Exploring the Role of ABA in Plant Defense Against the Necrotrophic Pathogen *Macrophomina phaseolina*

Adam Hefel
Faculty: Bin Shuai
Department of Biology, Fairmount College of Liberal Arts and Sciences

Macrophomina phaseolina is a major agricultural pest causing reduced crop yield across many continents including Asia, Europe, North, and South America. As a necrotrophic fungus, *M. phaseolina* destroys plant tissue to acquire nutrients, causing the disease charcoal rot in many plant hosts including agriculturally important legumes such as soybean and alfalfa. Charcoal Rot leads to leaf yellowing, root rot, and eventually plant death in infected plants. The disease can result in significantly reduced crop yield especially during hot and dry years when plants suffer from drought stress.

Plants can respond to drought stress with guard cell closure, effectively limiting water loss. This process is driven by the phytohormone abscisic acid (ABA) which is produced in drought stressed plants to induce drought tolerance. ABA-treated plants are more tolerant to drought stress, whereas, plants defective in ABA synthesis or ABA signaling are susceptible to drought. However, the effects of drought resistance on infection are unclear, as some drought resistant cultivars of soybean have demonstrated partial resistance to *M. phaseolina*, and others show increased susceptibility. To investigate if promoting a drought response using exogenous ABA application may aid in plant defense against *M. phaseolina*, plants of the model legume *Medicago truncatula* were grown in a sterile environment on media containing varying concentrations of ABA. Using *M. phaseolina* infected wheat seeds; plants were inoculated with the pathogen and then observed for the development of chlorotic and necrotic tissue as a measure of disease severity. Anova analysis and Tukey's honesty significance test of this data suggest that treating plants with low doses of ABA (10-20 μM) significantly accelerated disease progression, suggesting that ABA production and signaling may be detrimental to plants infected with *M. phaseolina*.