Early Detection of Chemical-Induced Temporal Stress Signatures in GMO and Non-GMO Maize

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Abstract

The development of technology and indicators that can measure plant health through spectral imaging has become more important in order to ensure crop yields meet the needs of a growing population. Remote and high-throughput indicators such as these will allow farmers to easily measure plant health and adjust irrigation or fertilization as needed. Moreover, this technology can indicate the presence of a chemical or toxicant in the soil that may alter plant health or enter the food chain. One chemical class of concern are engineered nanomaterials and in particular, carbon nanostructures as their uses are predicted to increase rapidly. The proposed project will investigate whole plant effects of carbon nanostructures on both BT maize and conventional maize with the use of spectral imaging technology, mass spectrometry, and RNA sequencing. The approach proposed here does not focus on a single time point, instead, by monitoring the temporal pattern of spectral and molecular signatures the ability to detect disruptions will be enhanced. The end goal of this project is to develop indicators through imaging frequencies and phytochemical time-ratios that will alert farmers to the presence of carbon nanostructures in their crops. These indicators will then be tested on other