

Studentship Project: Annual Progress Report 09/2021 to 10/2022

Student Name:	Camila Gonzalez Campo	AHDB Project Number:	SF/TF 170a
Project Title:	Understanding the control of perpetual flowering and runnering in strawberry		
Lead Partner:	BerryGardens		
Supervisor:	Dan Sargent (NIAB) & Jim Dunwell (University of Reading)		
Start Date:	20 Sep 2021	End Date:	19 Apr 2026

1. Project aims and objectives

Due to consumer demand for strawberry fruit across 12 months of the year, and the increasing cost of transportation related to imported fruit, extension of the cultivated strawberry cropping season is one of the main aims of strawberry breeding programs worldwide. Selective breeding for perpetual flowering (PF) cultivars can create new varieties that produce fruit throughout the whole growing season, and manipulation of flowering time could extend the season further still. Since the genetic mechanisms that control perpetual flowering and runnering are not fully understood in the cultivated strawberry, these traits cannot currently be fully exploited for marker assisted breeding or genetic engineering. Thus, understanding the genetic mechanisms that control everbearing and continuous runnering in the cultivated strawberry will aid the identification of novel target genes and the development of genetic markers. Hence, the aim of this project is to dissect the control of PF and runnering in the cultivated strawberry and has two main work packages:

- WP1: Understanding the regulation of *FaTFL1* and *FaFT1* in *F. x ananassa*
- WP2: Identifying the candidate gene(s) in the pathway controlling timing of vegetative reproduction in strawberry

2. Key messages emerging from the project

The activity plan for the first part of the project (WP1) consists of writing a draft of a literature review, designing gRNA for CRISPR/Cas9 genome editing, cloning CRISPR/Cas9 constructs, transformation of strawberry leaves, selection and regeneration of edited strawberry callus. The task for the second part of the project (WP2) consists of developing a genotyping-by-sequencing (GBS) library of a continuous runnering mapping population and developing a genetic linkage map and fine mapping the continuous runnering locus. All of the tasks up to date, for WP1 and WP2 of the project have been completed.

3. Summary of results from the reporting year

- Cloned CRISPR constructs for TFL1 and FT1 genes
- Transformed strawberry leaves with constructs
- Obtained plants from transformed leaves

The results described in this summary report are interim and relate to one year. In all cases, the reports refer to projects that extend over a number of years.

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- Developed a genotyping by sequencing (GBS) library for genetic mapping of a continuous running population
- Sequenced GBS library
- Did the genetic mapping of population
- Genotyped a few key markers

4. Key issues to be addressed in the next year

- Confirm transgenic plants and edits
- Narrow down locus for continuous running
- Develop edited plants for candidate continuous running gene

5. Outputs relating to the project

(events, press articles, conference posters or presentations, scientific papers):

Output	Detail
Presentation	Online project presentation for the Crop Science Seminars at the University of Reading (05/07/2022)
Presentation	Project presentation for the Genetic, Genomics and Breeding symposium at NIAB, East Malling (21/03/2022)
Presentation	CTP summer event presentation (19/07/2022)

6. Partners (if applicable)

Scientific partners	Timo Hytonen (University of Helsinki)
Industry partners	Harriet Duncalfe
Government sponsor	UKRI-BBSRC