

International Conference on

Plant Physiology & Pathology

June 09-10, 2016 Dallas, USA

Indirect detection of ratoon stunting disease in sugar cane

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Ratoon Stunting Disease (RSD), caused by *Leifsonia xyli* subsp. *xyli*, is one of the most significant diseases to affect sugarcane. Incidence of the disease depends on how strictly growers follow control measures aimed at excluding infected cane from the propagation cycle. In the past 60 years farm, hygiene, hot water treatment and use of approved seed plots have remained unchanged at the core of RSD management. Some species of pathogenic bacteria can be characterised by the volatile chemicals they produce. In this work, we harvested more than 10 varieties of sugar-cane from different locations in the Queensland region of Australia over 2 harvest years. The headspace of sugar sap from infected and uninfected plants was analysed using solid phase micro extraction and gas chromatography-mass spectrometry. We used maximum mutual information (MI) to select the compounds that best differentiate between the infected and uninfected samples. We validated the selected compounds using two simple classifiers – Support Vector Machine and k Nearest Neighbors– through one-against-all cross-validation. In Year 1 (n=146 samples), we were able to predict the infection status of plants with better than 98% accuracy using VOCs signatures. In Year 2 (n=140 samples), larger numbers of cultivars from more diverse sites were analysed with the results showing correct prediction 95% of the time. We also found that there was no correlation between the amount of bacteria and the levels of the diagnostic volatiles indicating that the changes observed are potentially due to a specific systemic response of the plant to this pathogen.

Biography

A Z Berna is a Senior Research Scientist at CSIRO. She received her PhD degree in Applied Biological Science from Catholic University of Leuven, Belgium. She leads the volatile biomarker discovery component of the Innovative Bioproducts group, her research focuses on the detection of low abundance volatiles release above food, plants and in human breath, with the aim of providing faster tools for predicting quality and health. She is the author of over 26 refereed international journal papers with >500 citations and is inventor on two patent families.

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