

STRESS RESPONSE NETWORKS

Model systems, non-host systems and food-providing systems for studying rust diseases of cereals

Jeff Ellis, Peter Dodds, Michael Ayliffe, Greg Lawrence Evans Lagudah, Wolfgang Spielmeyer and Rohit Mago

CSIRO Plant Industry, Canberra, Australia.

Jeff.Ellis@csiro.au

Rust diseases occur on an extremely broad range of plant species and are caused by an equally large range of fungal species classified in the *Uridinales* group. Rust diseases are best known for their damaging effects on most of the major cereal grains that form the basis of the human food supply and control of these diseases is a major focus of agriculture. All cultivated cereal species have at least one and up to 3 species of rust pathogen. Rice is the notable exception among the cereals in having no rust pathogens. We are studying the non-host resistance of rice to the wheat stem rust pathogen *Puccinia graminis* as a possible source of novel resistance for wheat. We are also studying the molecular basis of the two types of rust resistance that occur naturally in wheat and which are currently used by breeders for genetic control. These are race-specific (gene-for-gene) resistance, controlled mainly by NBS-LRR type resistance genes and non-race specific resistance called adult plant resistance, the molecular basis of which is unknown.

Arabidopsis has no rust pathogen so we have developed the flax-flax rust system as a model system. Here we have cloned resistance genes from the host and shown that resistance is induced by rust strains that carry specific effector genes that encode avirulence proteins that are delivered from the rust to the host plant cell and are detected by the host by direct interaction with resistance proteins.