Branching Out: Genetic and Epigenetic Control of Axillary Bud Fate in Berries

Supervisory team:
Main supervisor: Prof James Murray (Cardiff University)
Second supervisor: Dr Tamara Lechon Gomez (Cardiff University)
Non-academic (CASE) supervisor: Dr Graham Clarkson (Edward Vinson Ltd)

Collaborators: Prof Hilary Rogers (Cardiff University), Dr Walter Dewitte (Cardiff University), Dr Behzad Talle (Edward Vinson Ltd)

Host institution: Cardiff University
CASE partner: Edward Vinson Ltd

Project description:
Berries are part of a healthy diet and offer added health benefits due to their high antioxidant content. This makes them very popular among British consumers, and they represent a third of the total fruit bought in the UK. Their increase in popularity requires a concerted increase in berry production, so Cardiff University and the soft fruit breeders Edward Vinson have partnered to improve strawberry and raspberry yield and propagation, both of which are highly influenced by plant architecture. Plant architecture is defined as the number, size, and spatial organisation of organs in the plant body, including flowers, branches, and runners. All these structures originate from axillary buds, which integrate different plant signals to determine whether they will develop into lateral branches to produce leaves and fruits, or into runners. However, there is very little knowledge of the genes involved in this decision and of their epigenetic regulation. Most of the current knowledge about plant architecture originates from established model species that have simpler architecture and do not reproduce clonally through runners.

This project will address the fundamental questions that underlie plant architecture in strawberry and raspberry using a combination of genomics and epigenetic techniques. You will lead a comparative analysis of gene expression in axillary buds of different species to understand how lateral development is controlled in berry plants, acquiring big data handling and bioinformatic skills. You will also explore how DNA methylation drives dynamic changes in gene expression and the impact of epigenetic regulation during clonal propagation of commercially important rootstocks. The knowledge gained from these studies will help EV develop new breeding strategies to obtain berry plants with improved architecture and will generate exciting data on gene regulation of axillary bud fate. You will also contribute to establishing new gene transformation protocols, which could be applied to other important horticultural crops, in order to help study gene function in under-researched species. This project offers an opportunity to learn a range of transferable skills, including molecular biology, genomics, and bioinformatics, both in model and non-model plant species. The partnership with Edward Vinson will also provide you with valuable insights into commercial plant breeding and an opportunity to understand knowledge transfer between academia and industry. This studentship will equip you to succeed in a wide range of career opportunities.

If you are interested in using genomics to improve food security, we would love to hear from you!

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.