CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)

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Project Number

S2010

Project Title

The Effects of Soil-Contaminating Mercury on an Arbuscular mycorrhizal Symbiosis in Garden Bean Growth

Abstract

Objectives/Goals

Over time, mining, deforestation, and various industrial practices cause the toxic contamination of mercury compounds in soils worldwide. Mercury is a bio-accumulator that is known to inhibit or retard plant growth, preventing vegetation to be grown to its maximum potential. The objective of my project is to determine the tolerance of symbiotic garden bean plants, formed by inoculating its roots with arbuscular mycorrhizae (a fungi that occurs naturally in soil and may have adapted to natural-occurring mercury over millions of years), to mercury(II)chloride-contaminated soil, and its effect on resulting biomass, growth rate, and health of the plant.

Methods/Materials

I used mercury chloride in concentrations of 0 g/L (control group with no mercury), 0.10 g/L, 0.25 g/L, and 0.50 g/L to contaminate four groups of plants. Within each group, one plant will be inoculated with arbuscular mycorrhizae and the other will not. All plants were grown indoors under a grow light and observed for eight days for growth rate, height of plant, and other observations.

Results

By the eight day, all plants reached their seedling stage. The symbiotic plants had an average height of 17.75 cm and a growth rate of 2.2 cm/day, while non-symbiotic plants had an average height of 13 cm and a growth rate of 1.6 cm/day . While arbuscular mycorrhizae tolerated 0.50 g/L of mercury, the concentrations of mercury for each plant do not have an effect on its biomass. All three plants that are non-symbiotic and grown in mercury-contaminated soil displayed yellow cotyledons and pale stems, indicating a lack of chlorophyll.

Conclusions/Discussion

The arbuscular-mycorrhizal symbiotic plants had grown faster and developed a larger biomass than non-symbiotic plants, which indicates that the fungi had successfully protected the plant from the negative effects of mercury contamination. Due to the observation that non-symbiotic plants grown in mercury displayed yellow cotyledons and pale stems, it can be inferred that mercury inhibits the production of chlorophyll, responsible for photosynthesis in plants, which results in bean plants with smaller biomasses. The effect of various mercury concentrations on the growth of plants is indeterminable because some seeds may have been initially healthier than the others, which caused an inconsistency in my data.

Summary Statement

This project explores the tolerance of Arbuscular Mycorrhizae symbiotic plants to mercury, to determine its effectiveness for ecological restoration of mercury-contaminated areas.

Help Received

Set up my experiment under the supervision and assistance of Mrs. Navarro. Disposed of mercury chloride through professional toxic chemical disposal at Oak Grove High School.