Plant Pathology Seminar Series

"Sudden Oak Death: Predicting resistance to *Phytophthora ramorum* in natural populations"

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Phytophthora ramorum is an exotic oomycete that causes sudden oak death (SOD) of oak and tanoak trees, and ramorum blight of non-oak hosts such as douglas fir (*Pseudotsuga menziesii*) and madrone (*Arbutus menziesii*) (Parke and Lucas 2008). Mortality of urban California tanoaks was first observed in 1995 and has since been documented in nursery materials across the United States (USDA-APHIS 2016). Wildland infections are currently limited to 14 coastal counties of California and Curry county of Oregon (USDA-APHIS 2016). Infected oaks may exhibit twig and leaf blight, but the pathogen is typically restricted to the phloem and inner bark of the tree trunk. Trunk infection results in cankers that seep a dark red sap, a symptom known as bleeding (Parke and Lucas 2008). Trees with bleeding cankers are susceptible to secondary attacks by beetles and decay fungi, further increasing the likelihood of death of the host (Rizzo et al. 2002). It has been estimated that *P. ramorum* has directly or indirectly caused death of over one million trees in the coastal forests of California within the first decade of its detection (Parke and Lucas 2008). Despite mass mortality, several studies have suggested there might be a subset of oaks in natural populations that are resistant to *P. ramorum* (Dodd et al. 2005; Nagle et al. 2011). As *P. ramorum* threatens the presence of oak trees and overall composition of coastal forests in California and Oregon, attempts have been made to identify these resistant trees, so they may be preserved and used for future breeding efforts. Identification of resistant oak trees is complicated by varying levels of resistance, disease pressure, disease escape, and the likelihood that resistance is controlled by multiple genetic loci (Dodd et al. 2005). Predicting resistance to *P. ramorum* has focused on the use of metabolomics, which gives insight to the physiological response of an infected host as well as providing links between genotype and phenotype. Secondary metabolites such as tannins and other phenolics, which are present in the phloem of oak trees where SOD occurs, are known to have antifungal effects against *P. ramorum* and might prove to be valuable predictors of resistance (Stong et al. 2013; McPherson et al. 2014). In two separate studies, four metabolic biomarkers extracted from coast live oak phloem were identified and used in a predictive model for resistance in natural populations. One set of biomarkers was identified in populations where SOD was established, and the other set was identified in a naïve population. The studies showed a strong correlation between host resistance and phloem phenolics and revealed a diagnostic tool that could be used in conservation and breeding efforts (Mcpherson et al. 2014; Conrad et al. 2017). However, these biomarkers need to be validated outside of the sampled populations before their widespread use.

4:10 pm | Monday, October 8 | Johnson Hall 343

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References

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