

Deciphering the Genetic Control of Clonal Reproduction in Raspberry

Project ID: 3682

Supervisory team

Main supervisor: Dr Tamara Lechon Gomez (University of the West of England (UWE))

Second supervisor: Prof Hilary J. Rogers (Cardiff University)

Non-academic (CASE) supervisor: Dr Graham Clarkson (Edward Vinson Ltd.)

Other supervisors: Dr Carrie Brady (University of the West of England (UWE)) & Dr Walter Dewitte (Cardiff University)

Host institution: University of the West of England (UWE)

CASE partner: Edward Vinson Ltd.

Project description: Raspberries are widely consumed across the world, acting as a valuable source of micronutrients, antioxidants and fibres, and have a high content in vitamin C and polyphenolic compounds (Ruhsam and Hollingsworth, 2026). Thus, raspberries make a valuable contribution to nutrient intake and global food security. However, climate change resulting in water shortages and warmer temperatures in the recent years have caused a rapid increase in production costs for UK farmers (James Hutton Institute, 2024), so there is growing need to develop novel approaches to not only sustain but improve raspberry yield. Unlike typical plant models, raspberries reproduce sexually via fruit on lateral branches and asexually via stolons and spawns. Both of these are lateral organs developing from specialised structures, lateral meristems, also called buds. Bud initiation and development are highly dependent on temperature, limiting raspberry cultivation to temperate areas with cold winters, and thus under threat from climate change (Mateos et al. 2024). Commercial raspberry propagation relies on asexual reproduction to preserve the genotype of elite varieties and ensure availability of pathogen-free plants for fruit production. However, propagation success ranges only between 2 to 60% (Heide and Sønsteby et al., 2015), negatively impacting propagation and breeding programmes. Through a bioinformatic approach using transcriptomic datasets, our group has identified candidate genes with putative functions in lateral bud fate in raspberry (Wilson et al., unpublished). We now aim to confirm their role in raspberry propagation and understand whether environmental factors impact their role. During this project, you will:- Assess the role of our candidate genes by altering their expression using transgenesis and CRISPR-based gene editing.- Quantify gene expression in varieties with different propagation success rates using qRT-PCR and transcriptomics to identify propagation markers.- Analyse the genetic and epigenetic variation in regulation of propagation genes using promoter analysis and DNA methylation.- Explore the effect of temperature stress and plant hormones on propagation and fruiting. Knowledge gained from this project will help soft fruit breeders Edward Vinson develop climate-resilient raspberry breeding and propagation strategies and will generate exciting data on genetic regulation of clonal reproduction and lateral bud fate. This project offers an opportunity to learn a range of transferable skills, including molecular biology, cloning, tissue culture, genomics, and bioinformatics. The partnership with Edward Vinson will provide valuable insights into commercial plant breeding and an opportunity to understand knowledge transfer between academia and industry.

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.