

Exploring communication mechanisms between fungal pathogens and plant cells

Supervisory team:

Rothamsted supervisor: Prof Kim E Hammond-Kosack (Rothamsted Research)

Academic supervisor: Dr Michael Deeks (University of Exeter)

Dr Smita Kurup (Rothamsted Research), Dr David Richards (University of Exeter), Dr Vinar Panwar (Rothamsted Research)

Collaborators: Dr Christine Faulkner (John Innes Centre)

Host institution: Rothamsted Research (Harpenden)

Project description:

Climatic, environmental, legislative and societal changes lead to the emergence of novel crop pathogens and the evolution of existing problematic species. Phytopathogenic species which cause crop plant diseases are annually responsible for the loss of ~15% of total crop yield globally and are therefore a serious threat to global food security. Particularly serious are Fusarium head blight (FHB)/head scab disease caused by cereal infecting Fusaria fungi (www.scabusa.org) (Figure) and Zymoseptoria tritici infections in wheat crops (Dean (2012) Molecular Plant Pathology 13, 414–430), both will be studied in this PhD project.

The main scientific aims of this project are (A) to investigate both the cellular and molecular mechanisms required for the transition of Fusarium graminearum hyphae from apoplastic to plasmodesmatal growth (Brown (2010), Fungal Biology 114, 555-571; Brown (2017) MPP 18, 1295-1312 and (B) to explore the functional role(s) of specific plasmodesmata associated wheat proteins (Faulkner (2013) PNAS, 110, 9166-9170). To achieve the project aims the student will learn how to use a range of existing tools (fungal reporter strains, wheat, rice and Arabidopsis transformants), established techniques (RNA seq analyses, light/UV/confocal microscopy, Virus Induced Gene Silencing (VIGS) (Lee (2012) Plant Physiology 160, 582-590) and emerging technologies (genome editing). They will also be trained in the use of bespoke software to quantify and mathematically model the in vivo fungal-plant image datasets acquired from their detailed microscopy studies.

The student will spend the 1st six months of their PhD at the University of Exeter (UoE) undertaking specific taught courses and initial research training. Subsequently, the student will transfer full time to Rothamsted Research (RRes) (www.rothamsted.ac.uk). The advisory team includes Dr Deeks (UoE), Dr Panwar (RRes), Dr Faulkner (John Innes Centre), Dr Kurup (RRes), and Prof. Kim Hammond-Kosack (main supervisor). The student will have access to world class research facilities and will receive outstanding interdisciplinary training from their advisory team.

The student will also receive training in how to give oral/poster presentations at laboratory meetings, workshops, national/international conferences, write a scientific paper for peer review and will take part in suitable public outreach events, for example The British Festival of Science. Currently, Rothamsted Research has ~70 full time PhD students registered at various UK universities and these participate and help to organise the annual PhD student symposium. Students are also encouraged to take part in the BBSRC Biotechnology YES competition.

