IDENTIFICATION OF CANDIDATE DEFENCE RESPONSE GENES ASSOCIATED WITH THE BARLEY-*PYRENOPHORA TERES* INCOMPATIBLE INTERACTION

by

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ABSTRACT

Barley net- and spot-form of net blotch, caused by two *formae* of the hemibiotrophic fungus *Pyrenophora teres*, are two of the major diseases affecting barley crops worldwide. In this study, the method of suppression subtractive hybridisation was used to isolate barley epidermal genes that were differentially expressed in the early stages of both net blotch incompatible compared to compatible interactions. As a result, two subtracted libraries of cDNA clones comprising mainly of gene transcripts of low abundance were generated. Quantitative real-time PCR was employed to verify and profile the differential expression of forty-five subtracted transcripts during the first 48 hours of infection, resulting in the identification of twenty-eight clones that were pathogen-induced and differentially expressed. These clones were grouped into one of eight clusters depending on the kinetics of their expression, and they included groups of genes that were up-regulated early (within 3 hai) and later (24 hai) in both barley-*P. teres* incompatible interactions. Among the differentially expressed clones were those with sequence homology to genes that encode proteins involved in calcium signal perception (e.g. a calcineurin B-like protein), detoxification (e.g. multidrug transporters), carbohydrate metabolism (e.g. an invertase), and signal transduction (e.g. protein kinases). Furthermore, the expression profiles generated for each individual gene cluster were similar for both net- and spot-form interactions, indicating that the resistance-associated defence response against both pathogens may be mediated by the same molecular mechanism. The differentially expressed genes are discussed with respect to their potential functional role in contributing to net blotch disease resistance. In addition, a model detailing early events that may take place in the barley-*P. teres* incompatible interaction is presented.