

“The technology will enable growers to apply fungicides more precisely.”

AHDB

from theory
to field

Sentries set to watch over crops

Fungicide applications are very much an insurance measure, with resistance a growing problem. CPM finds out how spore-trapping may help growers refine their fungicide programmes using real-time information on disease pressure and its likely development.

By Lucy de la Pasture

It's a sure sign that when an innovation is being worked on simultaneously by different groups of pioneers it's likely to be a game-changer. It happened with the light bulb, the telephone and the aeroplane, and right now it's happening in agriculture.

Scientists at both Rothamsted Research and Fera have independently developed systems to monitor the levels of disease spores in the air. These spore traps work automatically, drawing in a sample of air, preparing it for testing and running a DNA

test to identify and quantify the disease spores present.

Disease models

Both research institutions have also built disease models which use weather data to help interpret the spore trapping information and predict the risk of disease developing in crops. It's an important technology that will provide decision support services (DSS) to help growers better manage diseases and the fungicides that are used to control them, explains AHDB's Cathryn Lambourne.

“DSSs are a necessity for IPM approaches, which are key to managing crops with a reducing number of active ingredients. But it's not just about fungicide loss, they will help reduce fungicide use by providing disease-risk information in near real-time.” she says.

AHDB have involvement with both projects, co-funding the research at Rothamsted in partnership with the device manufacturer. AHDB are also partners in CHAP, the agritech centre responsible for Crop Health And Protection. The CHAP work is being carried out in partnership with Fera, with funding support from Innovate-UK.

Rothamsted's Professor Jon West



Jon West says spore monitoring will enable growers to apply fungicides more precisely, particularly when diseases are difficult to control or sporadic in occurrence.

describes the novel spore-trapping devices as a new type of precision agriculture. “The technology will enable growers to apply fungicides more precisely, particularly when diseases are difficult to control or sporadic in occurrence,” he says.

The information the Rothamsted DSS will provide will also help growers with management decisions outside of the normal timings, he explains. “Fungicide applications at T1 and T2 are made to protect the top three leaves of the cereal



Judith Turner says information from the Fera SMART Decision Support System has been available on Crop Monitor this season and provides a traffic light system for disease risk across the UK.

► core platform. The spore trapping network integrates with a bespoke weather monitoring network, national pest and disease surveillance data and advanced risk models to produce a risk forecasts for pests and diseases of wheat, barley, oilseed rape and potatoes.

Wealth of information

The service will enable farmers and growers to make informed decisions based on a wealth of information that could lead to reduced costs and increased yields, explains Fera principal plant pathologist, Dr Judith Turner.

Currently in its pilot phase, the Fera project is building up data across its 30 sites before the service becomes subscription-based in March 2019. "Crop Monitor is a generic platform and designed to host this type of in-field detection system.



The Fera Spore Sentry prototype is fully automated, simply requiring its reagent cartridge changing once a week.

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Spore traps join the ultimate experiment in automation

Agronomy is touchy-feely by nature. It involves walking through the crop, pushing back the canopy to see what's going on in the bottom of the crop, inspecting the leaves, pulling up the odd plant to look at its roots and dissecting it to establish its growth stage.

For Hutchinsons' agronomist Kieran Walsh, all of these tools were lost to him when he took on the agronomy for the Hands Free Hectare (HFH) at Harper Adams University in Shrops. The project is the result of an idea born in a moment, he explains, made possible because the right people came together at the right time. Now in its second season and backed by AHDB funding, the HFH is attracting attention worldwide and stretching the boundaries of what's possible without feet on the ground.

With much of the early work concentrating on

Drone imagery has helped with disease monitoring, but spore trapping has given the edge to agronomy decisions at Harper Adams.



the mechatronics that make the project possible, this season there's been more time to focus on how to meet the needs of the crop without walking it.

"It's been easier this year because we have the bits of kit that had to be designed as we went along last season. Although I can use rovers to scout the crop and soil sample, no robot can yet dissect a plant. So when I needed to establish the growth stage of the crop, we commissioned the rover to dig up a plant and bring it out of the hectare and back to mission control for me to look at," explains Kieran.

"When I wanted to take leaf samples for tissue and disease analysis, we had to design a claw that fits underneath the big drone so that it can fly in and grab a sample. We're also able to use the claw to collect ears so we can test the moisture content of the grain before harvest."

This year the hectare is planted in wheat and Kieran says it's been much easier having the tools in-hand. He's been able to focus more on getting to know the field and its soil, sending the drone out more often than in its first season.

"We've used live-streaming from the drone and I've been able to visually inspect the crop from my office in the Cotswolds. From this aerial view, it's been possible to identify areas of the crop I'm not happy with and then the drone has gone to have a closer look, flying just above the crop so I can zoom in on the problem area," he explains.

This season Kieran has also had information from a spore trap which he's found invaluable. "It's really given an extra edge because disease and pest levels are the two most difficult things



Kieran Walsh has found making agronomy decisions without being able to enter the Hands Free Hectare a challenge, but possible.

to monitor effectively with a drone. With the spore trap data and information from a weather station, we've known when there have been peaks in septoria infection and have been able to adjust rates and timings accordingly.

"Thanks to Bayer, we've also taken leaf tissues to be tested at Fera for latent septoria infection and when the results come back we'll be able to see if we made the right spray decisions," he adds.

Will this new technology replace the agronomist? Kieran emphatically believes that won't happen, but it will provide a useful management tool, freeing up time currently spent scouting and driving from field to field. He also believes that spore-trapping will enable growers to manage out-lying land more reliably, giving them more freedom to choose varieties with the greatest margin potential.

