CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Alicia N. Hans

Project Number
S1207

Project Title
Fertilizer vs. Fungi: How Nitrogen Fertilizers Affect Beneficial Mycorrhizal Fungi

Abstract

Objectives/Goals
The objective of this project was to measure the effects of exposure to water containing nitrogen fertilizer runoff on the number of beneficial mycorrhizal fungi in the root systems of plants. The fungi assist their host plants in water and nutrient uptake, and protect the host plant from pathogens.

Methods/Materials
Collected plant and water samples, washed plant roots in water, stained plant roots using 2.5% potassium hydroxide, 1% hydrochloric acid, an acidic glycerol/trypan blue mixture, and acidic glycerol. Made permanent slides and counted fungi using a compound light microscope. Tested for nitrate in the water samples using cadmium powder and a nitrate testing kit.

Results
Beneficial mycorrhizal fungi were counted for plant root systems with and without exposure to nitrogen fertilizer runoff. The plant roots not exposed to the runoff showed more mycorrhizal fungi in their root systems than the plant roots exposed to the runoff.
Nitrate levels in the water before and after going through treatment were tested. The water before going through treatment had a slightly higher amount of nitrate than the water after going through treatment. Data obtained from the Irvine Ranch Water District indicated higher levels of nitrate in earlier months, when the plants were growing.

Conclusions/Discussion
The plant roots exposed to the nitrogen fertilizer runoff had fewer beneficial mycorrhizal fungi in their root systems. I concluded that nitrogen fertilizer runoff is lowering the number of beneficial mycorrhizal fungi in plant root systems. This indicates a previously little-known harmful effect of chemical fertilizers on plant health.

Summary Statement
I found that exposure to nitrogen fertilizer runoff can lower the number of beneficial fungi in a plant root system.

Help Received
Dr. Kathleen Treseder of the University of California, Irvine, allowed me to work in her laboratory, provided all materials, and explained all the procedures.