

Title: Utilizing Peanut Volatile Organic Compounds to Quantify Stress Level During Hydraulic Redistribution

Joint Project between Georgia Tech and the University of Florida

Goal

Directly sensing stress in a plant is relatively difficult and is often assessed through indirect measurements, including soil moisture. The proposed approach evaluates the potential to use volatile organic compounds (VOCs) that are released from the plant canopy in gas form to assess the stress condition of peanut plants under different growing conditions.

Experiment

The experiment was performed using peanut plants grown under three conditions: Primed, Fully Irrigated and rainfed. Fully Irrigated plants form a “control” group, primed plants form an “experimental” group treated to be more robust to stress and Rainfed plants which form the “stressed” group grown with normal rainfall.



Figure 1 Taking gas samples at University of Florida

VOCs were collected from 9 plots under different water stress conditions outlined above at three different collection times: pre-dawn, mid-morning and pre-dusk. VOC sample collection bags were kept inside a cooler and shipped back to the Georgia Tech Research Institute for analysis. The samples were processed using a gas chromatograph mass spectrometer (GC-MS) to establish the composition of the VOCs being emitted from the peanut plants. Preliminary data analysis of this data has been conducted.

Results

In most cases the mean of the VOCs emitted by Primed plants are similar or slightly lower than the mean of the VOCs emitted by Fully Irrigated plants. The variation in the VOC data within each group collected at 6am (Pre-dawn) and 6pm (Pre-dusk) is lower than data collected at Mid-morning/noon. Data collected at Pre-dawn shows significantly higher VOC means within each group than data collected at Pre-dusk and Mid-morning/noon. Data indicates that the mean of the VOCs from samples collected at the beginning of the experiment are significantly lower than those collected at the end of experiment for all irrigation conditions. Identified to regions in the GC spectra that appear significant. The compound (z)-3-Hexen-1-ol appears to be one significant VOC for peanuts.

Issues

Volatiles from the collection bags could have been a confounding factor in the data. A modified procedure for collection is being developed to address this problem.