were used to amplify 47 fragments (scored as + or -) from isolates of
Sphaeropsis sapinea. Three distinct groups were differentiated.
Similar procedures have been applied to collections of isolates
identified as B. dothidea (syn. B. ribis), B. obtusa, B. rhodina, and
B. stevensii. Banding patterns displayed by the isolates studied are
distinct enough to place other unidentified isolates into groups of
highly similar isolates. Collections of isolates identified as B.
dothidea, B. obtusa, B. rhodina, and B. stevensii, however, exhibit
even more heterogeneity than S. sapinea. Isolates of the B.
dothidea-B. ribis complex are very diverse, raising questions about
both identity of some isolates and validity of this synonym.
Sorting isolates into similar RAPD marker groups may be helpful
in preparation for subsequent taxonomic and pathologic studies of
Botryosphaeria species and related anamorphic fungi.

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Hadley Ave. North, Oakdale, MN 55128. The significance of
arbuscular mycorrhizae in an early successional tall grass prairie
reclamation.

The effect that mycorrhizal inoculum may have on the
development of an early successional plant community was
investigated in field plots of a recently disturbed area. Mycorrhizal
inoculum reproduced from a native prairie was placed below a mix
of prairie seed and monitored over two year period. Percent
cover of plants and percentage arbuscular mycorrhizal colonization
were measured in order to determine a) if inoculating a disturbed
soil with mycorrhizal had any effect on the percent cover of native
prairie or ruderal species, b) if inoculated plots had a greater
number of native prairie grasses that reached reproductive maturity and
c) if mycorrhizal inoculation could increase root colonization by
AM fungi. Inoculating plots with mycorrhizae significantly increased
the percent cover of native prairie grasses, had no effect on the percent cover of ruderal species and significantly increased
percentage root colonization by mycorrhizae. The increase in
percent cover of native grasses brought about by inoculation may speed
up the process of succession by allowing these grasses to
outcompete the ruderal species also present at the site. It also may
allow for more stability in the system when disturbances such as
periodic drought arise. Our findings suggest that the presence of
a diverse, viable population of arbuscular mycorrhizae can be
essential to the development of early successional tall grass prairie
communities.

F.W. SPIEGEL*, T. BARENBERG, G. BRYANT, K. PADILLA,
and D.L. MOORE. Department of Biological Sciences, University
of Arkansas, Fayetteville, AR 72701 USA. What are all those
protostelids doing out there, anyway?

The technique developed by D.L. Moore to evaluate community
structure of protostelids can be adapted to help answer a number of
different questions about the ecology of the protostelids. In brief,
the method consists of placing sterilized wheat straws into habitats
in which protostelids occur, then collecting them from the habitats
after set periods of time, and enumerating the protostelids which
have colonized the straws. A number of studies conducted by
undergraduates in our lab have helped the method can be
modified to test certain specific hypotheses. Moore's work shows
that certain species occur on aerial dead plants but not in the leaf
litter. Other species occur in litter but not on aerial dead plants.
This absence of a species from one of these habitats may be a
result of the failure of appropriate prey organisms to colonize the
straw. A study in which preferred food organisms were introduced
into each habitat on the straws shows that presence of appropriate
food is not sufficient to stimulate species of protostelids to colonize
straws in the nonpreferred habitat. However, presence of a
preferred food in the appropriate habitat appears to support greater
colonization by the appropriate protostelids. Another study in
which straws were fixed in the litter and suspended at different
heights above the ground suggests that the boundary between litter
and aerial habitats is very narrow. Finally, studies in which straws
impregnated with different concentrations of NaCl have been used to
approximate the level of salt tolerance of protostelids.

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Protease and carbohydrate strategies of Aspergillus fumigatus,
phytopathogenic and entomopathogenic Fungi.

We compared saprophytes (Neurospora crassa, Aspergillus
nidulans), an opportunistic human pathogen (A. fumigatus), an
opportunistic insect pathogen (A. flavus), plant pathogens
(Vorticillium albo-atrum, V. dothidea, Cochliobolus victoriae,
Colletotrichum spp., Magnaporthe grisea, Nectria haematococa,
a mushroom pathogen (V. fumicola) and entomopathogens (V.
lecanii, Nomuraea rileyi, Beauveria bassiana, Metarhizium
anisopliae) in their abilities to degrade and utilize host-derived
macromolecules (horse lung polymers, porcine mucin, hyaluronidic
acid, plant cell walls and insect cuticle). The major class of protease
produced by most plant pathogens and N. rileyi were broad
spectrum basic trypsins; analogous peptidases produced by insect
pathogens were specific for Phe-Val-Arg-X. In contrast, subtilisins
composed the major protease component secreted by Aspergillus
spp., and entomopathogens. This provided them with much greater
activity as cf. plant pathogens against elastin, mucin and insect
cuticle. Plant pathogens and Aspergillus spp., but not
entomopathogens, also produced high levels of several glycosidic
enzymes on mucin and plant cell walls, which contain inductive
carbohydrate substrates. Growth of A. fumigatus on mucin
degraded mucin carbohydrates and mucin proteins by 40% and
75%, respectively. The residual mucin resisted further degradation
because the fungus does not produce sialidase. Although they lack
hyaluronidase, most of the fungi secreted a range of other enzymes
on host-derived macromolecules e.g. phospholipases that are
common components of bacteria as well as reptilian and
invertebrate venoms. The wide distribution of these enzymes may
help explain the pathogenicity of opportunists such as A.
fumigatus, which are not subject to selection of specific host defense
genes.

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* G. R. STANOSZ and J. T. BLODGETT. Dept. Plant Pathology,
Univ. of Wisconsin, Madison, WI 53706 U.S.A. Confirmation of
Sphaeropsis sapinea as a latent pathogen of Pinus resinosa.

The relationship of the shoot blight and canker pathogen S. sapinea

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with its host *P. resinosa* was reexamined. To determine the potential for *S. sapinea* to persist on or in asymptomatic red pines, 100 dormant shoots of 2-year-old seedlings were collected in each of two nurseries. Each shoot was divided into four subsamples: 10 current year's needles; 10 previous year's needles; a current year's stem segment; a previous year's stem segment. Subsamples were surface disinfested, placed into water agar slants, and incubated for approximately 3 mo. The fungus was confirmed from 27.5% of the seedlings, and with only one exception was associated with previous year's stem segments. Virulence of a subset of these isolates was confirmed by inoculation. The potential for host water stress to release *S. sapinea* from latency and induce collar rot was tested in a greenhouse. Asymptomatic 2-year-old seedlings were obtained from one of the nurseries mentioned above. Transplanted, noninoculated seedlings were subjected to 5 watering regimes to maintain mean predawn needle water potential above -0.66 MPa (unstressed) or allow it to decrease to -1.1, -1.7, -2.0, -2.5, or -3.2 MPa before rewetting (100 seedlings/ regime in each of 2 separate trials). Mortality increased from 7.5% in the unstressed treatment to 50% in the driest treatment (*P* < 0.001, data pooled for the 2 trials). Death was associated with girdling cankers in the lower stem/root collars. Asymptomatic persistence and physiologically mediated release from quiescence confirm that *S. sapinea* can be a latent pathogen. These capabilities help explain long-term survival and rapid disease development under conditions that induce host stress.

A.R. SWANSON* and J.C. CAVENDER. Department of Natural Science, Manatee Community College, Venice, FL 34293 and Department of Environmental and Plant Biology, Ohio University, Athens, OH 45701 U.S.A. Global distribution of forest soil dictyostelids.

The goal of this project was to compile, organize and present the known distributional data on the dictyostelid cellular slime molds (CSM) found in forest soils worldwide. The question of what factors influence CSM distribution patterns was also addressed. CSM have been recovered from soils of temperate deciduous forest, tropical deciduous and seasonal evergreen rainforest, boreal coniferous forest, and tundra by various investigators. Within each of these biomes, specific patterns of distribution were recognized. Worldwide, sixty-five species of CSM were found to fall into one of four categories: cosmopolitan, disjunct, restricted, and pantropical. Global CSM distribution patterns are influenced by a variety of factors other than the biota (including but not restricted to climate, latitude, altitude, soil pH, and soil-forming parent materials). The current study supports the thesis that organic inputs from specific plant associations and animal vectors have an important role as well.


The demand for site specific native mycorrhizal inoculum has increased greatly with the recent interest in site restoration. The effects of different parameters on the production of native arbuscular mycorrhizal inoculum were investigated, including inoculum type and nutrient levels. The inoculum used was from a pot culture of material made from soil obtained adjacent to a remnant prairie site. Three inoculation treatments were tested, including untreated soil, AMF spores isolated from the soil, and a mixture of the soil inoculum and isolated spores. Using *Andropogon gerardii Vitman* (big bluestem) as a host, the mycorrhizal cultures were grown for 16 weeks in sand. They were watered with a system modified from that developed inBeltsville, MD (P.D. Millner and D.G. Kitt, 1992. *Mycorrhiza* 2: 9-15). Plant growth and health were monitored as indicators of plant nutrient stress. After 16 weeks, shoots were removed and analyzed for biomass. Roots were also sampled for biomass. Plant biomass data indicates that treatments inoculated with soil had less shoot biomass than those inoculated with isolated spores. However, pots treated with soil also exhibited less phosphorus stress under low phosphorus conditions. The pots not sampled for root biomass were dried for use as AM inoculum in a roadside prairie restoration project to test its efficacy in promoting native prairie plant growth.

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