The Influence Herbaceous Vegetation on Ectomycorrhizal Root Colonization and Nutrient Uptake[1]

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Abstract: Ectomycorrhizal (ECM) fungi are the primary symbionts important for the growth and establishment of many forest tree taxa used in forest restoration on coal-mined sites. Encouraging functional ECM symbiosis in restoration projects has resulted in improved seedling establishment, lower metal accumulation, and a positive correlation with tree growth. What is less understood is the compatibility of herbaceous vegetation planted with hardwood trees. Some non-native plant species used for mine reclamation may inhibit both nutrient acquisition and ECM colonization of tree seedlings in the early years of establishment. The objective of this study is to investigate the ECM root colonization, nutrient concentrations, and heavy metal accumulation on a single seven-year-old hardwood host (*Castanea dentata*) under three unique restoration conditions in eastern Tennessee: 1) trees planted with non-native, aggressive plant species, Chinese lespedeza (*Lespedeza cuneata*), 2) trees planted with a mix of native herbaceous species with Chinese lespedeza, and 3) trees planted with only native herbaceous species. ECM fungi present on roots was identified by DNA sequencing and correlated to root colonization, nutrient acquisition, heavy metal accumulation, and groundcover community composition. Trees growing within the monoculture of Chinese lespedeza were larger and did not show signs of nutrient deficiency. Types of groundcover did not impact ECM root colonization, however, there were significant differences regarding fungal community composition (P=0.0004) with certain ECM species associated with a higher level of organic matter, while some were linked to nutrient availability. Foliar analysis did not detect heavy metal accumulation in trees. Fungal species such as *Cortinarius* and *Scleroderma* were associated with an increase in foliar concentrations of nitrogen (P= 0.02) and aluminum (P=0.01). Results will inform future protocols regarding herbaceous species interactions with fungal symbionts of certain hardwood trees in mine restoration.

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