Grazing on mycorrhizae by the rhizosphere food web regulates seedling survival

Sina Adl*[1]

[1]University of Saskatchewan – 51 Campus Drive, College of Agriculture, Saskatoon, SK Canada, Canada

Abstract

We selected the eastern white pine (Pinus strobus) germinated in soil microcosms, in a full factorial design with 5 treatments each randomly replicated in ten trays (n=10, 50 seedlings) in a controlled-environment greenhouse. The pine is an obligate mycorrhizal species, and the five treatments provided more or less fungivory on the mycorrhizal association during the first 120 days of growth. Treatments were a) no ectomycorrhizae; b) 3 species of ectomycorrhizae (EM); c) EM and enriched with fungivorous nematode culture (Nf); d) EM, Nf, and enriched with microarthropods (MA); e) EM and MA. Seedlings were destructively sampled at four months or at seedling death (< 4 months). Data were analysed with ANOVA and multivariate procedures and results were compared across treatments for seedling survival rate, age at death, growth, mycorrhization and animal abundance and composition. Canonical scores plot in discriminant analysis clearly separated treatments by mean (%) root tip colonization. We observed trophic cascades during mycorrhization by varying community structure, and fungivory decreases mycorrhization levels, affecting both seedling survival and growth. Next we used stable isotopes tracer studies to measure the rate of fungivory by three microarthropods and their predator, for nutrient transfer through trophic levels. Excretion rates were also determined as well as moulting rate for the collembolan Lepidocyrtus, and food processing efficiency for the mite (Astigmata) Tyrophagus, the mites (Oribatida) Oribatula sp, Hypoaspis sp and the predatory mite (Mesostigmata) Lepidocyrtus sp. Our results show that we can measure stable isotope enrichment for single microarthropods using our modified mass spectrometry technique, that fungivory rates can be measured, and confirm our microcosm results, that grazing pressure on early stages of mycorrhization reduces seedling growth and can lead to seedling mortality.

*Speaker