

## Searching for the functional core for a microbiome-facilitated crop production: the case of Pseudomonas spp. in wheat rhizosphere

Supervisory team:

Rothamsted supervisor: Dr Vanessa Nessner Kavamura Noguchi (Rothamsted Research) Academic supervisor: Prof Tiffany Taylor (University of Bath) Dr Tim H Mauchline (Rothamsted Research), Prof Edward Feil (University of Bath), Dr Susan Mosquito (Rothamsted Research)

## Host institution: Rothamsted Research (Harpenden) Submit applications to this project to University of Bath

## **Project description:**

Just like the good bacteria in our gut, there are microorganisms around plant roots that are important for the health of plants. In this project, we would like to study which microorganisms are always there and which ones show up randomly. To do this, we are focusing on the area of soil around wheat plant roots, which is usually full of microorganisms because the roots release compounds that attract them. The aim of this project is to check if there is a common group of microbes that are always present and distinguish them from the others. Knowing this can help us make wheat plants grow better and more sustainably. We are particularly interested in a group of microorganisms called Pseudomonas.

We have a few hypotheses that we would like to test:

- a) Regardless of what kind of stress the wheat plants face (like aphid herbivory, drought, salinity and addition of fertilizers), we always find the same types of Pseudomonas.
- b) Whether Pseudomonas spp. found in wheat are different from the ones found in other crops.
- c) Whether Pseudomonas spp. can perform functions that help plants perform better, e.g. production of plant hormones and solubilisation of nutrients, especially when the plants are stressed with herbivores or harsh environmental conditions.
- d) Finally, we would like to check whether herbivory and other stresses change how Pseudomonas function and adapt to the environment.

To do all of this, we will use soil samples from different types of wheat plants that have been through different stresses. We will look for Pseudomonas bacteria in these samples and see what they can do for the plants. We will also compare them to Pseudomonas spp. from other crops. We will use some advanced methods to study the genes of these bacteria and see how important they are for helping plants and surviving in the soil. The student is expected to have obtained or soon to obtain a degree in Biology, Microbiology, Molecular Biology or related areas. Laboratory experience is desirable, but it is not essential. The supervisory team at Rothamsted Research and University of Bath consists of experienced microbiologists and plant microbiologists, molecular biologists, evolutionary biologists and bioinformaticians. By joining this multidisciplinary team, you will have a unique opportunity to work in one of the oldest agricultural research centres in the world and contribute to the development of agriculture for future generations using the full potential of microorganisms.

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.