BioScout: Real-time Disease Monitoring and Forecasting

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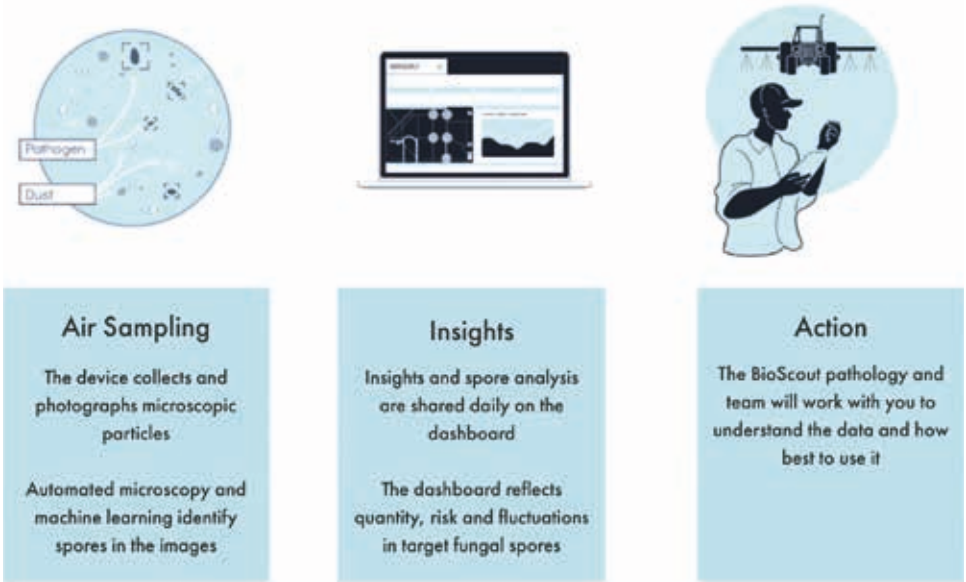
- BioScout was recently announced as the first recipient of funding through the Hort Innovation Venture Fund
- Launched in late 2024, the Venture Fund, delivered in partnership with Artesian Venture Partners, was created to accelerate innovation across the horticulture sector by investing in early-stage, high-growth startups
- In a real-life South Australian vineyard case study, a BioScout unit was deployed to measure airborne fungal spores
- Data from the BioScout system showed that most of the products applied **(51 out of the 54)** were unnecessary and that key opportunities to target pathogens when notable levels of spores were present in conjunction with conducive infection risk levels were missed

BioScout is an Australian agricultural technology company that has developed an autonomous sensor for detecting airborne fungal diseases. The technology can identify and count fungal spores affecting crops, and report results in near real-time. Combined with its integrated weather sensors, growers can use BioScout to identify which airborne diseases are present on their farms, assess the potential severity of infections, determine optimal timing of fungicide sprays, and gain quantifiable insights into the effectiveness of disease management activities.

HOW IT ALL BEGAN

Lewis Collins, BioScout CEO, was working on spore trapping (which is painfully slow) as part of his microbiology studies at University of Sydney when he thought: **"Why is it so challenging to analyse airborne disease? By the time you've received the data, it's already too late to avoid an outbreak".** Lewis had a vision of automating the process so that growers could get a real-time understanding of the pathogens in their environment.

HOW IT WORKS



BioScout units are positioned strategically throughout the field to intercept the air that flows into and within the crop. Air is sucked into the units where it passes over a sticky film that captures airborne particulates such as fungal spores. An autonomous microscope inside the BioScout captures high-resolution images of the spores on the film and instantly transfers them to cloud-based software in Sydney. Advanced AI algorithms identify and categorise the spores based on their morphology.

The system then converts spore counts into precise airborne concentration values (Figure 2). These values are displayed in charts alongside infection risk graphs, which are a combination of a weather-based model (temperature-moisture response function) with adjustments based on the concentration of spores detected (Figures 3 to 5). The infection risk graphs can be used to assess the most suitable timing for fungicide applications, helping to maximise their effectiveness while reducing unnecessary sprays.

Vast amounts of airborne particulate data are collected and reported by BioScout each day. This enables detection of fungal pathogens up to two weeks before symptoms become visible on the crop.

A BioScout unit in an open-field crop example
Photo credit: BioScout

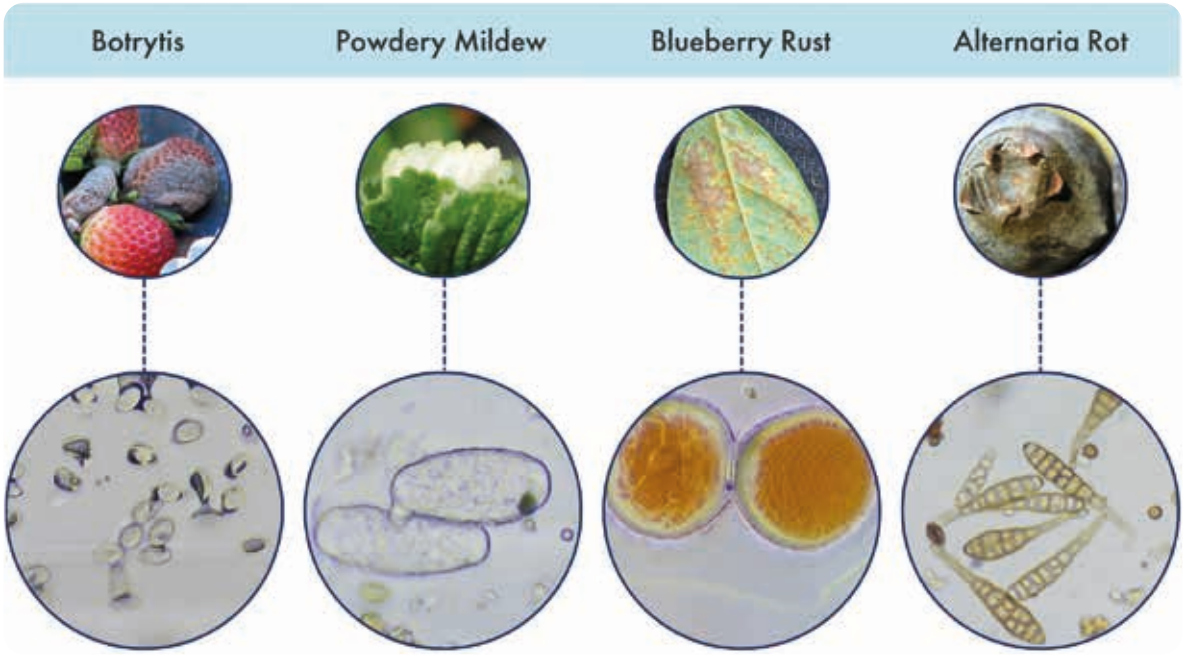


Figure 1. BioScout can detect common berry pathogens including botrytis, powdery mildew, blueberry rust and Alternaria, with capability to add more pathogens to the library

Figure 2: The BioScout Dashboard 'At a Glance' Disease Warning System provides quick updates on disease inoculum from units on your farm. You can have a look at live readings from the broadacre GRDC network at bioscout.com.au/grdc

Vineyard case study

BioScout units were deployed in a South Australian vineyard during the 2024/25 season where botrytis, powdery mildew and downy mildew were monitored. Air was sampled from 6 am to 12 pm local time and airborne spore concentrations were recorded daily and reported as spores/m^3 air.

The grower did not use data from the BioScout to guide spray applications. Grower driven fungicide spray timings were assessed using airborne spore concentrations and weather-driven infection risk predictions from the BioScout and were categorised as either:

- **'Unnecessary':** Sprays applied during periods of low/absent spore detection combined with unfavourable weather conditions for infection
- **'Necessary':** Sprays applied when moderate to high spore concentrations coincided with weather conditions conducive to disease development

Nineteen sprays were applied over the season, each containing a mixture of one to three fungicides (targeting different pathogens) along with wetters where required; this equated to a total of 54 individual product applications.

Data from the BioScout system showed that most of the products applied (51 out of the 54) were unnecessary and key opportunities to target pathogens when notable levels of spores were present in conjunction with conducive infection risk levels were missed.

Botrytis

Low levels of botrytis spores were detected across the season, reaching the high spore concentration on just one occasion (14/01/25). The weather, however, was extremely conducive to infection for much of the period. Even a moderate number of spores (yellow in the threshold) can lead to infection if the weather is highly optimal for the disease to proliferate. Figure 3 shows the spore load and corresponding infection risk over the season. Spray applications that contained fungicide targeted at botrytis are marked with a star (14 in total); all bar one of these was categorised as **unnecessary** according to BioScout data. The two points shown in red had notable levels of spore concentration, but more importantly, high infection risk levels. Applying botrytis-targeting fungicides at or shortly after these points would likely be more effective for managing disease.

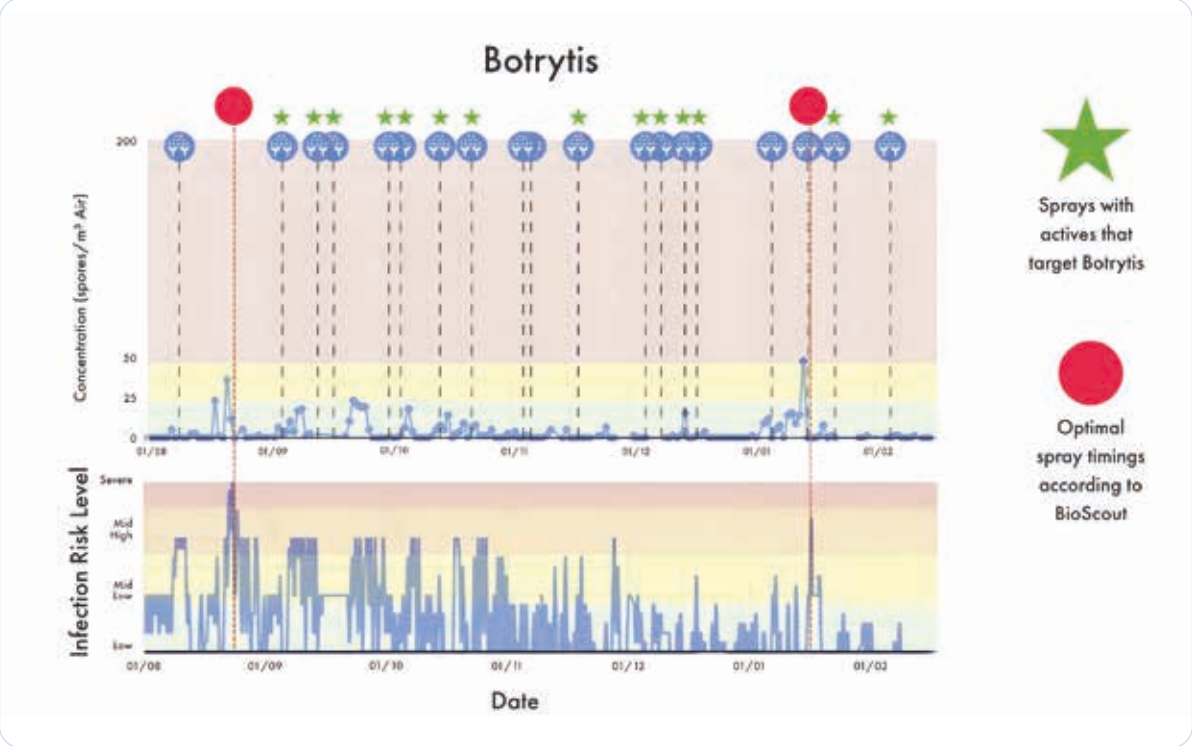


Figure 3. Botrytis spore concentration and infection risk graphs from the vineyard. Spray applications containing botryticides are marked with a star. Optimal spray application timings according to the BioScout system are shown in red.

Downy Mildew

Downy mildew posed a higher risk overall throughout the season. Several high peaks of airborne spores of downy mildew were detected across the period, especially from September to late October. It then remained low for the remainder of the season. Figure 4 shows the airborne spore load and corresponding infection risk over the season. Spray applications that contained fungicide targeted at downy mildew are marked with a star (16 in total); all bar one was categorised as **unnecessary** according to BioScout data. The three points shown in red were identified as more suitable spray timings for effective for disease management. These were when the spores were present and the weather was conducive to an outbreak, which resulted in mid-high to severe infection risk.

Powdery Mildew

There were only four powdery mildew spikes detected throughout the season. Analysing the spore concentration graph and infection risk graph in tandem (Figure 5), the BioScout system deemed all bar one of the 19 grower-applied powdery mildew sprays as unnecessary. This is because the spikes in spore concentration corresponded with relatively low infection risk levels; the weather was not suitable for infection; therefore, those spores were unlikely to cause problems. However, if the vineyard wanted to adopt a more conservative approach, application of a fungicide after the large concentration spikes could be justified.

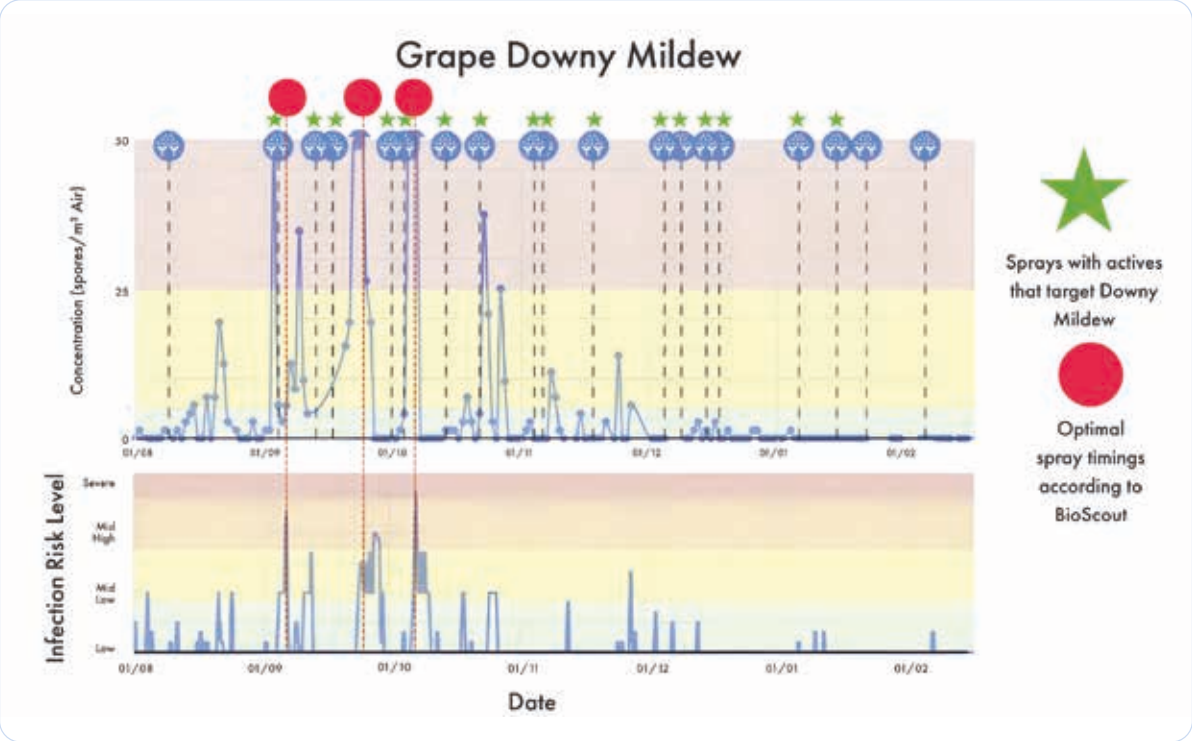


Figure 4. Grape Downy Mildew spore concentration and infection risk graphs from the vineyard. Spray applications containing actives targeting downy mildew are marked with a star. Optimal spray application timings according to the BioScout system are shown in red.

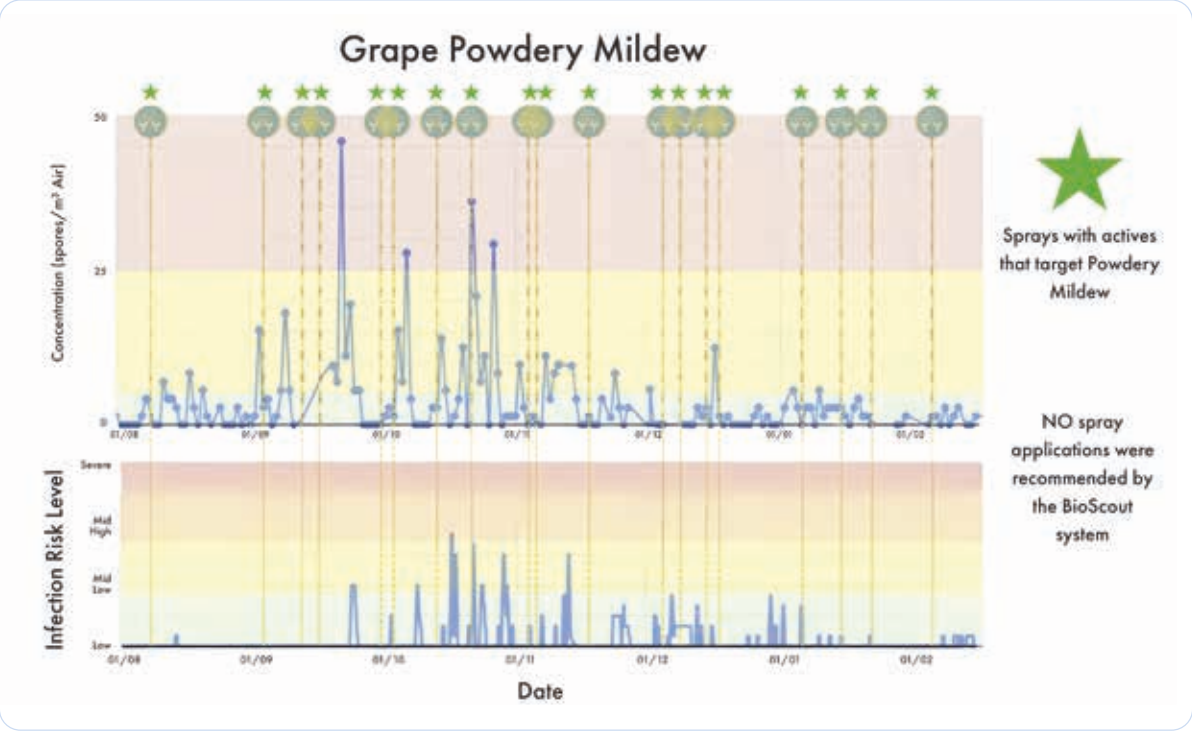


Figure 5. Grape Powdery Mildew spore concentration and infection risk graphs from the vineyard. Spray applications containing actives targeting powdery mildew are marked with a star. Infection risk remained relatively low during spikes in spore concentrations, so no spray applications were recommended by the BioScout system.

More information

Hort Innovation Venture Fund: www.frontiers.au/startups
BioScout: www.bioscout.com.au