



Grower Summary

Integrated decision support tools
for management of downy mildew in onions

CP 184

Project title: *Integrated decision support tools for management of downy mildew in onions*

Project number: CP 184

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Report: Annual report, November 2021

Previous report: N/A

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Date project commenced: 01-04-2020

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The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.

AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

Paul Lansell

Programme Manager

Fera Science Ltd

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GROWER SUMMARY

Headline

Currently there is insufficient data to complete the evaluation of whether impaction spore samplers could be used as a lower cost method for spore trapping, reducing equipment costs and time in kit maintenance and sample processing. Further work in the final year of the project aims to secure enough data to complete the evaluation.

Based on ongoing evaluation work, there are several concerns around LFD being suited for testing spore samples collected with the alternative spore samplers.

Background

Downy mildew (*Peronospora destructor*) is a common disease that can result in major yield losses in bulb and salad onions and in onion seed production (Develash and Sugha, 1997) and crops may receive fungicide treatments as frequently as every 10 days. It is therefore crucial to have accurate and timely information around infection risk. Although the CropMonitor Pro (CMP) Platform by Fera Science Ltd on behalf of the Crop Health and Protection Centre now includes an onion downy mildew risk prediction module based on the MILLIONCAST algorithms (Gilles *et al.*, 2004), this module cannot predict the onset of spore presence. This means that although CMP can help guide spray timings once spores are present, currently growers may use in-field spore sample detection methods to pinpoint the onset of the epidemic. This spore sampling is expensive and time intensive so any cost savings that can be made would enable increased uptake of these methods.

Summary

This project aims to validate the performance of two rotation impact samplers as a low-cost alternative to the more sophisticated suction traps for use in conjunction with a lateral flow device for detection of onion downy mildew (*Peronospora destructor*) spores to aid early detection of the pathogen entering onion crops. The three types of traps will be tested in onion trials at two locations provided by AHDB and/or G's. Further validation will be undertaken by growers evaluating the ease of use of the different samplers as decision aids in the field. Data collected will be used in modelling work to more clearly define spore thresholds for disease development in the crop. All trial sites will be hosted on an updated version of the CropMonitor Onion downy mildew module and results updated in real-time for use in local disease management decisions. Results at the AHDB and G's trials sites will be used for knowledge transfer activities to the wider industry, including presenting at relevant industry events (e.g. BOPA meetings; open days) across the 2022 season.

During the early stages of the project concerns were raised about the suitability of the MOLOGIC Lateral Flow Device (LFD) assay for detection of *P. destructor* spores collected using rotation impact samplers due to potential interference with the coatings (Vaseline or silicone grease) used on the spore collection sticks. This led to the project being extended to also validate the LFD for use in this setting whilst simultaneously developing Loop-Mediated Isothermal Amplification (LAMP) and real-time Polymerase Chain Reaction (PCR) assays, which could be used as alternative detection methods if the LFD is proven to not be fit for purpose.

The first sampling season provided limited sets of samples with which the sampler types could be directly compared. Further data is therefore needed to make any solid conclusions regarding potential differences in sampler type performance. A main concern is that in some cases the difference in spore numbers between replicates of the same impaction sampler type was found to be larger than the between sampler type difference. This could be a result of either inconsistencies in the sample collection or inability of the LFD to provide a quantitative measure of spore presence.

Initial validation has raised some concerns around the validity of the LFD to detect spore loads in samples collected with rotation impact samplers. This work needs to be completed before the start of the 2022 growing season. If the LFD shows to not be fit for purpose a further detailed comparison between the sampler types needs to be performed with the most appropriate diagnostic method.

Some concerns were also raised by the lab staff around the user friendliness of the LFD and the growers around operating the samplers. For example, the LFD is provided as a dipstick rather than a fully housed test kit. This means that the conjugate disc needs to be added by the user which risks cross contamination after which the stick needs to be dipped into the sample tube. Given that the tubes also contain ball bearings to get the Vaseline/Silicone coating which contains the spores off the matchsticks, it is difficult to add the LFD to the test tube without having lots of sample material sticking to the side of the LFD. Further feedback from growers on the experience setting up and operating the samplers was gathered following the end of the sampling season.

This first round of feedback will be used to adjust the 2021/2022 sampling protocols. Additional feedback around usability of the diagnostic methods and spore samplers will be collected through engagement with growers at events in 2022.

Financial Benefits

The exemplar sampler which is the Burkard cyclone spore trap has a price point of £2,547 excl. VAT (excluding batteries), whereas the alternative samplers have a much lower price point with the SporeStick coming in at £600 excl. VAT (excluding batteries) and the GRIPS-99M coming in at £525 (+ shipping & excluding batteries).

Not only are these alternative samplers cheaper to purchase they are believed to be easier to handle given that the weekly changeover of eight Eppendorf tubes in the Burkhard cyclone would be replaced by changing over two matchsticks (or plastic sticks) coated in grease, resulting in a significant weekly time saving (approximately 20 minutes time saving per changeover event per trap).

Action Points

- Completion of the assessment of the LFD as a suitable diagnostic method to be used in conjunction with the lower cost spore samplers
- A more detailed Fera-based comparison in performance of three sampler types using the diagnostic method identified as most appropriate for these traps
- Knowledge transfer event at one of the AHDB monitoring farms to test usability of the different sampler types and diagnostic methods (LFD and LAMP/PCR)