

Innovative Genetic Approach May Give Crops Resistance to Charcoal Rot Disease

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Macrophomina phaseolina, causative agent of the plant disease charcoal rot, impacts over 500 plant species, causing devastating crop failures worldwide. In Kansas, it is often the biggest cause of soybean crop loss, and disease epidemics are increasingly frequent. Charcoal rot attacks primarily through fungus-infested soil, leading to rot of the stem, roots, fruits, seeds, and 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 required for the synthesis of *M. phaseolina* cell wall compounds, *CHS6* and *GLS2*. 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 observed apparent suppression of growth in fungus treated with siRNAs against *GLS2* at early timepoints. We will follow this work with microscopic fungal examinations and quantitative confirmation of gene suppression. Our work gives insights into RNA interference in *M. phaseolina* and provides a framework for future siRNA testing.