DEVELOPMENT OF RHIZOBIACEAE AND FABACEAE SYMBIOSES FOR ENHANCING BIOLOGICAL INPUTS OF NITROGEN IN RECLAMATION OF DISTURBED LANDS IN WYOMING[1]

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Abstract. Leguminous nitrogen fixation is an important biological function which has been commonly used to improve nitrogen levels in disturbed land. In Wyoming, native legumes are abundant but few are used as reclamation species because seed is often difficult to obtain, germination rates are low and growth is often poor. This research examines inoculation of native and non-native legume seed with bacteria isolated from root nodules of native legumes as a way of perhaps improving germination and growth. Root nodule bacteria have been isolated from a diversity of native legume nodules including lupines and vetches. Bacteria isolates were tested for infectivity and effectivity in a previous study. In this study, the effective bacteria isolates were tested at a recently disturbed field site (a surface strip mine) and in a controlled greenhouse environment on two subspecies of lupine (*Lupinus argenteus*), cicer milkvetch (*Astragalus cicer*) and sainfoin *(Onobrychis viciifolia*). Four isolates were tested on each plant species and compared to controls. All treatments were replicated five times. The experimental design was the same for the field and greenhouse studies, with both experiments being completely randomized. Soil was taken from the field site to use in the greenhouse experiment. All plants were grown for four months and harvested. Each experimental unit was measured to determine biomass, the extent of nodulation and nodule development, total nitrogen and ^{15}N:^{14}N natural abundance as a measure of nitrogen fixation. Results suggest sainfoin is an effective nitrogen fixing plant that establishes well. The other legumes had highly variable germination and inconclusive nitrogen fixation rates.

Additional Key Words: nitrogen fixation, remediation of disturbed land, mine reclamation, Fabaceae, legumes, lupine, cicer milkvetch, sainfoin, soil bacteria, rhizobia.

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