

Minding the gap: *Fusarium graminearum* navigation through restricted cell-space

Project ID: 3700

Supervisory team

Rothamsted supervisor: Dr Kim Hammond-Kosack (Rothamsted Research)

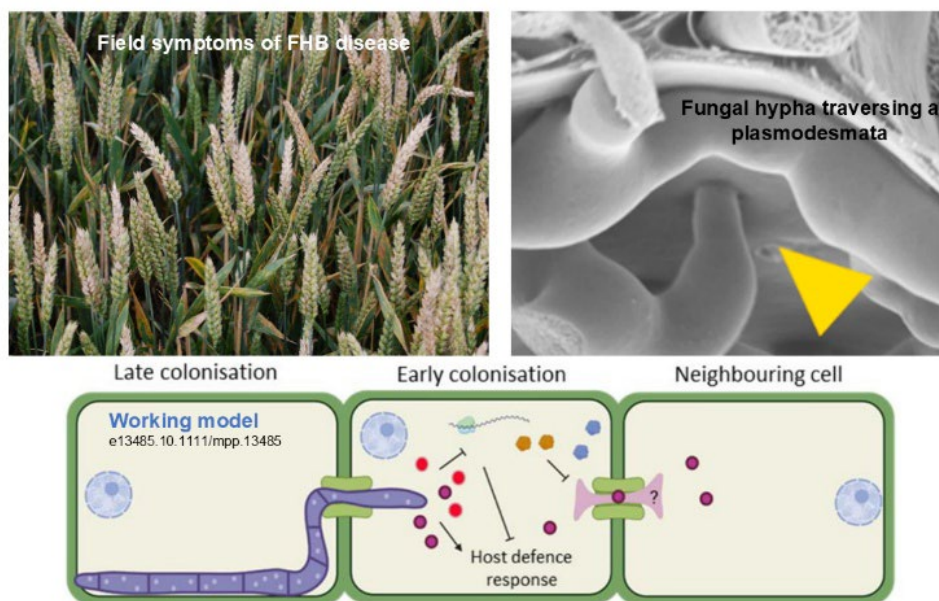
Academic supervisor: Dr Mike Deeks (University of Exeter)

Other supervisors: Dr Smita Kurup (Rothamsted Research) & Dr Helen Fones (University of Exeter)

Registered institution: University of Exeter (Streatham)

Host institution: Rothamsted Research (Harpenden)

Project description: Multiple factors, including climatic, environmental, legislative and societal changes, have led to the evolution of problematic plant pathogens that are collectively responsible for annual losses of ~15% of total crop yield globally and are a serious threat to global food security. Major threats to wheat, Europe's most important crop, include the head blight fungus *F. graminearum* (Fg; www.scabusa.org) (Fig.1(a)) and *Zymoseptoria tritici* (Zt; Figueroa et al.,2018). Understanding how filamentous fungal pathogens colonise wheat host tissue is essential for identifying effective control mechanisms. The main scientific aim of this PhD project is to investigate both the cellular and molecular signalling mechanisms required for Fg hyphae to traverse through the plasmodesmata-containing pit fields of plant cell walls (Fig. 1(b&c)); a crucial phase in the Fg infection process (Brown et al.,2010; Brown et al.,2017; Armer et al.,2024). Zt will be used in this project as a comparator phytopathogen. The student will learn how to use a range of existing tools (fungal reporter and single gene deletion strains), established techniques (dual wheat-Fg/ZtRNA-seq analyses, light/confocal microscopy) and emerging technologies (microfluidics; two-photon 3D printing). The student will also be trained to quantify and mathematically model the in vitro growth of Fg strains in microfluidic devices and in vivo data from Fg-wheat image datasets acquired from detailed microscopy studies. The student will undertake a rotation research project at Rothamsted Research (RRes; for 0.5 years) then a second rotation project and first half of the main project at the University of Exeter (1.5 years at Exeter). This is a unique opportunity for a PhD student to learn valuable phytopathology techniques at the world-leading RRes institute, followed by the mastering of specialist skills in microfluidics, bioimaging and mathematical modelling approaches at Exeter. The student will then return to RRes for the final half of the main research project to test on wheat hosts the concepts and phenotypes discovered through microfluidics. An SWBio-funded industrial placement will bridge the Exeter and RRes sections of the main project. The student will have access to world class research facilities throughout and will receive outstanding interdisciplinary training in microfabrication and mathematical modelling. 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 outreach events, for example The British Festival of Science. Continued on next page.....



Our aim as the SWBio DTP is to support students from a range of backgrounds and circumstances. Where needed, we will work with you to take into consideration reasonable project adaptations (for example to support caring responsibilities, disabilities, other significant personal circumstances) as well as flexible working and part-time study requests, to enable greater access to a PhD. All our supervisors support us with this aim, so please feel comfortable in discussing further with the listed PhD project supervisor to see what is feasible.