



HINKLER AGTECH INITIATIVE

Automated Spore Trapping Technology

INTRODUCTION

This trial was undertaken as part of CQUniversity's Hinkler AgTech Initiative. The Initiative aimed to increase the productivity and profitability of the Bundaberg region's agricultural sector through greater availability and utilisation of agricultural technology (AgTech). An extensive consultative process undertaken with agribusinesses identified on-farm needs that may be addressed using AgTech. Trials of selected AgTech products and services were then undertaken in partnership with agribusinesses and technology providers to determine the technologies' efficacy in on-farm conditions. This summary provides an overview of findings from one of the technology trials, including grower feedback and considerations for other growers when deciding whether to utilise the technology in their own enterprise.

Background

Plant diseases are a significant productivity and marketing constraint in Australian horticulture and chemical crop protectants are an important part of disease management programs. Efficient application of chemicals is increasingly important due to rising input costs, environmental awareness and consumer demand for sustainable farming practices. Traditional disease monitoring methods, involving manual checking and identification of crop symptoms, are time-consuming and prone to error. Innovative systems for disease monitoring are needed so that growers can make informed decisions regarding spray applications and accurately assess the effectiveness of disease management strategies.

The Technology

'BioScout' is an automated plant disease monitoring platform based on a spore trap that is programmed to collect air samples at regular intervals. Airborne particles, such as fungal spores and pollen, are trapped and identified via an artificial intelligence (AI) model. The BioScout platform provides real-time data on airborne spore concentrations, temperature, humidity and wind speed. These data are transferred via the Cloud to an online portal enabling a grower to view any changes in spore concentrations, as an indicator of crop disease, detected in the trap. The portal can also be used to view spray records, field reports and pathology reports.

The Trial

BioScout units were installed adjacent to crops for detection of:

- *Botrytis* - causal agent of grey mould disease in strawberries
- *Peronospora* - causal agent of downy mildew in basil
- *Alternaria* - a common pathogen in many crops that provides a benchmark for spore concentration data.

The units were deployed on a rotating steel pole to monitor airborne particulates during 2-3 months of crop production. During this trial period, crops were monitored weekly for crop disease incidence. The AI model for *Botrytis* detection is one of BioScout's most advanced models. A new model was developed and validated for detection of basil downy mildew.

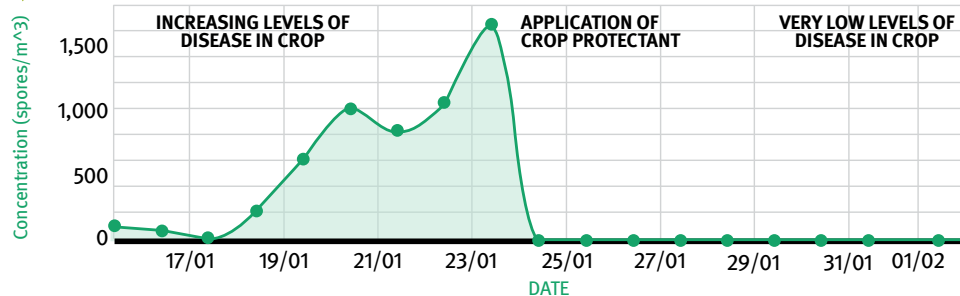
RESULTS

The BioScout platform successfully collected data relating to spore concentration and weather conditions. A new model was also successfully developed to consistently and accurately identify downy mildew spores. Spore concentrations reported by the BioScout platform generally reflected the level of disease that was observed in field crops. Growers highlighted the importance of real-time data, as data availability was delayed at times due to technical issues. The following graph is an example of data collected and reported by the platform and shows the concentration of spores detected over a two-week period, including the response to crop protectant application.





Example of BioScout data:



The trial highlighted the siting of BioScout units as an important factor for accurate disease monitoring. For example, dust from vehicles driving on headlands near the units limited the ability of the AI model to detect spores. Spore capture as an indication of crop disease incidence is also most accurate when the unit is installed within or close to fields, enabling more direct sampling of air currents passing over the crop.

Value to Business

Monitoring crops for disease outbreaks is an important aspect of crop management. The information provided by the BioScout system integrated with weather data and spray records, could enable growers to make informed disease management decisions, such as when to apply a crop protectant and which product may be suitable (e.g., can a biological control be used?).

Growers involved in this trial commented on the importance of early disease detection in crops, particularly for basil downy mildew, due to the rapid development and spread of that disease. Timing of spray applications is critical to achieve effective control and to mitigate significant yield losses. Spore concentration data can also provide insights into the effectiveness of previous control strategies at different stages of disease development. The BioScout units were recognised by basil growers as a valuable disease monitoring tool and will continue to be used commercially.

The cost of the BioScout system ranges from \$12,000 - \$20,000 per unit*, depending on the number of units purchased. This fee includes installation of the units, 12 months servicing, data transfer and analytics, and reporting via Bioscout’s online dashboard. The fee also includes development of new machine learning models where required for crop pathogens not before detected and analysed by the Bioscout system.

Grower Feedback

Trial Summary Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I see value in this technology				✓	
I found the technology easy to use			✓		
The technology was easy to integrate within my business				✓	
I was satisfied with the service provided by the AgTech company			✓		
I intend using this technology in my business				✓	
I recommend this technology to other growers				✓	

Other Considerations

The BioScout units are best positioned within the crop and away from heavy-traffic areas, as dust can impact the quality of imagery and spore detection.

BioScout is a Sydney-based company, and a leader in the field of automated crop disease detection. The BioScout platform was originally developed for disease monitoring in vineyards and cereal crops. Development of new machine learning (ML) models for detection of a wider range of crop pathogens is ongoing.

Further Information



For further information on this trial and results, email CQUniversity’s agricultural research team: agriculture@cqu.edu.au

For further information on the Bio Scout system, visit: bioscout.com.au

Summaries of other technology trials undertaken through the Hinkler AgTech Initiative are available at: bundabergagtechhub.com.au

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