FoodBioSystems DTP - PhD Project Advertisement Text

Project Title: FOODBIOSYSTEMS - Reducing seed loss and waste in umbelliferous crops

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Research Group: FOODBIOSYSTEMS BBSRC DTP
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Project Description: Umbelliferae species flower and set seed over a period of about 6 weeks depending on weather conditions. As a result, the bulk seed harvested contains seed at various stages of maturity and therefore of different quality. Seed companies must separate the high-quality, high germination seed from the harvested bulk. This is mainly done by differences in size, weight and chlorophyll content. The high seed heterogenicity though, leads to a lot of seed being wasted before a saleable batch is obtained.

Currently, breeding programmes focus mainly on the improvement of agronomic traits, such as yield and resistance to pests and diseases. In order for seed companies to reduce the loss of seed in the field and the waste during processing (due to inadequate seed quality), their breeding programmes need to be enhanced to include selection for relevant traits associated with seed variability.

The aim of this project is to use a combination of phenomics coupled with modern forward and reverse genetics approaches in order to, 1) investigate the genetic control of seed abscission, plant architecture and flowering time umbelliferous crops, and 2) select elite parsnip lines with superior characteristics in order to ensure that flowering time is shorter, seed stays longer on the plant, and that it is of increased quality (uniform, with higher germination capacity and improved vigour).

The project will provide the student an excellent opportunity for multi-disciplinary training in molecular genetics, phenomics and bioinformatics as it will include a) the generation of hybrid parsnip populations that segregate for the desirable traits, and b) the detailed phenotypic and genotypic characterization of breeding lines using 3D scanning phenotyping and Genotype-by-Sequencing (GBS) technologies respectively, in order to identify causative Quantitative Trait Loci (QTLs). The ultimate goal of the project is to generate suitable markers that could be used for Marker Assisted Selection (MAS) in parsnip breeding programmes.

The student will work closely with a plant breeding and seed supply company, the market leading Elsoms Seeds

Ltd. This will provide them a unique opportunity to get an insight into the breeding industry and undertake research at industry-level standards.

Funding Notes: This project is part of the FoodBioSystems BBSRC Doctoral Training Partnership (DTP), it will be funded subject to a competition to identify the strongest applicants. Due to restrictions on the funding, this studentship is only open to UK students and EU students who have lived in the UK for the past three years.

This is a CASE studentship, supported by Elsoms Seeds Ltd, the UK's leading independent plant breeding, seed supply and seed treatment specialists. The selected student will benefit from a minimum of 3 months placement in the company, where they will receive comprehensive training on all aspects of vegetable breeding and seed production.

The FoodBioSystems DTP is a collaboration between the University of Reading, Cranfield University, Queen's University Belfast, Aberystwyth University, Surrey University and Brunel University London. Our vision is to develop the next generation of highly skilled UK Agri-Food bioscientists with expertise spanning the entire food value chain. We have over 60 Associate and Affiliate partners. To find out more about us and the training programme we offer all our postgraduate researchers please visit https://research.reading.ac.uk/foodbiosystems/.

Training opportunities: The student will benefit from a placement at Elsoms Seeds Ltd. (minimum of three months), where he/she will receive training in all aspects of vegetable breeding and seed production, including glasshouse and field trials, generation of F1 hybrids, as well as seed quality evaluation and seed treatments.

Hands-on training will be provided for all the required molecular genetics, bioinformatics and phenomics work at Cranfield and Reading University. In addition, the student will be able to attend relevant modules of the Agrifood MSc Programmes at Cranfield, such as, 'Exploratory Data Analysis and Essential Statistics Using R' and 'Next Generation Sequencing Informatics', 'Plant-based Technologies', 'Principles of Sustainability', 'Food Chain Resilience' and 'Agrifood Business Innovation'.

Emphasis will also be given to personal development and core research skills training. Relevant courses are regularly provided by the Cranfield Doctoral Research Core Development programme and the University of Reading Researcher Development Programme (RRDP). Examples include (but are not limited to) training on 'Research ethics', 'Data Management' 'Communication skills' and 'Time Management'.
The student will also have the opportunity to develop their teaching and supervision skills by being involved in MSc laboratory practical demonstrations and the supervision of relevant MSc research projects students.

Student profile: This project would be suitable for students with a BSc or MSc in plant sciences, crop sciences, biology, genetics or other closely related subject. The work will involve generating and managing large datasets, so good organizational skills and analytical ability would be essential. A strong interest in crop improvement and breeding, as well as good oral and written communication skills would also be required.