CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

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Project Number

34899

Project Title

The Effects of Common Californian Soil Treatments on Arbuscular mycorrhizal Succession in Nassella pulchra Specimens

Abstract

Objectives/Goals

The purpose of this study was to determine the effects of common Californian soil treatments in restoration plots on the development and activity of arbuscular mycorrhizal fungi as seen in the native grass Californian N. pulchra (purple needlegrass).

Methods/Materials

Soils collected from UCI and Crystal Cove, seeded with the invasive B. nigra, were taken from three groups: an untreated Control group, an annually treated Mow (physical plant removal) group, and an annually treated Herbicide (Roundup chemical application) group. 36 subjects were prepared and seeded with N. pulchra, grown for a period of 85 days split into 3 trimesters. After their growth was charted, the plants were harvested and roots were sterilized and dyed with acid fuchsin to color fungal structures. Afterwards, the roots were made into slides and read for presence of fungal structures and colonization by region coloration. The remaining soil was tested for aggregation through physical separation to gauge levels of soil quality and composition by mass, as indicated by a higher ratio of large (>2mm) to small (<2mm) aggregates.

Results

Herbicide treated plants had the most success in mycorrhizal succession, showing higher percent root colonization (40.30%), bioassay growth rates, soil quality (70%), and fungal hyphae (556). Mow treated plants showed the lowest percent colonization (19.44%), bioassay growth, soil quality (63%), and a considerably low presence of hyphae (44) compared to Herbicide. Control plants also had low soil quality (64%) and hyphal network (403), but fared better than the Mow in percent colonization (27.99%) and bioassay growth rates.

Conclusions/Discussion

Herbicide-treated plants were the most successful, largely due to their ability to remove saprotrophic fungi from the microbial ecosystem and allow succession of mycorrhizae- they had high soil qualities, growth rates, and numbers of fungal structures. Mow plants were likely the least effective due to high levels of saprotrophic fungi decomposing topsoil detritus left behind by the mowing process, combined with poor soil quality due to direct UV exposure. Control plots did not enjoy considerable success likely due to the allelopathic nature of the untreated B. nigra creating conditions hostile to mycorrhizae. These results suggest that in restoration plots, chemical treatments can be more conducive to sustainable ecosystems than physical methods of treatment.

Summary Statement

This study seeks to assess the effects of soil treatments for invasive species in restoration plots on the development of mycorrhizal soil networks in a new rehabilitated ecosystem.

Help Received

Used facilities of Treseder Lab at UCI to house project and conduct all testing procedures; original design was approved and mentored by Mia Maltz.