# Studentship Project: Annual Progress Report 0109/2019 to 0109/2020

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| **Student Name:** | **Thomas Crocker** | **AHDB Project Number:** | |
| **Project Title:** | **Integrated Forecasting of Light Leaf Spot (*Pyrenopeziza brassicae*) on Oilseed rape (*Brassica napus*) and Vegetable Brassica (*Brassica oleracea*)** | | |
| **Lead Partner:** | Newcastle University, Fera Science Ltd | | |
| **Supervisor:** | Roy Sanderson, Judith Turner, Femke van den Berg | | |
| **Start Date:** | 01092018 | **End Date:** | 01092021 |

## 1. Project aims and objectives

1. Develop disease cycle models required for a forecasting system that can be adapted for epidemics on oilseed rape (OSR) and vegetable brassica.
    - An infection model built using germination and penetration components.
    - A latency model that estimates the time to the onset of sporulation
2. Format models so they are compatible with the time-series meteorological data produced by weather stations.
3. Develop and validate a risk forecasting system based on the number of days that pass a threshold risk of infection adjusted for airborne ascospore concentration
    - Sample ascospore from field sites and analyse days when infection risk is estimated to be high
    - Correlate result with disease severity data from field plots

## 2. Key messages emerging from the project

Ascospore release occurs much earlier in the year than previously thought. First observations in January.

Germination of *P.brassicae* spores can occur at very low temperatures and the growth rate of germtubes and hyphae is surprisingly high at 2.5ºC. Much higher that a traditional linear relationship between growth rate and temperature would suggest.

It was possible to develop a germination model that can be used with smoothly changing metrological data of the kind that is generated from in-field weather stations and this model has some moderate predictive capabilities when validated against disease severity data from controlled environment experiments in OSR.

## 3. Summary of results from the reporting year

Experiments concerning the germination and growth of *P. brassciae* spores in artificial media have been completed. The upper and lower temperature thresholds for germination have been identified and the relationship between percentage germination and thermal time at a range of temperature settings was fitted by logistic growth models. This data was used to develop a germination model suitable for the kind of time-

series temperature inputs recorded by weather stations - enabling it to be used as one component of an infection model for light leaf spot on OSR or vegetable brassica.

Germtube growth was also recorded and modelled in a way that allowed estimation of germtube length given time-series temperature inputs. This second model can be used in parallel with the germination model to give an indication of germtube development at each time point in a time series data set of in-field temperature measurements. This might be a useful proxy for the penetration component of an infection model. Both models were used to estimate the disease severity observed in published controlled environment trials. They were moderately successful but a temperature dependant effect on disease severity was observed that cannot be accounted for by germination or germtube growth in media. This implies an effect of temperature on penetration or during the latency phase and will require further study.

## 4. Key issues to be addressed in the next year

The relationship between germination and germtube growth on the penetration of the cuticle in OSR and vegetable brassica will be assessed using detached leaf and leaf disk experiments. This will complete the infection component of the model and explore the differences in leaf surface resistance in both host types.

A further investigation of the latency will be conducted using glasshouse experiments. The infection model will enable initial infection severity to be held constant so that the effect of host type on time between infection and sporulation can be assessed directly.

The infection model will also be used to estimate the daily risk of infection in data sets collected from OSR and vegetable brassica field plots. This will inform the analysis of daily ascospore samples from these sites by qPCR and allow the observed disease severity to be correlated with risk of infection.

This model will be compared with existing Alternaria models on OSR and vegetable brassica using historic data sets.

## 5. Outputs relating to the project

A 10-minute presentation was given at the Fera Science Symposium on the 18th November 2020

| **Output** | **Detail** |
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| **First Data Chapter** | **Data and models for germination and germtube growth of *P.brassciae* spores** |
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## 6. Partners (if applicable)

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| **Scientific partners** | Newcastle University |
| **Industry partners** | Fera Science Ltd |
| **Government sponsor** | NA |