Plant Pathology Seminar Series

"*Functions of effectors and mall RNAs involved in wheat rust disease*"

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Rust diseases caused by members of the genus *Puccinia*, are a major constraint to global wheat production. Efficient management of rust is a challenge due to the ability of the pathogen to rapidly alter its effector repertoire in response to recognition by resistance genes. Thus, judicial deployment of resistance genes necessitates a better understanding of fungal pathogenesis and host defense responses. Although many putative effectors have been predicted using bioinformatics pipelines, functional studies on effector proteins have been limited due to the lack of a suitable effector delivery system in wheat. In this study, we identified two *Pseudomonas* species: *P. fluorescens* (EtHAn), and *P. syringae* D36E, as transient transformation systems for delivering effector proteins into wheat leaf cells. Additionally, a heterologous system was successfully used for screening twenty rust effectors from *Puccinia graminis* and *P. stiriiformis*, and nine effectors capable of attenuating host immune responses were selected using this system.

In addition to interactions at the protein level, extensive changes in small RNA accumulation also occur during infection. As part of the second Aim of this thesis project, we analyzed the small RNA profiles of two wheat cultivars, one susceptible (Penawawa) and one partially resistant (Louise) to *P. striiformis*, to better understand differences in gene regulation that occur during infection. A total of 163 novel miRNAs and 182 known miRNAs were identified using 12 small RNA libraries prepared from two wheat cultivars infected with *P. striiformis*. A number of these miRNAs were differentially expressed (*P*-value < 0.05) between the two uninfected cultivars, as well as during infection. These results were validated using RT-PCR and qRT-PCR. Targets of these miRNAs were predicted using different target prediction software and miRNA-mediated cleavage for one gene was verified using 5' RACE. Overall, this work contributes to the current knowledge on the wheat-rust pathosystem and will help improve existing management strategies for wheat rusts in the future.

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