IDENTIFYING GENES ESSENTIAL TO FUNGAL PATHOGENESIS

DSW

DELIVERING SUSTAINABLE WHEAT

THE CHALLENGE

Pathogen and pest burden substantially contribute to wheat losses globally. The five highest global contributors to wheat yield and quality losses are all fungal diseases.

These include *Fusarium graminearum* which causes fusarium head blight and *Zymoseptoria tritici* which causes septoria tritici blotch. Both pose serious threats to global food security by causing devastating diseases in cereal crops, like wheat.

With growing challenges in disease control due to increased fungicide resistance and heightened restrictions on fungicide use due to environmental concerns, the need for innovative control strategies has become urgent.

Over

20% wheat yields

are lost to pests and disease annually

OUR RESEARCH

ROTHAMSTED RESEARCH

Image credit: Rothamsted Research

Using a dual whole genome gene expression approach, we have analysed the infection process of *F. graminearum* in wheat spikes. This targeted approach identified a gene called *Knr4* as a critical driver of *F. graminearum* infection and fusarium head blight disease.

Knr4 is involved in regulating growth rate and sensitivity to stress, and appears to be necessary for full pathogen virulence.

Knocking the *Knr4* gene out in *F. graminearum* saw a complete inability of the pathogen to spread in the wheat spike.

SCAN FOR MORE INFO

The *Knr4* gene is highly conserved between fungal species and disruption of the *Knr4* orthologue in *Z. tritici* led to parallel phenotypes of reduced fungal growth and virulence, and a reduction of septoria tritici blotch disease in wheat leaves.

Promisingly, *Knr4* is only found in fungi, and not plants or animals. These findings suggest that *Knr4* could serve as a potential target for controlling fungal diseases in crops without harming the wheat crop, ourselves or other animals.

This could be achieved through the development of chemical fungicides that disrupt the protein's function or through the application of RNA interference techniques that would reduce fungal gene expression.

UKRI Biotechnology and Biological Sciences Research Council

DSW DELIVERING SUSTAINABLE WHEAT

The Delivering Sustainable Wheat research programme aims to address critical challenges in wheat health, yield, and production in order to safeguard the future of this vital crop.

It is a collaboration between the John Innes Centre, Rothamsted Research, Quadram Institute, and Earlham Institute, with the universities of Bristol, Lancaster, Leeds, Imperial College London, and Nottingham, NIAB, and NISD-UEA.

This work was led by Rothamsted Research, in partnership with the Universities of Bath and Exeter.

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