EFFECTS OF ARBUSCULAR MYCORRHIZAE ON NATIVE PLANTS GROWN IN MINE TAILINGS[1]

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Abstract. Abuscular mycorrhizae (AM) are plant-fungal symbioses that can enhance plant growth and survival, especially under stressful conditions. Greenhouse and field studies were used to test effects of three AM sources on native plant species growing in mine tailings. Sources of AM included 1) sterilized inoculum, 2) inoculum from a metals-contaminated site, and 3) inoculum from an uncontaminated site. Plant species were selected for their sensitivity to metal-contamination and potential use for mine waste revegetation. Tufted hairgrass (*Deschampsia cespitosa*) and yarrow (*Achillea millefolium*) are often used in mine waste revegetation because of their tolerance of soil acidity and elevated metals. Bluebunch wheatgrass (*Pseudoroegnaria spicata*), rough fescue (*Festuca scabrella*), blue flax (*Linum lewisii*), and purple coneflower (*Echinacea angustifolia*) are generally more sensitive to harsh soil conditions and are not widely used for mine revegetation.

In the greenhouse, AM from metals-contaminated soil increased biomass of rough fescue (53%), blue flax (283%), and purple coneflower (798%) relative to nonmycorrhizal plants. Uncontaminated soil AM increased biomass of blue flax (262%) and purple coneflower (646%), but not rough fescue. Biomass of yarrow, tufted hairgrass, and bluebunch wheatgrass was not affected by either AM source in the greenhouse. In the field, the same 3 sources of AM inoculum were tested on plant communities composed of container-grown tufted hairgrass, bluebunch wheatgrass and yarrow that were transplanted into several tailings types. While these plant species showed little or no response to AM in the greenhouse, the metals-contaminated soil AM had a positive effect on plant communities in the field. The metals-contaminated soil mycorrhizae increased total biomass of constructed plant communities by 19%, and increased the number of flowering stalks by 20% over nonmycorrhizal plants. There was no effect of the uncontaminated soil AM in the field.

This research shows that AM effects vary with plant species, AM inoculum source, and abiotic conditions, which may have important implications for revegetation practices. Re-evaluating growth of plant species in mine tailings with their natural AM symbioses will expand the pool of desirable revegetation species and lead to more stable, productive and diverse plant-soil systems.

Additional Key Words: plant diversity, restoration, soil ecology, microbiology

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