

Enhancing Reproductive Resilience to Drought in Cereals and Legumes

Project ID: 3556

Supervisory team

Rothamsted supervisor: Dr Hari Ram Upadhayay (Rothamsted Research)

Academic supervisor: Prof Iain Hartley (University of Exeter)

Non-academic (CASE) supervisor: Dr Kathrin Thor (Syngenta)

Other supervisors: Dr Smita Kurup (Rothamsted Research) & Dr Kees Jan van Groenigen (University of Exeter)

Collaborators: Ms. Kirstie Halsey (Rothamsted Research)

Host institution: Rothamsted Research (Registered at University of Exeter)

CASE partner: Syngenta

Project description: Drought stress is one of the most significant challenges to global crop production, particularly when it occurs during the reproductive phase of crop development. Water deficit during flowering, fertilisation and early seed formation can severely disrupt pollen development, fertilisation success and grain set, resulting in substantial reductions in yield and seed quality. As climate change increases the frequency and unpredictability of drought events, there is an urgent need to develop innovative strategies that enable crops to maintain productivity under water-limited conditions. We are seeking an enthusiastic and motivated PhD candidate to join an interdisciplinary research project focused on understanding and mitigating reproductive-stage drought damage in wheat and soybeans. The project will investigate how soil water deficit affects critical reproductive processes and evaluates novel approaches to enhance crop resilience through physiological, molecular and agronomic interventions. Using advanced phenotyping approaches, the project will assess pollen viability, stigma receptivity, fertilisation success and early grain development under varying levels of water stress and exogenous mitigation treatments. Stable isotope analysis of carbon, nitrogen and oxygen will be used to provide mechanistic insights into how various interventions influence plant physiological responses to drought. The project integrates bioimaging and physiological measurements to identify key pathways associated with reproductive resilience. These data will be incorporated into predictive modelling frameworks to identify drought-sensitive developmental windows and optimise intervention strategies. This multidisciplinary project brings together expertise from Rothamsted Research, the University of Exeter, and Syngenta. The candidate will receive generous salary package. The student will receive training in plant physiology, stable isotope techniques, metabolomics, bioinformatics, statistical analysis and systems modelling. Through a combination of laboratory, controlled-environment and data-driven research, the project aims to generate new knowledge on reproductive drought tolerance while developing practical strategies to improve crop performance under increasingly variable climatic conditions. We are looking for candidates with an interest in plant stress biology, crop physiology, systems modelling and data analysis within a collaborative and supportive research environment. For informal queries, please contact: hari.upadhayay@rothamsted.ac.uk and/or I.Hartley@exeter.ac.uk. 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.