Studies in aquatic Fungi of Varanasi. III. Observations on some parasitic aquatic Phycomycetes.

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Introduction

The record of Indian parasitic aquatic fungi is rather meagre. A scrutiny of the literature shows that only a few forms have so far been reported (B utler, 1907; Thirumalachar, 1947; D as-G upta and John, 1953; Srivast ava and Bhargava, 1963; and Srivast ava, 1964) from this country. The authors during their collection of aquatic fungi from Varanasi (D ay al and T hak ur, 1965; 1967), came across to some species of *Achlya* and *Saprolegnia* infected with *Olpidiopsis* species. An exhaustive collection of the various water sources with view of such a study was undertaken and the subsequent treatment was followed as given by S p a r r ow (1960). The observations included herein pertain to two well known group of aquatic Phycomycetes, namely, Chytridiales and Lagenidiales. Except *Olpidiopsis achlyaa* McLarty, all the species described in the paper have been reported occurring new from India.

The present paper deals with the observations on some new parasitic aquatic Phycomycetes of Varanasi and some more observations are added to *O. achlyae*, in addition to the previously known from this country. A new host record for *Rhizophydium carpophilum* (Zopf) Fischer, parasitic on the sporangium of *O. achlyae* is recorded. The development of the sporangium has been studied in detail. Except where otherwise indicated, all of the host fungi, whose parasites are reported here were obtained from isolations on hempseed and ant added to the water collections as "baits".

Observation

Olpidiopsis achlyae McLarty. Bull. Torrey Bot. club. 68: 62, 1941.

Since the *Olpidiopsis achlyae* has been insufficiently described by D a s - G u p t a and J o h n (1953) and as stated by them "The identifications are provisional", hence we feel the necessity of describing the fungues in detail.

Zoosporangia numerous, usually localized in a terminal or inter-



Figs. 1—5. Olpidiopsis achiyae McLarty. Fig. 1. Two emptied sporangia in a swollen hyphal tip of Achiya sp., Fig. 2. Spiny sporangium in a hyphal tip, Fig. 3. A portion of hypha bearing smooth sporangium and intercalary resting spores with and without its companion cell, Fig. 4. Resting spores in host filament, Fig. 5. Resting spore without companion cell lying free in a part of host filament. All figures drawn with scale A. — Figs. 6—11. Olpidiopsis saprolegniae var. indica. Dayal and Thakur var. nov. Fig. 6. Sporangia causing gall in a tip of hypha, Fig. 7. Sporangia sending tubes through wall of host, Figs. 8, 9. Different shape and forms of sporangia in a hypertrophied filament of Saprolegnia sp., Fig. 10. Resting spores merely rough or warted, Fig. 11. Resting spore with its companion cell and emptied sporangia inside a hypha. Figures 6—9, 11 drawn according to scale B and Fig. 10 with scale A. calary swelling of the host filament, smooth or covered with fine or coarse bristles; spherical, oval, ellipsoidal or elongate, variable in size, 33—100 μ in length by 26—100 μ in breadth, one to three exit tube of variable length. Zoospores hyaline with numerous small granules, oval, spherical or somewhat reniform, 2—5.5 μ \times 3—4 μ , usually about 4 \times 3.1 μ with two approximately equal flagella attached near the anterior end. Resting spores sexual and asexual, spherical or oval, 22—74 μ ; predominantly 48 \times 52 μ and brown in colour. Endospore composed of cellulose, smooth, 1—15 μ in thickness. Exospore not composed of cellulose, varying greatly in thickness, with small or large narrow or broadbased spines throughout the undulate margin. Male cells or companion cells when present, may or may not discharge their content into female thallus, spherical or oval, thin walled, smooth, sometimes embedded in exospore.

Parasitic in *Achlya* sp. Isolated several times from channel water near Medical College. On 10 Jan., 1966. Leg. Thakur Ji. Culture RD 21. Fig. 1—5; 25, 26.

Olpidiopsis saprolegniae var. indica Dayal and Thakur var. nov.

Sporangia globosa, subglobosa, ovoidea vel ellipsoidea $18-203/15-187 \mu$, terminalia, raro intercalaria, tenuiter tunicata, papillulis 1-3 cylindraceis, quoad longitudinem variabilibus praedita; zoosporae ovoideae vel ellipsoideae $2-5 \mu$ longae; sporae perdurantes globosae, hyalinae vel brunneolae, crassiuscule tunicatae, irregulariter verruculosae, $29-74 \mu$ diam; germinatio ignota.

Sporangia globosa, subglobosa, ovoidea vel ellipsoidea 18–203/ soidal, 18–203 μ long by 15–137 μ in width, generally terminal, occasionally intercalary in the hypertrophied host filaments, wall thin, smooth, colourless, discharge tubes from one to three, narrowly cylindrical of variable length; zoospores ovoid or ellipsoidal, 2–5 μ in length; resting spore spherical, 29–74 μ in diameter, colourless or somewhat brownish, with a fairly thick wall and covered with protuberances which show remarkable variation from low rounded to long warts, germination not observed; companion cells from one to three with each resting spore, ovoid or nearly spherical, 18–37 μ in diameter, wall thin, smooth and colourless.

Parasitic in filaments of *Saprolegnia* sp. Found several times around the Medicall College channel. On 20 Jan., 1966. Leg. Thakur Ji. Culture RD 25. Figs. 6—11.

Marked hypertrophy of the host filament has been noted by various workers similar to our observation. Considerable increase in diameter and cessation of apical growth occurred in regions harbouring the parasite. This species is predominantly parasitic and occours on a wide variety of host. In its vegetative growth and asexual reproduction when developing on hempseed in water O. saprolegniae var. indica is quite



Figs. 12—24. Rhizophydium carpophilum (Zopf) Fischer. Fig. 12. Stalked and sessile sporangia seated on spiny sporangium O. achlyace, Fig. 13. Stalked sporangia, some already discharged, others in the process, Fig. 14. Sporangium infected with the parasite, the formation of spores has been prevented by an early attack, Fig. 15. Settled planont, Figs. 16, 17. Sporangial rudiments, Figs. 18, 19. Immature sporangia with developing exit papillae, Figs. 20—22. Successive stages in the planont development, Fig. 23. Planont emergence from a sporangium through a single orifice, Fig. 24. Planonts, similar to *O. saprolegniae* var. *saprolegniae*. With the abundant material available, it was possible to verify all of the original observations.

The characters of the isolates examined almost agree with those of $O.\ saprolegniae$ var. saprolegniae except in the following features: (1) The size of the sporangia, resting spores and companion cells are somewhat larger than those described by the previous investigators; (2) The irregular, bottle or muriform sporangia are quite distinct, which may be due to a virulent strain of the parasite probably interfering with the growth metabolism and on such account the sporangia may not have developed fully; and (3) The isolate further do not show any sharp ornamentations on resting spores except wall sculpturing from low to long warts but not to a shape of definite spines. Hence we feel these distinctions are of sufficient import to be of variety delimination.

R hizophydium carpophilum (Zopf) Fischer. Rabenhorst. Kryptogamen Fl. 1: 95, 1892.

Rhizidium carpophilum Zopf. Nova Acta Acad. Leop-Carol. 47: 200, 1884.

Sporangia sessile or stalked and clustered on the surface of the sporangia of the host, at first spherical or avoid becoming somewhat pyriform after discharge; $18-33 \mu$ in diameter, wall thin, smooth and colourless. Spores are spherical, about 3μ in diameter, colourless and posteriorly uniflagellate. Each contains a single, prominent, eccentric, refractive body. They emerge in clusters through an apical fairly broad slightly elevated one or more orifices, formed by deliquescence of papilla apex; from their own efforts and still some dash around madly inside the sporangium.

Parasitic on sporangia of *O. achlyae*. Isolated from channel water near Medical College. On 10 Jan., 1966. Leg. Thakur Ji. Culture RD 22. Figs. 14-24; 27, 28.

This fungues is very common and capable of parasitising the host. It soon retards the growth of the host. It is our common observation that if the contents of the host are not differentiated in the early stages of its development, when the attack occurred, the whole contents of the infected sporangium contracted into a ball of fatty material. This species is far the most part found after the vigorous growth of the host plant has ceased.

The sporangial infection of *O. achlyae* by *R. carpophilum* is ensued by a protrusion from an encysted spore. This infection protrusion later gives rise to endobiotic rhizoidal system (Fig. 15), while the spore, enlarges to become sporangium (Figs. 16, 17). As soon as the sporangial growth proceeds further, generally one rarely two or three exit papillae appear (Figs. 18, 19). The vacuolization of the protoplast in the enlarging sporangium disappears as early as the spore rudimentation becomes visible (Fig. 20). The protoplast becomes separate from the sporangial wall in due course. Meanwhile the planont initials in each sporangium

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Sydowia. Annal. Mycol. Ser. 2. Vol. XXII,

Plate XXII



round up (Fig. 21); their refractiveness intensifies and the thickened sporangial wall becomes evident (Fig. 22).

The rhizoidal system is stout, irregular and branched. They often terminate in slender threads (Fig. 23). The full extent of the rhizoids could not be determined because the disrupted host protoplast is usually very dense below the sporangia (Fig. 24).

Summary

A morphological and taxonomic investigations of the parasitic aquatic Phycomycetous flora of Varanasi, was undertaken. A new host for *R. carpophilum* and three species of *Olpidiopsis* viz., *O. achlyae*, *O. saprolegniae* var. *indica* var. nov. and *R. carpophilum* have been described in detail. Observations on the spores and subsequent sporangial development have also been made.

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References

- Butler, E. J. 1907. An account of the genus *Pythium* and some Chytridiaceae. Mem. Dept. Agri. Bot. Ser. 1: 1-160.
- Das-Gupta and R. John. 1953. Studies in Indian aquatic fungi. I. Some water moulds of Lucknow. Proc. Ind. Acad. Sci. Sect. B. 38: 165-170.
- Dayal, R. and Thakur Ji. 1965. Studies in aquatic fungi of Varanasi. Proc. Natl. Acad. Sci. Sect. B. 35: 309-319.
- 1967. Studies in aquatic fungi of Varanasi. II. A new species of *Achlya* with notes on other species. Mycopath. et. Mycol. appl. (In press).
- Sparrow, F. K., Jr. 1960. Aquatic Phycomycetes. 1187 pp., Univ. Michigan Press, Ann Arbor.
- Srivastava, G. C. 1964. Observations on Indian aquatic fungi. II. Occurrence of *Olpidiopsis varians* Shanor at Gorakhpur. Indian Phytopath. 17: 249-253.
- and K. S. Bhargava. 1963. Observation on Indian aquatic fungi.
 I. Three species of Olpidiopsis from Gorakhpur. Ibid. 16: 271-274.
- Thirumalachar, M. J. 1947. Some fungal diseases of Bryophytes in Mysore. Trans. Brit. Mycol. Soc. 31: 7-12.

Explanation of Plate XXII

Figs. 25—26. Olpidiopsis achlyae, Fig. 25. Two discharge sporangia in a swollen tip \times 143, Fig. 26. Sporangium covered with spines \times 144, Figs. 27—28. Rhizophydium corpophilum, Fig. 27. Sessile sporangia on sporangium of O. achlyae \times 150, Fig. 28. Microphotograph showing sporangium infected with the parasite, the formation of the spores has been prevented by an early attack \times 720.

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