CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

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Project Number

36316

Project Title

Plant Communication Experimentation

Abstract

Objectives/Goals

This project tested underground communication through endomycorrhizal networks against above ground communication through volatile organic compounds (VOC) on different plant types. It was hypothesized that underground communication would be more effective, as it allows plants to communicate directly, the bean plant would be the best above ground communicator, due to its broad leaves where more VOC can be released, and coriander would be the best underground communicator due to its deep reaching, fast developing tap root system.

Methods/Materials

Each plant type was planted in a control bin (separate cells and air tight bags on plants preventing fungal communication and chemical signaling), chemical signaling bin (separate cells and bag over whole bin), and underground communication bin (endomycorrhizae mixed into soil and airtight bags on plants). Plants were grown and measured for height and fresh weight. Two in each bin were stressed with glyphosate. Neighboring plants were allowed to #eavesdrop# and activate defense mechanisms. Salicylic acid (SA), produced by activation of defense mechanism, was extracted from leaf cuttings into a powder form. The ferric chloride test was used to test for presence of SA and reaction time was recorded (less time meaning more SA present meaning a better form of communication took place). A UV spectrophotometer measured absorbance of solutions and a calibration curve was used to find which plant produced a higher concentration of SA.

Results

Underground communication had produced an average of 16.15% more SA than underground communication and 41.95% more than above ground communication, making it the best form of communication. The bean plant had the greatest change in SA produced from the control to the above ground communication category, and the early sunglow corn had the greatest change in SA from the control to the underground communication category.

Conclusions/Discussion

Underground communication allowed plants to communicate directly and enhance their immune systems. The bean plant was the best above ground communicator because it can adapt easily to differing levels of sunlight which affects the amount of VOC it produces. The third hypothesis was proved to be incorrect as the corn was the best underground communicator rather than the coriander, due to the corn#s fibrous root system allowing for more bonds to form between the fungus and plant.

Summary Statement

This project found plant communication through mycorrhizal networks to be more effective than chemical signaling in most plants with early sunglow corn being the best underground communicator and the bean the best above ground communicator.

Help Received

Coach and professors gave advice on project. Student at the Jacobin's School of Engineering helped me gain access to a lab and equipment.

Preliminary