Studentship Project: Annual Progress Report Sept/2021 to Sept/2022

Student Name:	**Katherine Stewart**	**AHDB Project Number:**	**SF/TF 170/a**
Project Title:	**Understanding the dynamics of ascospore production to optimise apple scab management**		
Lead Partner:	NIAB		
Supervisor:	Xiangming Xu (NIAB); Carol Verheeckhe-Vaessen (Cranfield)		
Start Date:	September 2021	**End Date:**	September 2025

1. Project aims and objectives

Objective 1: Sex initiation

1. Is sex (ascospore production) initiated before leaf fall?
2. Does sex exclusively occur between lesions on the same leaf?

For both of these hypotheses, I will be using light and scanning electron microscopy to identify the formation of pseudothecia on the leaves.

I will also inoculate trees with individual isolates and pairs of compatible isolates to identify if this mating can occur between detached leaves from different trees (to mimic fallen leaves under the natural conditions).

Objective 2: Mating type - Design molecular markers for the two mating type locus. These will be used for population genetics studies.

Objective 3: Population variation – I will be studying the temporal variation between scab populations on cultivars with different resistance genes against scab in the same orchard, focusing on potential resistance gene breakdown.

Objective 4 – Pathogenicity – Following from objective 3, I will assess the possibility of identifying pathogenicity factors that may result in gene-for-gene interactions. I would use the RNA seq technique to study Gala isolates infecting *Rvi*6 resistant genotypes and vice versa, and then use bioinformatics to identify any pathogenicity factors.

Objective 5 – Microbial methods to disrupt sexual reproduction on leaves

- I will study the impact of microbial agents on leaf litter degradation in order to reduce overwintering inoculum. If this approach works, it should reduce primary inoculum in the spring.
- Foliar application of microbial/biological control agents to identify biocontrol products that are comparable to fungicides in scab control.

2. Key messages emerging from the project

All of my experiments are still underway due to the long growth periods of the scab fungus and furthermore I have just finished my first year . Thus, there are no messages from my project that will have impact on scab control in practice.

3. Summary of results from the reporting year

I have no experimental results so far as the scab fungus takes long periods of time to grow and mate. I have completed a first literature review and am in the process of editing a review paper which I aim to submit to an appropriate journal before the Christmas period.

I will soon be carrying out some preliminary microscopy work to identify the formation of sexual structures on the leaf surface which contributes towards my first objective (sex initiation). I have completed several mating crosses and will be using the ascospores from these to carry out the work in objective 2 (mating type). Finally, I have designed an experiment to evaluate the efficacy of selected alternative products on leaf degradation; this experiment will be carried out in the coming winter.

4. Key issues to be addressed in the next year

I aim to achieve both my first objectives by the end of the next academic year (September 2023). My biocontrol experiments should be well underway by this point and I will have more time to focus on pathogenicity and population variation studies.

5. Outputs relating to the project

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

Output	**Detail**
Presentation	**CTP autumn event at Lincoln University – introductory event for first year of PhD**
Conference Poster	**British Mycology Society - fungi and the environment conference at Cranfield University**
Conference Poster	**IOBC-WPRS workshop on pome fruit diseases in Plovdiv, Bulgaria**
Presentation	**CTP summer event held at NIAB EMR**
Review paper	**In editing stage***

6. Partners (if applicable)

Scientific partners	Cranfield University
Industry partners	Worldwide fruit; National Association of Cider Makers
Government sponsor	UKRI BBSRC – CTP FCR