Plant Pathology Seminar Series

"Real-time detection of olfactory volatilome biomarkers in diseased plants"

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All living organisms, including microbes, animals and plants release low molecular weight, high vapor pressure lipophilic molecules known as volatile organic compounds (VOCs) (Bitas et al. 2013). Plant VOCs respond to changes associated with abiotic stress or diseases caused by pathogenic microorganisms such as fungi, Stramenopiles, bacteria or viruses. Interestingly, some pathogens have been suggested to be able to manipulate their host's metabolism to cause them to release odors that are attractive to pollinators or insect disease vectors (Wu et al. 2017; Martini et al. 2015; Mas et al. 2014).

An effective program for management and prevention of plant diseases spread based on the detection of VOCs requires the availability of tools to measure and properly interpret these biomarker signals (Jansen et al. 2011). The detection of volatile biomarker emissions is an indirect method of disease diagnosis relying on detecting the impact of the pathogen on the physiological plant response (Ray et al. 2017). Sinha et al. (2017) assessed the performance of field asymmetric ion mobility spectrometry (FAIMS) as a biomarker-based technique for the detection of soft rot in stored potatoes caused by *Pectobacerium carotovorum*. Similarly, Biondi et al. (2014) tested a commercial electronic nose for detection of potato brown rot and ring rot, two important diseases caused by quarantined bacterial species, at three different spatial scales from the laboratory to a commercial potato storage facility. The results of the two aforementioned studies showed promise for the use of VOC biomarkers for detection of plant disease. However, laboratory experiments were much more effective than those performed at the commercial scale suggesting more research is needed before it will be possible to implement these methods commercially. An alternative and fascinating method for indirect disease detection involves the use of dogs and is known as canine assisted early detection. This approach has received a lot of attention for application in detection and diagnosis of human diseases such as cancer, but has also been recently used in plant pathology. Specific examples include the detection of citrus canker and citrus greening (HLB) (Gottwald et al. 2015) and the detection of Laurence wilt affected avocado trees (Simon et al. 2017). In both of these preliminary reports, accuracy of identification of diseased plants was over 90%, even in the presence of distracting odors under field conditions.

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