Silencing the *NAC1* gene to determine its role in disease resistance

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Plant defense responses after pathogen infection include up-regulation of genes necessary for survival. Our gene of interest *NAC1* encodes a transcription factor belonging to the NAC (NAM, ATAF1,2, CUC2) family. Collinge and Boller have found this *NAC1* gene is strongly induced in potato by *Phytopthera infestans*, the causal pathogen of late blight disease. The exact function of the *NAC1* gene in plant resistance is poorly understood and requires further research. In trying to determine the role of the NAC1 transcription factor in pathogen-related defense responses we utilized virus induced gene silencing (VIGS) to target the *NAC1* gene in *Nicotiana benthamiana*, another host plant for *P. infestans*. VIGS utilizes viral plant defense mechanisms to disrupt mRNA translation, knocking out the protein functionality. The *N. benthamiana* seedlings were silenced 14 days after germination using syringe infiltration of *Agrobacterium tumefacians* containing a T-DNA insert of the tobacco rattle virus and a fragment from the *N.b. NAC1* gene. These *Agrobacterium*-mediated silencing constructs induce systemic silencing of the *NAC1* gene where we can look for phenotypic changes from pathogen assays. Three to four weeks after silencing we will infect the silenced plants with the bacterial pathogen *Pseudomonas syringae* and oomycete pathogen *Phytopthera infestans* in an attempt to determine how crucial the *NAC1* gene is preventing the spread of the disease. If the*NAC1* gene plays an important role in disease resistance, we will observe enhanced disease symptoms in *NAC1*-silenced *N. benthamiana* as a result of knock-down of *NAC1* gene expression. Further research may determine what genes are transcriptionally activated by the NAC1 transcription factor and what role they perform in disease resistance. A better understanding of NAC1 transcription factor and its role in plant resistance may lead to greater plant immunity and increased crop yields for future generations.

References

Collinge, Margaret, Boller, Thomas. (2001) Differential induction of two potato genes, Stprx2 and StNAC, in response to infection by *Phytopthera infestans* and to wounding. Plant Mol. Biol. **46**, 521-529.