Physiological Impacts of Disease

Centre for Crop and Disease Management

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

Curtin University

Description of Project:

We aim to explore a new generation of potential breeding targets associated with host physiological responses to disease, determinants of recovery post disease disruption and the role of tolerance (as distinct from resistance). We are developing phenotyping targets and applying a multi-disciplinary and multi-faceted approach to track the changes in cellular processes in infected leaf tissues during early phase of infection and recovery post disease disruption in multiple pathosystems. These approaches open a window into plant physiological responses to disease to dissect the impact of early phase of infection on leaf function and the dynamics of leaf function pre and post-fungicide application. In turn, this knowledge will identify complex traits associated with tissue recovery and disease tolerance resulting in new horizon of breeding targets.

KEY ACHIEVEMENTS

This project is a relatively young project in CCDM and we have had a successful start by leveraging off new skills and in-house expertise to develop a suite of novel tools and techniques and collaborations to enable investigation of physiological responses of crops to diseases pre and post-fungicide treatment in genetically diverse hosts.

The collaborations include the NCRIS-funded facility, the Australian Synchrotron with competitive funding that enabled the use of highly sought X-ray fluorescence microscopy (XFM) and Infrared microscopy (IRM) beamlines, opening new horizons to understanding plant diseases. The XFM and IRM imaging datasets have enabled studies of nutrient re-distribution in diseased leaves. This work has opened a new avenue for better understanding crop diseases, and optimisation of these experiments has provided our team with meaningful data that can be applied to various studies at our Centre. Our high-resolution nutrient mapping of infected leaves is the first reported use of the synchrotron-based XFM instrument to study the physiological impacts of plant diseases.

We have used a range of rigorous phenotyping techniques and technologies to define various zones in diseased leaf tissue, including the asymptomatic zone that is impacted by diseased symptomatic zones. These phenotyping techniques will allow for more effective analysis of disease impacts and create a foundation for other studies aimed at advancing plant pathology knowledge.

OUR TEAM

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