

**Project Title:** Functional characterization of genes that may be used to develop varieties with novel resistance mechanisms to barley leaf diseases.

S 7/06 Final Report

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## **Executive Summary**

### **Introduction**

There are a small number and relatively weak resistance genes that are known to control net- and spot-form of net blotch in barley, which can be easily overcome by these fungi. Fungal pathogens constantly mutate and thus avoid recognition by the plant's resistance genes. As a consequence resistance genes are no longer able to recognize an invading pathogen and the plants' own defence mechanisms are not switched on.

The answer is to develop novel strategies, which produce durable resistance and that is the aim of this project.

One such novel strategy to combat pathogens and establish more durable resistance could be achieved by genetically modified (GM) plants. The novel type of resistance is producing GM plants that activate a network of defence mechanisms independent of the resistance gene. Such plants are no longer affected by newly appearing aggressive pathogen strains. In this project 28 such defence genes were identified that are very strongly activated when barley successfully defends both, net- and spot-form of net blotch. They are likely to be a crucial part of the defence armoury against these pathogens and probably also other fungal leaf diseases such as scald disease of barley.

### **Results**

The aim of this project was to prepare the most promising defence genes (up to 10 out of 28) so that they can be used to genetically modify the net blotch susceptible barley cultivar Golden Promise. Seven genes were prepared and submitted to the GRDC funded barley transformation unit at the University of Adelaide who will carry out the genetic modification. The impact these genes will have on the resistance of the normally susceptible cultivar Golden Promise will be evaluated in the new current project funded by SAGIT.

Because similarities exist between the net blotch- and scald-causing pathogens, the new current project has the added benefit to provide an elite barley variety with durable resistance to both these diseases.