Capitol Graduate Research Summit

# Innovative Genetic Approach May Give Crops Resistance to Charcoal Rot Disease

Heather Forster and Bin Shuai

*Department of Biological Sciences, Wichita State University*

*Macrophomina phaseolina*, causative agent of the plant disease charcoal rot, impacts over 500 plant species, causing devastating crop failures worldwide. In Kansas, it is the biggest cause of soybean crop loss, and disease epidemics are increasingly frequent. Charcoal rot attacks primarily through fungus-infested soil, leading to yellowing and death of plant leaves. Traditional pathogen control means, such as natural resistance, crop rotation, and fungicides, have been ineffective or problematic. This study aims to evaluate the effectiveness of host-delivered RNA interference (HD-RNAi) to manage charcoal rot. HD-RNAi exploits the natural process of RNA interference to target essential genes for *M. phaseolina*. In this process, small interfering RNAs (siRNAs) are designed and engineered into plant genomes. Upon infection, siRNAs expressed in plant cells can enter invading fungus and prevent expression of genes necessary for successful infection. HD-RNAi has been successful against some nematodes, insects, and other fungi. In this preliminary work, we have manufactured siRNAs to interfere with genes used in the production of *M. phaseolina* cell wall compounds. We hypothesize that without these compounds, the fungus will be unable to grow and infect plants. To test siRNA effectiveness, we incubated the fungus with siRNAs and measured its growth. To date, we've detected no difference in growth between siRNA-treated and untreated fungus. We are working on optimizing testing conditions and developing an assay to evaluate the efficiency of siRNAs. Our work gives insights into RNA interference in *M. phaseolina* and provides a framework for future siRNA testing.