已被多囊蟲菌 (*Woronina polycystis*) 所感染。它是屬於內寄生黏菌科 (Family Plasmodiophoraceae) 的一種強迫性寄生而且最後能破壞寄主之菌絲。迪氏腐菌 (*Pythium debaryanum*) 被發現僅在死卵上的一種腐生。

Figs. A-B. *Aphanomyces laevis* deBary

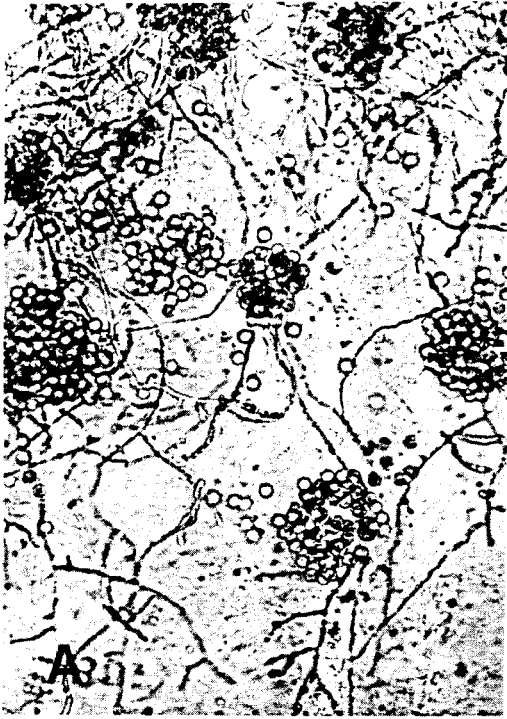


Fig. A. Asexual stage, showing released zoospores, X 100.



Fig. B. Sexual stage, showing immature oogonium (right) and a mature oogonial branch with antheridial branches, X 400.

Figs. C-D. *Saprolegnia diclina* Humphrey



Fig. C. A mature oogonium with mostly declinous antheridial branches, X 400.

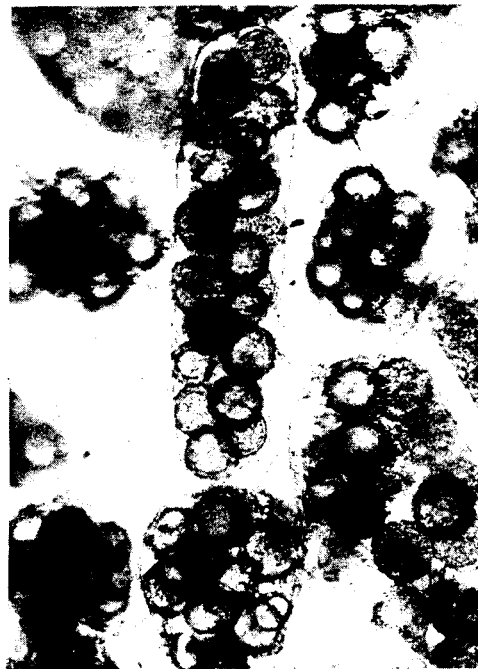


Fig. D. Mature and young clavate oogonia, some in a chain, X 100.

Figs. E-H. *Woronina polycystis* on its original host — *Saprolegnia diclina* Humphrey.



Fig. E. A hypha showing segments containing sporangial sori, X 100.



Fig. F. Branched hyphae of *S. diclina* containing zoosporangial sori and empty sporangial sori with arrows indicated, X 40.

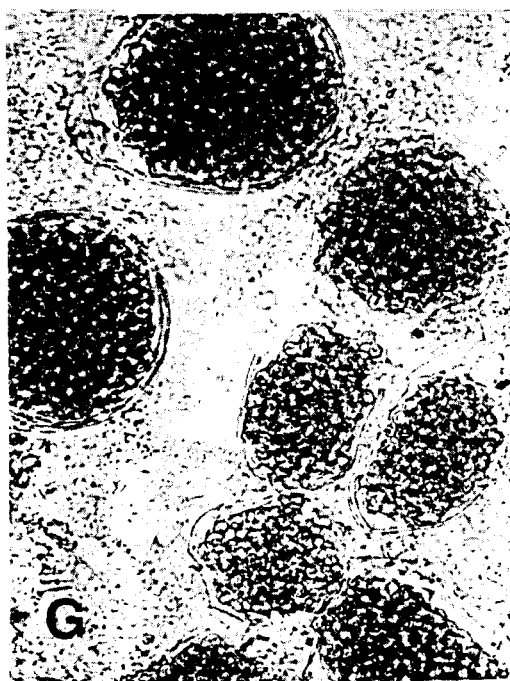


Fig. G. A group of cystosori showing resting spores filling the host cells, X 400.

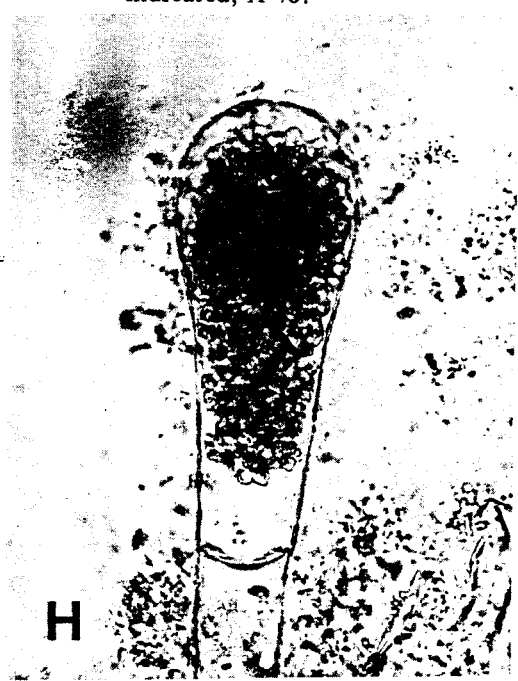


Fig. H. A cylindrical cystosorus showing resting spores filling the host hyphal segment, X 200.