Future-proofing wheat: harnessing microbiomes and chemical signalling for climate resilience

Project ID: 220

Supervisory team

Rothamsted supervisor: Dr Vanessa Nessner Kavamura (Rothamsted Research)
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Host institution: Rothamsted Research (Harpenden)

Project description: Climate change is reshaping the way we grow food. Rising drought, emerging pests and soil degradation threaten global wheat production, one of the world's most essential crops. But what if the key to resilient, climate-smart agriculture lies hidden in the wheat plant's own chemistry and its partnership with microbes?At Rothamsted Research (in partnership with Bath University), we are offering an exciting PhD opportunity to unravel how wheat breeding and introgression shape above- and belowground microbiomes, plant chemical signalling and resilience against biotic and abiotic stresses.This project will dive into how ancestral wheat traits, reintroduced via introgression, can restore lost microbial partnerships and enhance tolerance to drought and pathogens. By combining cutting-edge chemical ecology, microbiome science, and molecular biology, you will explore how modern wheat can be re-empowered to face the challenges of climate change.What you'll investigate:How wheat introgression influences secondary metabolites and chemical signals both in roots and leaves.Whether these changes allow wheat to recruit stronger, more complex microbial communities in the rhizosphere and phyllosphere.How microbial interactions impact plant growth promotion, pathogen suppression, and stress tolerance.The role of introgression in shaping defense pathways under combined drought and pest pressure (plant pathogens).What you'll gain:Hands-on training in chemical ecology, analytical chemistry (GCMS, LCMS, NMR), microbiology, soil science, molecular biology, and bioinformatics.Experience with multi-omics approaches and microbial functional assays.A comprehensive training programme including statistics, professional development courses.Opportunities to present at leading international conferences (ISME, Plant Microbiome Symposium, International Society of Chemical Ecology).This is more than a PhD, it's a chance to be at the forefront of research that redefines the future of sustainable agriculture under climate change. By bridging plant genetics, microbiomes, and ecology, you will contribute to real-world solutions for global food security.If you are passionate about microbiomes, plant science and building climate-resilient agriculture, we would love to receive your application!

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.