

# Dissecting the molecular basis of virulence in *Gaeumanomyces tritici*, the causal agent of take-all disease of wheat

## Supervisory team:

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**Host institution:** Rothamsted Research (Harpenden)

**Submit applications for this project to the University of Exeter**

## Project description:

Wheat is one of the most important staple crops globally, the largest crop-based protein source, and its consumption is increasing globally. Given its economic and social importance, wheat losses by pests and pathogens are of considerable concern. Take-all disease is the most important disease of wheat roots globally. This disease is caused by a soil-borne fungus that infects roots and damages the vasculature tissue of the plants resulting in reduced yield and grain quality. In addition, the disease has an important environmental impact by reducing the uptake of fertilizers by wheat plants, which can lead to higher greenhouse emissions and water eutrophication. Despite the importance of this disease, there are currently no effective control methods available except crop rotations. Compared to other aboveground fungal diseases, the molecular interactions between roots and fungal pathogens are still poorly understood. Dissecting these “hidden” interactions will allow the development of new sustainable strategies to disease control.

This PhD project will use functional genomics approaches to dissect the molecular mechanisms of virulence in the take-all fungus. This knowledge will allow us to move a step forward in developing better strategies to protect wheat roots from take-all disease and in general to protect crops from root infecting fungi. The project will use the natural variation between strains and closely related species differing in virulence, and newly acquired genomic and transcriptomic data, to identify candidate genes associated with fungal virulence. The new candidate genes will be functionally validated by using CRISPR/CAS9 to generate deletion mutants. The mutants will be phenotyped by using a combination of plant pathology and microscopy approaches to confirm the function of the candidate genes and their role in fungal virulence and root colonization.



Through working with a combination of research expertise at Rothamsted Research and Exeter University, training in advanced Bioinformatics, Genomics, Transcriptomics, Molecular Plant Pathology and Microscopy techniques will be provided.