Host-delivered RNA Interference May Confer Plant Resistance Against Charcoal Rot Disease

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Macrophomina phaseolina, the causative agent of the plant disease charcoal rot, impacts over 500 plant species, and causes devastating crop failures globally. It attacks plants primarily through fungus-infested soil. Once infected, plant tissues become clogged, leading to yellowing and death of the leaves. Traditional means of pathogen control, such as crop rotation and fungicides have proven ineffective or otherwise problematic. This study aims to evaluate using host-delivered RNA interference (HD-RNAi) to manage charcoal rot. HD-RNAi exploits the natural process of RNA interference found in many organisms and may provide a new path toward conferring plant resistance against *M. phaseolina*. In this process, small interference RNAs (siRNAs) are designed, manufactured, and incorporated into plant genomes, and can then enter invading fungus and prevent the expression of genes necessary for successful infection. HD-RNAi has been successful against some nematodes, insects, and other fungal pathogens. In the current study, we have identified ten genes as candidates against which to test the viability of HD-RNAi. The genes code for chitin synthase and β-1,3-glucan synthase, enzymes necessary for synthesis of major components of the fungal cell wall. We hypothesize that preventing the synthesis of chitin and β-1,3-glucan, which are needed when new fungal tissues are rapidly forming, can slow down the infection process. Preliminary assessment of gene expression indicates all ten genes are expressed in rapidly growing *M. phaseolina* tissue. These data will be used to develop siRNAs to test the effectiveness of HD-RNAi.