

Studentship Project: Annual Progress Report 10/21 – 03/22

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Project Title:	The Biology & Integrated Management of the Bean Seed Fly		
Lead Partner:	University of Warwick		
Supervisor:	Prof Rosemary Collier (Warwick), Rob Lillywhite (Warwick) & Dr Becky Howard (PGRO)		
Start Date:	10/19	End Date:	09/23 (submission date)

1. Project aims and objectives

Aim: To contribute towards an integrated pest management (IPM) strategy to reduce crop damage and economic losses by the Bean Seed Fly (BSF) in horticultural crops

Objectives:

1. Establish a BSF culture to provide insects for experimental work
2. Investigate the impact of temperature on BSF development and diapause
3. Identify effective trapping methods for monitoring BSF
4. Create and validate a BSF forecasting model
5. Assess the efficiency of cultural and physical strategies on reducing damage caused by BSF

2. Key messages emerging from the project

Objective Two:

The overwintering strategy of BSF is different from the overwintering strategy of species that share the same genus, *Delia*. It appears that a proportion of BSF do not enter diapause over the winter. These findings will have implications for forecasting the Spring emergence of BSF. The methods used to forecast the BSF may need to differ from the methods used to forecast similar species such as the Cabbage Root Fly and Onion Fly.

Objective Three:

Blue sticky traps containing a lure catch more BSF than blue sticky traps not containing a lure. It is not known if blue sticky traps with a lure catch a higher ratio of BSF to species that could be easily confused as BSF. It is important that traps are selective to BSF so growers can be confident that they are monitoring BSF as opposed to similar species.

Objective Four:

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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The Spring emergence of BSF can be predicted by accumulating day degrees from 1st January using a threshold temperature of 3.9°C.

Objective Five:

The literature suggests that the timing of cultivation and covering of the crop in relation to the sowing date of vining peas can have an effect on plant damage caused by the BSF. Three repeats of field trials have not shown significant effects.

3. Summary of results from the reporting year

Objective Two:

- A small proportion of wild BSF at Warwick Crop Centre (WCC) enter diapause in early Autumn
- The diapause of wild BSF at WCC is shorter than similar species such as Cabbage Root Fly and Onion Fly

Objective Three:

- Blue sticky traps containing a lure (Andermatt or Ag-Bio Inc.) catch significantly more BSF than blue sticky traps not containing a lure ($P = 0.002$)
- Lure: Containing volatile attractants (2-phenylethanol & *n*-valeric acid) associated with decomposing onion pulp

Objective Four:

- There is a significant relationship between the accumulation of day degrees (base temp: 3.9°C, accumulated from: 01/01) and the proportion of BSF to emerge from the Spring generation of BSF ($P < 0.0001$)

Objective Five:

- The timing of cultivation and covering the crop in relation to the sowing date of vining peas has shown no significant effect on plant emergence, BSF tunnelling in the seed and larvae found in seeds

4. Key issues to be addressed in the next year

Questions to be asked:

Objective Two:

- When do BSF from the culture enter diapause in field conditions at WCC?
- When do BSF from the culture finish diapause in field conditions at WCC?
- How long do BSF from the culture spend in diapause?
- Does photoperiod affect diapause initiation?

Objective Three:

- Do blue sticky traps containing a lure catch a higher proportion of BSF to similar species than blue sticky traps not containing a lure?
- Does the height of a blue sticky trap affect the number of BSF caught on the trap?
- Does the height of a blue sticky trap affect the proportion of BSF to similar species caught on the trap?

Objective Four:

- Do different models show a better fit to the Spring emergence data, such as a Probit model?
- Can day degrees be accumulated from an earlier date?

Objective Five:

- Does the timing of cultivation and covering of the crop in relation to the sowing date of vining peas and salad onion seeds have an affect on damage caused by the BSF? The field trials completed in 2021 may have had low BSF damage as BSF numbers were low at WCC in 2021 (BSF population

monitored via yellow water traps). The trial will be repeated. BSF will be attracted to the site before the experiment begins by applying organic matter.

5. Outputs relating to the project

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

Output (Oct 21 – Sept 22)	Detail
Conference Poster	17th – 18th Nov 2021: Association of Applied Biologists: Improving Global & Local IPM
Presentation	8th Dec 2021: Bean Seed Fly Growers' Meeting
Presentation	9th Feb 2021: British Leek Growers' Association Meeting
Presentation	17th Feb 2021: Royal Entomological Society: Student Forum
Presentation	18th Feb 2021: International Organisation for Biological and Integrated Control – West Palaearctic Regional Section: IPM in Vegetables

6. Partners (if applicable)

Scientific partners	University of Warwick
Industry partners	Processors and Growers Research Organisation
Government sponsor	N/A