available at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/funeco

Patterns of occurrence of corticolous myxomycetes on white oak trees of two different size classes

Morgan E. CLAYTON[a], Adam W. ROLLINS[b,*], Steven L. STEPHENSON[a]

[a]Department of Biological Sciences, University of Arkansas, Fayetteville, AR 72701, USA
[b]Department of Biology, Lincoln Memorial University, Harrogate, TN 37752, USA

ARTICLE INFO

Article history:
Received 26 June 2013
Revision received 27 October 2013
Accepted 7 November 2013
Available online 27 December 2013
Corresponding editor:
Martin H. Schnittler

Keywords:
Amoebozoa
Corticolous slime molds
Mycetozoan ecology
Myxogastrids
Myxomycetes
White oak

ABSTRACT

Data were obtained on the assemblages of corticolous myxomycetes (plasmodial slime moulds or myxogastrids) associated with the bark surface of living white oak (*Quercus alba*) trees from two different size classes. Bark samples obtained from larger trees were characterized by higher values for both species richness and diversity when compared to those collected from smaller trees. This might have been expected since the former possess a larger surface area and presumably have persisted over a longer period of time. However, the myxomycete assemblage associated with smaller trees was appreciably different and did not simply represent a depauperate version of the assemblage associated with larger trees. This suggests that the differences observed between size classes cannot be simply attributed to size alone.

Introduction

One relatively distinct ecological assemblage of myxomycetes (plasmodial slime moulds or myxogastrids) consists of species typically associated with the microhabitat represented by the bark surface of living trees. Although it is sometimes possible to collect fruit bodies of at least some species of these corticolous (bark-inhabiting) myxomycetes under field conditions, especially after a period of rainy weather, most records are obtained through the use of moist chamber cultures (Stephenson and Stempen, 1994). More than 300 species of myxomycetes have been reported from the bark microhabitat, and more than 100 are considered to represent truly corticolous species since some of these are only known from this microhabitat (Mitchell, 2004). The results obtained from a number of studies (e.g., Stephenson, 1989) indicate the taxonomic composition of the assemblages of myxomycetes associated with particular trees can vary rather widely. For example, some species seem to exhibit a clear preference for trees with bark that is relatively acidic (e.g., most conifers), whereas others appear to be restricted to trees in which the pH of the bark is circumneutral or even basic. In contrast, some species can be found over a wide range of pH conditions (Stephenson, 1989).

Myxomycete spores are thought to be largely wind-dispersed (Stephenson, 2011) and could conceivably be introduced onto any exposed surface in nature. As such, the rough bark surface characteristic of many trees could represent an especially effective "spore trap." Moreover, it would seemingly follow that the longer a given surface persists in nature, the greater the opportunity it would have to come into contact with both a higher number of spores as well as spores from a wider variety of species of myxomycetes. Since not all species

* *Corresponding author*. Tel.: +1 423 869 6421; fax: +1 423 869 7091.
E-mail addresses: Adam.Rollins@lmunet.edu, rollinsbiology@gmail.com (A.W. Rollins).
1754-5048/$ – see front matter
http://dx.doi.org/10.1016/j.funeco.2013.11.005

appear to be equally capable of becoming established (i.e., germinate to complete the life cycle either on the bark surface in nature or on pieces of bark placed in a moist chamber culture) in the bark microhabitat, this would place severe constraints on the absolute species richness of the assemblage of myxomycetes associated with a particular tree. However, all other things being equal, one might anticipate that larger and presumably older trees would tend to support a higher number of species than smaller and presumably younger trees present in the same forest habitat. Under these assumptions, a high degree of overlap with respect to the taxonomic composition between the two size classes would be expected and it would follow that the assemblage associated with smaller trees should represent a depauperate version of the assemblage associated with larger trees.

Although what is outlined above appears to represent a reasonable hypothesis, we are not aware that it has ever been tested. The primary objective of the research described herein was to characterize, as completely as possible, the assemblages of myxomycetes associated with the same species of tree occurring in the same forest habitat but falling into two distinctly different size classes. An effort was made to control as many factors (e.g., the time and method of collection, period and intensity of observations, etc.) as possible to allow an accurate assessment of "real" differences in the assemblages of myxomycetes present. The tree (white oak [*Quercus alba*]) selected for study was relatively common in the forest habitat in which it occurred.

Materials and methods

A hammer and a small chisel were used to obtain samples of dead outer bark at approximately breast height (1.4 m) from the north facing side of living white oak trees, from two distinct size classes, in the Lost Valley region (36 °01′ 42.52″ N; 93° 22′ 06.40″ W) of the Buffalo National River on 25 Feb. 2011 (Fig 1). Most of the sampled trees were located at an upper slope position on the western side of the valley and occurred within a range of elevations from 365 to 560 m. A total of 34 samples were collected, of which 17 were obtained from trees representing the smaller size class (circumference <50.8 cm) and 17 from the larger size class (>101.6 cm). The samples collected from each tree were placed into small paper bags, labeled and then transported to the laboratory at the University of Arkansas.

The following day the samples were plated out in triplicate, utilizing the moist chamber culture method as it applies to the laboratory isolation of myxomycetes (Stephenson and Stempen, 1994) for a total of 102 cultures. In brief, this consisted of placing pieces of bark collected from each tree into Petri dishes lined with filter paper and soaking them in distilled water overnight. The next day the pH was determined with a portable pH meter and a flat surface electrode. Afterward, the excess water was drained, leaving only enough water to maintain moist conditions in each dish.

The moist chamber cultures were left undisturbed for 1 week and then examined on a regular basis (usually two or three times each week) for almost 4 months to detect the presence (either plasmodia or fruiting bodies) of myxomycetes. When mature fruit bodies developed, small pieces of the substratum upon which they occurred were removed and glued to a paper tray that was inserted into a small pasteboard box which was then labeled with the appropriate information (e.g., size class of the tree, date collected, collection number, etc.). This continued until the end of May 2011, at which time the cultures were allowed to dry and remain dormant until Aug. 2011. At that time, water was added to the cultures and they were monitored again until mid-Dec. 2011. All specimens were identified by the third author, using

Fig 1 – Representative smaller (A) and larger (B) white oak trees in the general study area at Lost Valley.