

Fighting Superweeds with Soil Microbes: Nature-Based Solutions for Blackgrass Control

Project ID: 266

Supervisory team

Rothamsted supervisor: Dr Dana MacGregor (Rothamsted Research)

Academic supervisor: Dr Paula Kover (University of Bath)

Other supervisors: Dr Tim Mauchline (Rothamsted Research), Dr Daniel Henk (University of Bath)

Collaborators: Dr Pam Marrone (The Invasive Species Corporation)

Host institution: Rothamsted Research (Harpenden)

Project description: Herbicide-resistant weeds are one of the most pressing challenges facing modern agriculture. Blackgrass (*Alopecurus myosuroides*), the UK's most problematic weed, has evolved resistance to multiple herbicides and now dominates winter cereal fields, reducing yields and threatening food security. This PhD project offers an exciting opportunity to explore a sustainable, nature-based solution: using soil microbes to suppress blackgrass growth without harming key crops like wheat and barley. Working within Rothamsted Research's Weed Molecular Biology and Soil Microbiology teams, you will investigate microbial isolates from the UK Crop Microbiome Cryobank. These microbes have shown promising potential to inhibit blackgrass seedling growth under controlled conditions. Your research will involve screening diverse blackgrass biotypes to identify effective microbe-weed interactions, assessing crop safety, and uncovering the biological and ecological mechanisms that underpin microbial suppression. You will also work at the University of Bath using *Arabidopsis* MAGIC lines to identify genetic loci associated with microbe-mediated growth suppression. Functional validation and mechanistic studies will be conducted using the combined Team's advanced genomics, metabolomics, and phenotyping platforms. You will receive training in plant phenotyping, microbial ecology, molecular biology, and data analysis, using our state-of-the-art laboratories, glasshouses, and imaging platforms.



The supervisory team includes experts in weed molecular biology (MacGregor), soil microbiology (Mauchline), and plant genetics (Kover) and includes collaborators that are directly involved in biocontrol innovation. You will be embedded in collaborative research environments at Rothamsted and Bath, gaining hands-on experience in molecular biology, plant physiology, and data analysis. The long-term goal is to develop microbial biocontrol products that reduce chemical inputs and restore productivity in herbicide-resistant fields. The project leverages the Teams' world-class facilities and interdisciplinary expertise, contributing to sustainable weed management strategies and UK farming resilience. This interdisciplinary project combines cutting-edge science with real-world impact. It aligns with the growing demand for sustainable farming practices and offers the potential to develop microbial biocontrol products that reduce chemical inputs and restore productivity in herbicide-resistant fields. We are committed to providing a supportive and inclusive research environment. You will be part of a collaborative team and benefit from

tailored mentorship, professional development opportunities, and engagement with both academic and industry partners. Whether your interests lie in plant science, microbiology, or sustainable agriculture, this project provides a strong foundation for a career in research and innovation.

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.