Genome edited crops for larger seed

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Proposed start date: 6th July 2020 (flexible)
Length: ~8 weeks

Project description: Seeds are the most important agricultural product, accounting for at least 70% of the world’s food supply. With rising population and diminishing agricultural land, it is increasingly urgent to improve crop yields. Increasing seed size and number in seed crop species are important routes to achieving this goal and improving food security. Previous work has shown that loss-of function mutations in the transcription factor AUXIN RESPONSE FACTOR 2 (ARF2) in Arabidopsis results in larger seed1. This is due to extra cell divisions within the integument prior to fertilization leading to a larger seed cavity, and ultimately larger and heavier seeds.

Panel A shows a comparison of control Arabidopsis seeds and the much larger arf2 mutated seeds. Panels B and C are photos of the Brassica genome edited lines that will be assessed during the placement project.

Currently we are interested in investigating the loss of function of ARF2 in two major crops, Brassica and rice. This project aims to investigate whether a similar loss of function of the ARF2 orthologue in crops using a “genome editing” non-GM approach will lead to an increase in seed size and potentially seed yield. Brassica and rice plants that have been edited in their ARF2 homologue have been generated. These plants will be genotyped to assess for the presence of the arf2 mutation and the absence of Cas9, essential to stabilise the mutation event. The effect on cell number in the seed integuments will be analysed along with the effect on seed size and ultimately, seed yield. This project encompasses a variety of disciplines- molecular cell biology, molecular genetics, plant physiology, and microscopy. The student will receive training in basic and advanced laboratory techniques. 1Schruff et al., 2006