

Name: Robert Andrews

Defense date: April 29, 2011

Title: Invasive Chinese Lespedeza (*Lespedeza cuneata* [Dum.-Cours.] G. Don] Alters the Root and Rhizosphere Fungal Communities of Switchgrass (*Panicum virgatum* L.) in Northern Virginia

Thesis Director: Dr. Albert P. Torzilli

Committee members: Dr. Patrick Gillevet, Dr. James Lawrey, Dr. Andrea Weeks.

Abstract

Exotic plants can alter the fungal communities of soils outside their native range with possible impacts upon competing plant species. Based on automated ribosomal intergenic spacer analysis (ARISA) of root and rhizosphere-soil fungi across gradients of plant invasion, I demonstrate that the invasive exotic *Lespedeza cuneata* altered the fungal communities of the native prairie grass *Panicum virgatum* at a site along the Washington and Old Dominion Trail in Reston, VA. The fungal communities of the roots and rhizospheres of *L. cuneata* significantly differed in structure compared to those of uninvaded *P. virgatum* ($p < 0.02$ and $p < 0.01$, respectively). Additionally, the fungal communities of *P. virgatum* roots and rhizosphere more-closely resembled those of the invader when both plants shared the same quadrat ($p < 0.05$ and $p < 0.01$), especially when the areal cover of *L. cuneata* exceeded 40%. In all, 15 of the 157 fungal operational taxonomic units (OTUs ~ species) detected were significant in differentiating the fungal communities of *L. cuneata* and *P. virgatum* ($p < 0.05$) and eight of these were responsible for fungal community shifts with invasion, representing a putative crossover to *P. virgatum* of seven OTUs associated with *L. cuneata* and a decline of a single fungus associated with *P. virgatum*. Pyrosequencing of select fungal communities suggested that *L. cuneata* was associated with a variety of fungi, of which members of *Fusarium* were prominent, whereas *P. virgatum* was distinguished by a few uncultured environmental fungi. Additionally, the microscopic analysis of roots for arbuscular-mycorrhizae (AM) and dark-septate endophytic fungi (DSF) revealed that mycorrhizal-colonization exceeded 80% on average in both plants but the presence of DSF was twice as great in *P. virgatum* ($p < 0.005$), presenting the possibility of unique AM-DSF interactions within the invasive and native species. The observed shifts in fungal community structure of *P. virgatum* in the presence of invasive *L. cuneata* could represent a mechanism by which invasive species manipulates the fungal root community of native species in a way that promotes invasion.