Occurrence and Distribution of Aquatic Saprolegniaceae in Northwest and South of Tehran[1]

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Abstract

Twelve aquatic sites in northwest and south of Tehran were sampled at monthly intervals form June through February 1996–1997 for members of Saprolegniaceae. In this study 12 genera and species were isolated.

Saprolegnia with five species and *Achlya* with two species were more common whereas, *Isoachlya*, *Leptolegniella*, *Protoachlya* and *Pythiopsis* all had low frequencies. Species of *S.ferax* was abundant in cool waters of winter and fall, whereas species of *S.litolaris* had highest frequency during summer months. Species of *Achlya chlorata* was more abundant during summer months. *A.debaryana* was isolated during summer and fall with almost the same frequency.

Occurrence of species of this family was comparable with occurrence of those in other temperate zones, although, there was some differences in comparison with findings of other workers.

Key words*: fungi, saprolegniaceae, distribution*

Introduction

Saprolegniaceae are zoosporic fungi and these fungi are gathered in four taxonomic groups, which do not have phylogenetic relationships. These groups are Mycetozoa, Chytridiomycetes, Plasmodiophoromycetes and Oomycetes (Dick, 1992). Saprolegniaceae belongs to order Saprolegniales of class Oomycetes. There are several forms of zoospore in Oomycetes life cycle primary zoospore, secondary zoospore and cyst zoospore. The most important aspects of members of Saprolegniaceae is their ephemeral nature in aquatic ecosystems. The term water mold is customarily used to designate the Saprolegniales, for most of them occur abundantly in

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clear waters and are easily isolated. Many species are however soil inhabiting. The majorities of species in this order are saprobic and are of little economic importance. A few of them, however, are important parasites. Some species of *Saprolegnia* such as *S.parasitica* cause disease of fish and fish eggs and many do significant damage to commercial fish hatcheries. The genus *Aphanomyces* contains several destructive parasites of the roots of vascular plant causing disease of sugar beets, peas and other crops.

Seasonality and distribution of some species have been reported by some investigators (Klick & Tiffany, 1985). Factors influencing their distribution and abundance in aquatic ecosystems were studied by several workers. Dick & Newby (1961) Roberts (1963) indicated that in temperate zones species diversity and frequency of occurrence were great during spring and fall.

Rooney and McKnight (1972) working on a subalpine lake with maximum temperature 19°C found greatest abundance of these fungi in summer months.

Types of oospore are important morphological factor correlated with seasonal periodicity of these fungi. For example in Florida, fungi with eccentric oospore are more common in warmer weather, whereas Saprolegneaceous fungi with centric and subcentric oospore were isolated in cold weather (Hughes, 1962).

Species with centric or subcentric oospores are abundant in temperate zones and are associated with rainy seasons and those with eccentric zoospores were more abundant during dry seasons in the tropics (Dick, 1976).

There is no study about occurrence and distribution of Saprolegniaceous fungi in Iran. The present work studies the distributions and seasonal occurrence of Saprolegniaceous fungi in Iran. Field study of these fungi was designed to survey Saprolegniaceae northwest and south of Tehran.

Materials and methods

Study sites: twelve aquatic sites for sampling were selected. Sites 1-8 were northwest of Tehran in national botanical garden about Km 15 Karaj Highway. These were standing waters located in different parts of the garden. Four aquatic sites were south of Tehran, two standing water in Beesat Park and two lentic water located in flower nestries. There was an

algal bloom in sites 7 and 8 during most sampling times. Samples were obtained from each sites at monthly intervals from June through February 1996-1997. In all occasions, samples were collected between 10 AM- 13 PM.

Procedure for isolating fungi: surface water samples were collected in a 1 liter beaker within half meter from shoreline and water temperature was measured immediately after collection with a mercury thermometer. On shore, the content of beaker was poured into three 300*ml* screw capped bottles contained boiled seeds as baits. The first bottle contained five *cannabis* seeds. The second bottle contained five *seasame* seeds and the third bottle contained five *Trifolium* seeds. All bottles together with seeds had been sterilized in autoclave at 15 psi for 15 minutes. Willinghby (1962) suggested that if there is no suitable bait for encysted zoospore they may die within two hours. Placing samples in contact with baits immediately after collection may keep this loss to a minimum. After collecting the samples they were transported to laboratory. Contents of bottles were poured in sterile petri-dishes and were placed in laboratory in temperature 21–26°C and exposed to natural light. After five to seven days colonies around seeds were examined.

If there was more than one species around seeds, hyphal tips of each colony were cut and transported to another petri-dish with the same kind of seed and about 40 *ml* distilled water. Then after 5 days these colonies were reexamined. Identification of Saprolegniaceous fungi was based on Seymour (1970) and Johnson (1956) for *Achlya*.

Results and Discussion

In this study, 12 species in 7 genera of Saprolegniaceous fungi were isolated. The isolated species are listed below:

Achlya debaryana Humphrey, *A.chlorata* Pringsheim, *Isoachlya sp.*, *Leptolegniella sp.*, *Protoachlya sp.*, *Pythiopsis sp.*, *Sommerstroffia sp.*, *Saprolegnia diclina* Humphrey, *S. eccentrica* Seymour, *S.ferax* Thuret, *S. hypogyna* De Bary, *S. litolaris* Coker

As can be seen from above list, *Saprolegnia* with 5 species and *Achlya* with 2 species had greatest species diversity. Of course, this was not unexpected as these are large genera and each of them contains many species in aquatic ecosystems. Species of *Achlya* and *Saprolegnia* were isolated in all sampling occasions and *A.chlorata* and *S.ferax* were isolated from all sampling sites.

Other species of *Saprolegnia*, *A. debaryana*, *Protoachlya sp.*, *Leptolegniella sp.*, *Isoachlya sp.*, and *Pythiopsis sp.*, were rare and were not isolated from

all sampling sites or on all sampling occasions. *Sommerstroffia sp*., was isolated only once. Within *Saprolegnia* species with centric or subcentric type oospores except *S.diclina* had a seasonal periodicity (Fig. 1). *S.ferax* was isolated more frequently in cool waters of fall and early winter, but had low frequency in summer. This cool water species had greatest frequency in 2–10°C (Fig. 1b). Klick and Tiffany (1985) considered it to be a cool water organism. Also Hughes (1962) reported that this fungus was more abundant during spring. In this study, the same distributional patterns were seen. Species with centric and subcentric oospores except *S. litolaris*, had the greatest frequency in fall and early winter (Figs 1a-1d). During January and February there was a decrease in frequency of all except *S.litolaris*. The greatest frequency of *S.litolaris* was in September (Fig. 1d).

S.diclina did not show a definite seasonal periodicity. Frequency of this species was high during June, decreased and then again showed higher frequency during December and January. High frequency of this species in temperature limits of 22–26 °C and 7–16 °C indicated that this species grows well to both warm and cold water (Fig. 1a). There are different reports about seasonality of this species (Roberts, 1963; Maestres and Nolan, 1978).

S.hypogena had greatest frequency in temperature range of 12–16 °C, showing highest frequency in December. Klick and Tiffany (1985) isolated this species from lentic waters (Fig. 1c).

Of two species of *Achlya*, *A.chlorata* was the most common species but was not isolated from all sampling sites. It occurred in high frequency during summer and early fall. Roberts (1963) was reported high frequency of this species at temperatures 22-31 °C. He considered this fungus to be a summer species. In this study, such a distributional pattern was seen (Fig. 1e). Highest frequency of *A.debaryana* was in September, above 40%. This species was isolated at temperatures of 22-31°C most frequently and did not show seasonal periodicity (Fig. 1f). Other rare species did not show seasonal distributional patterns and were seen only in some sampling occasions and in some sites. More studies should be done in order to understand the periodicity and seasonal occurrence of these fungi in other areas.

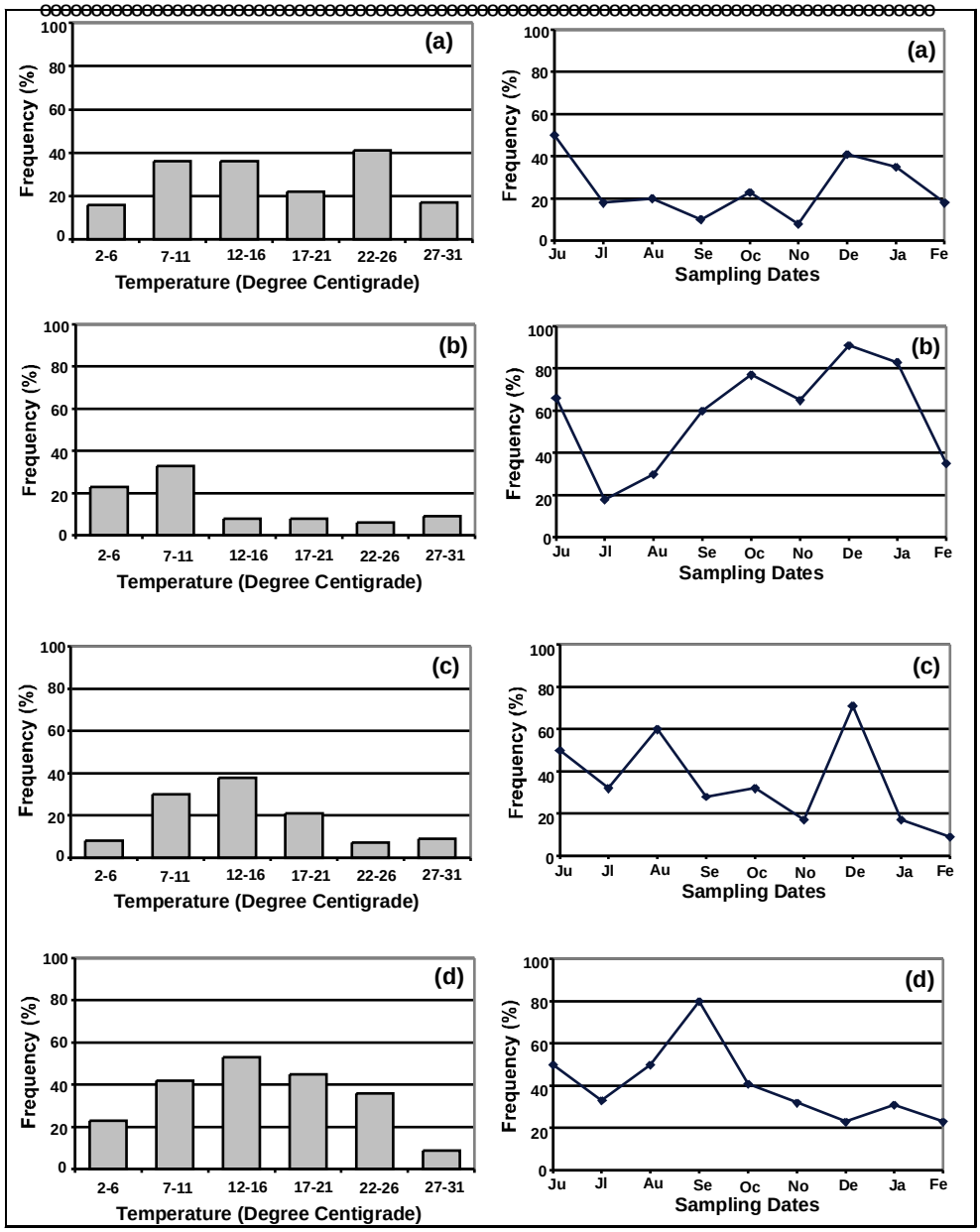

Figure 1 – Line graph, percentage of total aquatic locations sampled from which the fungus indicated was isolated. Bar graph, percent frequency of the (a) *Saprolegina diclina*, (b) *Saprolegina ferax*, (c) *Saprolegina hypogyna* and (d) *Saprolegina litolaris,* indicated in the given temperature range (frequency = number of isolates of the fungus in a specific temperature range/total numbers of samples taken in the same temperature range).

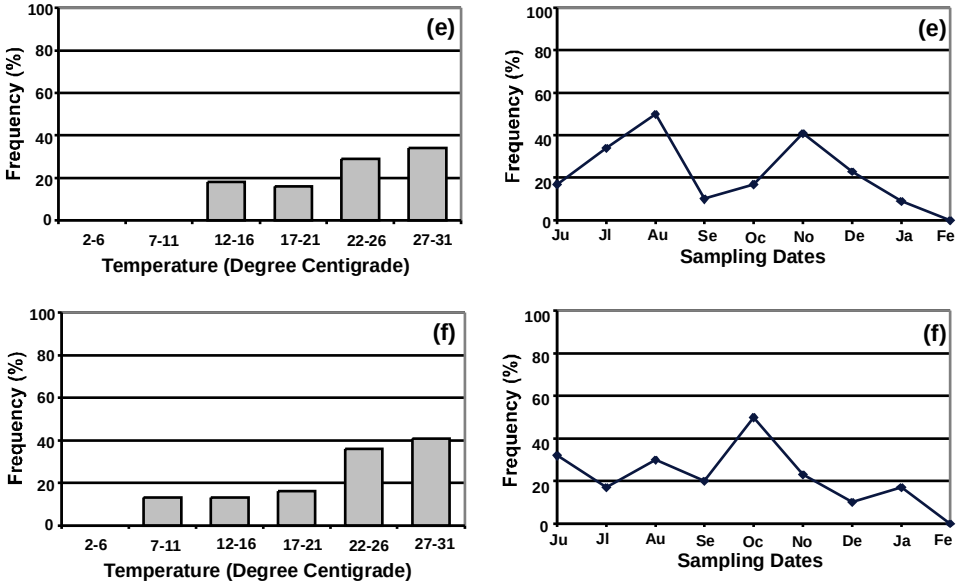

Figure 1 (Continued) - Line graph, percentage of total aquatic locations sampled from which the fungus indicated was isolated. Bar graph, percent frequency of the (e) *Achlya chlorata* and (f) *Achlya debaryana,* indicated in the given temperature range (frequency = number of isolates of the fungus in a specific temperature range/total numbers of samples taken in the same temperature range).

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