Determining the effects of diverse volatiles on the oxylipin and phytohormone profile of maize.

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Abstract

Many dicots have had JA syntheses researched but few monocots have been, including maize. Volatiles may act through the synthesizes of oxylipin and phytohormone to protect plants from the outside world. Many monocots are constantly being used for food and resources around the globe and any improvement to their yield will dramatically help the ever expanding population. Maize is a staple crop that there are significant losses due to insect damage and other biotic stresses that could be avoided if better responses can be expressed and earlier.

Introduction

Volatiles are airborne signals that change hormone composition of receiving plants. Changing these hormones will improve the response to abiotic and biotic stresses. Oxylipins are a large group of oxidized fatty acids. The best studied oxylipin is the hormone known as jasmonic acid (JA). The rest of the oxylipins are under explored. Determine the effect of specific volatiles on the oxylipin and phytohormone profile of maize. The second best studied oxylipins are green leaf volatiles (GLVs). They are known to regulate JA biosynthesis and effects. However, the effect of specific GLVs, other volatile oxylipins, or classical volatiles, such as methyl-salicylic acid, on the hormone and oxylipin profile for maize or any other plant species is unknown.

Methods

Grow the W438 for an extended amount of time
Build and prepare the volatile system which includes the activated charcoal, volatile jar, the experiment chamber, and the vacuum
Leave the plants in the chamber for 8 hours, 4 hours, 2 hours for the different levels of exposure of the different volatiles
After the allotted times, collect both leaf and root tissues and place in liquid nitrogen
Then take the samples, grind them and prepare for hormone testing.
The 8 volatiles were control, Z-3-hexanal, E-2-hexenal, Z-3-hexenyl acetate, linalool, α-pinene, carophylene, and indole

Conclusion

This project ended inconclusively. Due to time restraints no results were found. This experiment is one trial in a larger group of experiments the Maize Lipoxygenase Laboratory is working on.

Relationship to Career Goals

This research opportunity let me learn different lab procedures and work with different chemicals. Working with a team of students and professionals in my field let me understand more of the laboratory work possible in my future.

References and Acknowledgement

"Jasmonate Biosynthesis, Perception and Function in Plant Development and Stress Responses." - Yan, Yuanxin, Eli Borrego, and Michael V.

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