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Presence of Myxomycetes in a Southern Bottomland Hardwood Swamp in South Carolina

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Abstract: Myxomycetes, or slime molds, are an important but understudied component of wetland ecosystems. This study aimed to determine the presence and distribution of myxomycetes in southern bottomland hardwood swamps by sampling tree bark, bryophyte mats, and leaf litter from Sparkleberry Swamp in South Carolina. Using the moist chamber culture method, 65 samples were incubated, and from these, six myxomycete species were identified, including *Acryria cinerea*, *Echinostelium minutum,* and *Physarum pulcherripes.* Fruiting bodies or plasmodia were found in 42% of cultures from tree bark and bryophytes, and 26% from leaf litter, indicating that these swamps can support myxomycete growth across different substrates. Our findings contribute to the understanding of myxomycete ecology in wetland ecosystems, suggesting that these organisms play a role in nutrient cycling and microbial diversity. Further research is needed to assess species richness and abundance more fully and to explore how environmental factors influence their distribution.

Keywords: bryophytes, ecology, myxomycetes, nutrient cycling, southern bottomland hardwood swamps, wetland.

Introduction

Myxomycetes, or slime molds, are a group of protists that contribute significantly to nutrient cycling, decomposition of organic matter, and microbial diversity. Although well-studied in terrestrial ecosystems, their presence and role in wetland environments remain largely unexplored. Wetlands like southern bottomland hardwood swamps are characterized by rich biodiversity and complex hydrology (Fish and Wildlife Service 1982), providing a unique ecosystem for studying myxomycetes. The dynamic changes in water levels and variety of substrates in these swamps create distinctive microhabitats that may affect the distribution and abundance of myxomycetes.

Research on myxomycetes in aquatic ecosystems is limited. However, it is known that myxomycetes can thrive in such environments given suitable conditions. For instance, previous studies have found myxomycetes in streams and other wetland ecosystems (Gottsberger and Nannenga-Breemekamp 1971), and some research suggests substrate specificity (Stephenson and Studlar 1985). These findings hint at the ecological importance of myxomycetes in wetlands, particularly their potential as bioindicators of ecosystem health (Wrigley de Basanta 2004).

To address the gap in understanding the presence and role of myxomycetes in wetlands, this study focuses on determining their presence, distribution, and species diversity in a southern bottomland hardwood swamp. Specifically, we aim to answer the following questions:

1) What is the presence and distribution of myxomycetes across different substrates in these swamps?
2) Which species are present, and how do their abundances vary among substrates like tree bark, bryophyte mats, and leaf litter?
3) What environmental factors influence the presence and distribution of myxomycetes in these swamp microhabitats?

This study contributed to a better understanding of the ecological roles of myxomycetes in these wetland ecosystems and lay the groundwork for future research on their abundance and diversity.

Materials and methods

Study Area and Sampling Sites

This study was conducted at Sparkleberry Swamp, located within the upper Lake Marion Santee Swamp system in South Carolina, the United States of America (Fig. 1). This swamp is characterized by water-tolerant tree species such as *Taxodium distichum* (bald cypress) and *Nyssa aquatica* (water tupelo).

Figure 1. General overview of Sparkleberry Swamp in South Carolina, United States of America.

Sample Collection and Preparation

Sampling focused on three primary substrate types: tree bark, bryophyte mats and leaf litter. The bark was collected directly from trees and the leaf litter samples were comprised primarily of water tupelo leaves submerged in water or collected from the base of four bald cypress trees. The bryophyte mats containing mosses and liverworts were collected from the base of bald cypress and water tupelo trees (Fig. 2).

Figure 2. Image of the base of a water tupelo from which samples were collected.

Moist Chamber Cultures

A total of 25 moist chamber cultures were prepared from both tree bark and bryophyte mats, and 15 from the leaf litter samples. In this manner, a total of 65 samples were incubated using moist chamber culture method. In all cases, samples were divided into portions and placed in 90 mm plastic petri dishes lined with filter paper. Substrates in the petri dishes were covered with distilled water for 24 hours, after which the pH of each dish was measured and recorded. Excess water was then drained, and the dishes were maintained in a moist environment out of direct sunlight.

Monitoring and Identification

The moist chamber cultures were checked weekly for three months using a dissecting microscope to detect the presence of myxomycetes, indicated by fruiting bodies or plasmodia. Water was added as needed to maintain moisture levels. Fruiting bodies collected from the moist chambers were stored in 90 mm plastic petri dishes for long-term storage and identification. Identification was done using standard references, including *The Myxomycetes* (Martin and Alexopoulos 1969) and *Myxomycetes: A Handbook of Slime Molds* (Stephenson and Stempen 1994). These steps ensured that samples were collected and analysed consistently to provide an accurate assessment of the myxomycetes present in the swamp.

Results and discussion

This study provides valuable insights into the presence of myxomycetes in southern bottomland hardwood swamps. While myxomycetes have been studied extensively in terrestrial ecosystems, research on their role in aquatic environments remains limited. Our findings reveal that these swamps can support myxomycete growth across various substrates, with six species identified using the moist chamber culture method.

Patterns of Occurrence

We found myxomycete fruiting bodies or plasmodia in 42% of cultures from tree bark or bryophytes and 26% from leaf litter. These patterns suggest that tree bark and bryophytes provide a more conducive habitat for myxomycetes compared to leaf litter in aquatic environments. The pH range of 6.5 to 7.0 across both substrates is consistent with optimal growth conditions, corroborating earlier studies that myxomycetes prefer slightly acidic to neutral environments (Stephenson 1988). However, additional research is required to determine the specific environmental factors that contribute to these patterns.

Species Diversity

The six species identified included *Acryria cinerea*, *Diderma effusum*, *Echinostelium minutum*, *Metatrichia vesparia*, *Gulielmina vermicularis and Physarum pulcherripes* (Fig. 3). The presence of *Acryria cinerea* as the only species found on leaf litter may suggest the generalist strategy that has been previously noted (Stephenson and Studlar 1985). Our findings suggest that myxomycetes contribute to biodiversity and ecosystem function in southern bottomland hardwood swamps, particularly in nutrient cycling and microbial diversity.

Ecological Implications

Understanding the role of myxomycetes in these fragile ecosystems is crucial. The ability of these organisms to thrive in the swamp's dynamic microhabitats indicates their potential use as bioindicators of ecosystem health. Past research indicates that environmental stressors like acid rain can negatively impact myxomycetes (Wrigley de Basanta 2004), so monitoring these organisms might help gauge swamp health and identify emerging environmental threats.

Future Research Directions

Our study forms a basis for understanding myxomycetes in southern bottomland hardwood swamps, but further research is needed. Specifically, studies should explore species richness and abundance across different swamp microhabitats, analyze seasonal variations, and investigate environmental factors such as temperature, humidity, and substrate composition. Such research will expand our knowledge of myxomycete ecology, informing swamp management and conservation practices.

Figure 3. Images of *Physarum pulcherripes* (left) and *Gulielmina vermicularis* (right) recorded in the present study.

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