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Seasonal sporulation of some aero-aquatic fungi

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With 2 figures in the text

Abstract

Aero-aquatic fungi inhabiting a small woodland pond exhibited markedly increased sporulation during the fall season. As aero-aquatic fungi produce buoyant propagules only, this allows them to infect autumn shed leaves falling into the pond. Abundant sporulation in the spring following the breakup of ice cover was also observed.

Introduction

Aero-aquatic fungi are aquatic anamorphs which colonize submerged detritus but develop propagules in the air above the water surface, rather than below it (MICHAELIDES, 1982; MICHAELIDES & KENDRICK, 1982). Mature propagules subsequently float on the water surface until they encounter fresh substrate which often takes the form of riparian leaves falling onto the water surface. Propagules can be harvested year round by skimming the surface film at the air-water interface. This study was designed to investigate any seasonal variation in propagule density and to relate this to concurrent factors of seasonal change, eg. leaf fall.

Materials and methods

Field work was carried out at a small woodland pond in the Laurel Creek Conservation Area (Waterloo, Ontario, Canada). Pond topography was mapped in early April and 10 readily accessible sites were selected. Pond surface area was approximately 405 m^2. Insofar as possible, sites were spaced evenly around the pond approximately 1.5 m from the waterline. Surface film sampling began in early April following the breakup of ice cover and was conducted weekly at each site until the surface froze in early December. Sampling was not conducted during the latter half of June and during July as a result of an exceptionally dry summer which reduced the pond to a muddy sludge. All data from each site were pooled at the end of each month. Year totals are shown in Fig. 1, weekly concentrations for total numbers of conidia are shown in Fig. 2.

Surface film was harvested from each site using a modified flattened plastic scoop with a 30 cm leading edge. This device was used to quickly skim the surface off an area of approximately 3600 cm^2 delineated by stakes driven into the substratum. The

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harvested surface film and some water, a total of about 80 ml, were quickly poured into a sterile plastic sampling jar together with 10 ml FAA solution as a preservative. This was necessary to kill the propagules and to prevent them from germinating, and adhering to the sides of the jar. Many aquatic fungi are known to exhibit exceptionally rapid germination, in some cases requiring as little as 30 seconds to break dormancy, germinating readily even on glass (INGOLD, 1966). The contents of the jar were filtered through a Whatman # 1 filter. Filters were stained with acid fuchsin, incubated at 40 °C for 72 hrs and mounted on glass slides. Propagules were then identified and counted using a compound microscope.

Results and discussion

The following species were identified on stained filters: *Hormiactis ontariensis* (PREUSS), *Beverwykella pulmonaria* (VAN BEV.) TUBAKI, *Pseudoaegerita*

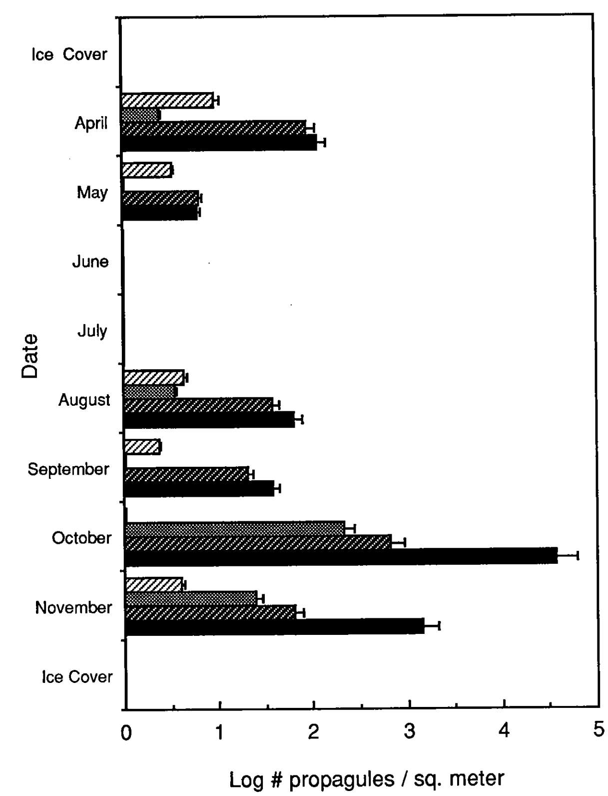

Fig. 1. Monthly variation of *H. ontariensis, B. pulmonaria, P. matsushimae,* and *H. elegans* propagules found in surface film. Each bar represents the mean of 40 samples (95 % confidence limits).

- *H. elegans*
- *H. triglitziense*
- *B. pulmonaria*
- *P. matsushimae*

matsushimae (Matsushima) Webster, *Helicoon elegans* (Corda) Arnaud and *Helicodendron triglitziense* (Jaap) Linder. *Hormiactis ontariensis* was sampled, identified, but not counted. This species produces loosely interwoven, highly branched chains of conidia (Michaelides & Kendrick, 1982) which fragment upon filtration making precise quantification difficult.

Propagules of *H. ontariensis*, *B. pulmonaria*, *P. matsushimae*, and *H. elegans* could not be conclusively identified in surface ice taken from the pond in late March. However, these were relatively abundant when surface films were sampled approximately one week later in April. Total propagule density was depressed in May and propagules were not found in films sampled during early June. Following August rainfall, numbers of propagules increased on the water surface (Fig. 2). Abundance peaked in October (Fig. 1), coinciding with maximum autumn leaf-shedding. Apart from casual observation, no attempt was made to measure volume of leaves entering the pond.

Pseudoaegerita matsushimae and *B. pulmonaria* were the two most frequently identified propagules in film samples taken throughout the year (Fig. 1). These fungi were also characterized as the predominant species in earlier studies conducted at this site (Premdas & Kendrick, 1991 a).

The pond dried out during the last two weeks of June and remained in that condition throughout July. Aero-aquatic fungi require moist conditions for sporulation and would have been quiniscent during these months. Prevailing August rainfall would have provided the necessary stimulus for renewed sporulation.

Increased propagule production during October (Fig. 2) may be due to new substrate, in the form of autumn shed leaves, being available for coloniza-

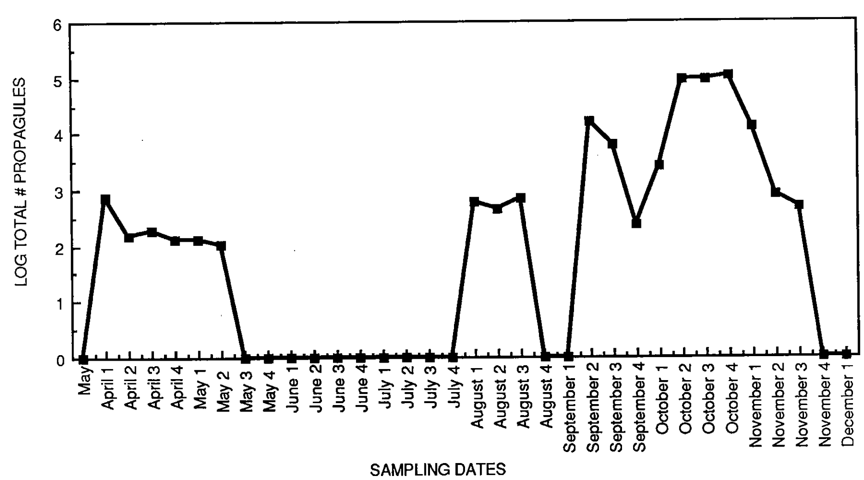

Fig. 2. Log total numbers of propagules sampled from surface film weekly.

tion and growth. Any leaf falling into a pond at this time comes into contact with numerous floating propagules. Riparian leaves placed on the water surface when propagules are present are successfully infected by germinating conidia (PREMDAS & KENDRICK, 1991 b). Colonization at the air-water interface is likely the primary means by which this genera infects new leaves becauses these fungi produce buoyant propagules only. However, possibility of infection by floating mycelial fragments should not be discredited entirely (WEBSTER & DESCALS, 1981).

There is also an increased production of propagules in April following the breakup of ice cover (Fig. 1 and 2). Sporulation of aero-aquatic fungi is greatly enhanced by high oxygen concentrations (WEBSTER & DESCALS, 1981). The formation of continuous ice cover in December would have resulted in microaerobic or near anaerobic conditions up to spring thaw. The rapid breakup of ice cover and subsequent equilibration of oxygen tensions may have stimulated new sporulation to occur.

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