

# Swift and sure



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## Innovation Insight

**A rapid diagnostic test for disease in arable crops, launched last year, was originally developed to save lives. CPM explores the potential of SwiftDetect.**

*By Tom Allen-Stevens*

**Knowing the level of disease in your crop can be critical in deciding how to treat it. But in the pharmaceutical industry, knowledge of the level of infection can be literally life-saving.**

The connection between pharma and farming is closer than you might think. Last year, a new rapid disease detection service was launched — SwiftDetect by Microgenetics can spot a range of key cereal diseases from a sample of ten leaves to a sensitivity of just one single active cell. The science behind it was developed for sterility tests, however.

“The research into an accurate rapid-detection test started in 2015 following an incident at a pharmaceutical company in which baby foods were contaminated with bacteria,” recalls Dr Rebecca Sanders, principal scientist at Microgenetics. “At the time, the standard test had a two-week turnaround, which proved too long a wait, with tragic consequences.”

A collaboration was set up with Bath University, led by Prof Ruth Massey, to begin research, and Microgenetics was born. The plan was to develop a molecular testing approach that can detect trace amounts of DNA of a specific target pathogen. “But the

real challenge was to incorporate novel complex sample processing that could bring the speedy result,” notes Rebecca.

### One working day

Over the next two years, the team developed the process to one which can detect, down to a single cell, contamination in large volume samples in under six hours — 56 times faster than conventional sterility tests. “This means you get a result within one working day. What’s more, the test gives a positive result only for living microorganisms, so you don’t get any red herrings for non-viable DNA.”

So could this be applied to agriculture? “The question was asked by our CEO, who also owns a farm in Wiltshire. He could see there’d be an application for a highly sensitive rapid-detection test for disease in the field to inform spray applications.”

Again, the barrier to overcome was the sample processing. “The team had to adapt the process quite significantly — preparing material for sterility testing is very different to processing a sample of leaves. But it turns out the procedure is very adaptable. In 2021,

we launched the SwiftDetect service for septoria in wheat.”

Sensitivity and rapid turnaround are the two critical elements, as crop diagnostics product manager Chris Steele explains. “Septoria goes through a latent period of around

2-3 weeks following a spore landing on and infecting a leaf. During that time, the fungus grows inside the plant but there are no visible symptoms. What’s more, most fungicides will only work effectively during that latent period.

“So having an accurate picture of infection level at the time of spraying can be very important, not only to ensure the crop is adequately protected, but to avoid over-application which is not only expensive and environmentally damaging, but can drive resistance in septoria populations.”

Chris believes the single-cell sensitivity of the SwiftDetect test makes it the most sensitive on the market — testing over two seasons in both small plot and field trials has proven its efficacy (see chart on p100). Microgenetics is also an independent company, he adds, with no financial interest in how much fungicide is applied to the crop.

The company’s six-hour processing time brings the grower a result within one working day. “You get real-time levels of active disease in your crop, but it’s important not to take the result in isolation — a crop of late drilled KWS Extase in East Anglia will behave very differently from early drilled Elation in Herefordshire.

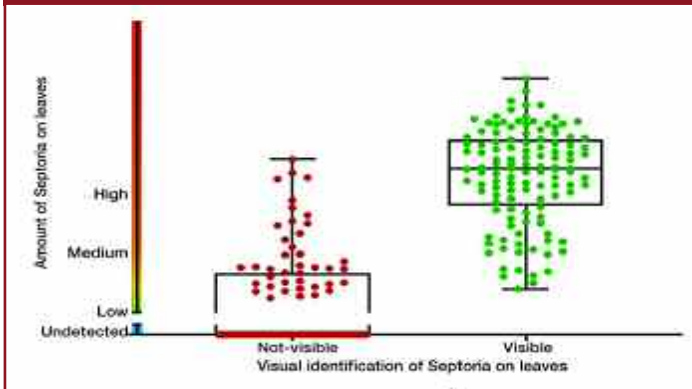
“Last April, the cold dry conditions suppressed levels of disease, and it wasn’t until the end of May, when warm and wet weather came in, that septoria exploded in some crops that had been left with insufficient protection,” he recalls.

One aspect to watch for this year will be levels of septoria in varieties with Cougar in their parentage. “Last year there were reports of disease in varieties with a high resistance ▶

## Special offer for CPM readers – five steps to SwiftDetect

1. Go to [store.microgenetics.co.uk](http://store.microgenetics.co.uk) and pre-order your test — it costs £70 (+VAT) per sample. Use the code CPM22 to get 25% off your first order.
2. A few days before you plan to spray, take a sample of 10 leaves from your field, following the standard W-shape. For the T1 spray timing, take both leaves four and five, while prior to T2, the sample should consist of leaves two and three.
3. Ensure leaves are dry and place them in a paper envelope. Do not use a plastic bag or an envelope with a window. Prepay envelopes are available.
4. Post them to Microgenetics— the sample will be fine in transit for at least 3-4 days.
5. You will receive your results by email within one working day of the sample arriving at the lab. Discuss these with your BASIS-registered advisor.

## Visible identification of septoria



Results from SwiftDetect sampling conducted in 2020, indicating whether symptoms were visible on the leaves at the time of assessment. While most samples with no visible symptoms had medium-to-low levels of septoria, some had high levels than leaves with visible symptoms. *Source: Microgenetics.*

## Average septoria scores during 2021



Results from SwiftDetect samples, May-June 2021. Although there was rain in May (as shown), it wasn't until temperatures increased at the beginning of June that disease levels took off. *Source: Microgenetics.*

► rating, according to the AHDB Recommended List. This suggests the make-up of the septoria population has shifted

and these varieties may be more vulnerable than you think," says Chris.

SwiftDetect is accurate enough

to differentiate between isolates, but not enough information is available about the DNA of the rapidly changing septoria population. So the service can't yet tell exactly what isolates are lurking in your crop canopy, although research is continuing. The range of crops and diseases has been expanded for 2022, however. This now includes:

- Septoria in wheat
- Yellow rust in wheat
- Brown rust in wheat
- Mildew in wheat
- Ramularia in barley
- Light leaf spot in oilseed rape (coming autumn 2022)

"Ramularia is a seed-borne disease that's a lot more prevalent in crops than we give it credit," continues Chris. "It will only express itself if environmental conditions are right and the crop comes under stress. If you have an early warning your crop is infected, you can tailor your management accordingly to protect yield."

There are plans next year to expand the service to take in net blotch and rhynchosporium in barley and phoma in oilseed rape. Tests for sclerotinia in OSR and other fungal diseases in vegetable crops are in development. Blackleg and powdery scab in potatoes are also being considered.

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"We can pick up bacterial and fungal infections, but can't yet spot viral diseases," says Rebecca. "We're also looking at soil-borne pathogens. The difficulty there is developing a rapid process that will deliver a sample we can test from what is inherently a very difficult medium to work with. At the same time, we're aiming to develop a more high-throughput technique for testing — it's quite laborious at present."

And it's not just crops — also in development is a test for bovine tuberculosis, for example. "This can be detected from samples of the animal's faeces, if we can refine the extraction process from what is a very complex medium to deal with. The benefits in terms of reduced stress on livestock compared with the current testing procedure are potentially very significant," notes Rebecca. ■

## Last minute change to the spray plan pays off

For Robin Aird, fungicide decisions are too important to leave to chance. As farm manager of Charlton Park near Malmesbury in Wiltshire, he's responsible for bringing together the twin aims of long-term sustainability and a year-on-year thriving arable enterprise that drives the 1820ha estate.

"If you don't get the right conditions for disease to develop, you don't want to needlessly spend money. Equally, you want to be sure that any trimming back is the right decision," he says.

That was the choice he was facing last year. "It was cold throughout April and continued dry right up to the T2 spray timing. I used a service

provided by a fungicide manufacturer that confirmed the level of septoria in our KWS Extase and KWS Siskin was effectively zero. But a week after I did the test, just before applying the T2 spray, it rained."

The wheats in question were drilled in the first week of October into silty clay loams. Robin knew both varieties had the potential to yield well. But after applying only trace elements at T0 and a generic prothioconazole at T1, he was reluctant to scale back the main flag leaf spray too much, in spite of the apparent very low levels of disease.

"I'd attended the SwiftDetect webinar and thought I'd try the service to see if there was any

difference. Seeing as I live nearby the lab, I dropped the sample in first thing in the morning and got the results that evening."

Sure enough, the level of disease had already started to shift. Although still relatively low, Robin now had an accurate idea of exactly how much septoria the sprays he'd planned had to tackle. "We did cut the T2, but not by as much as we might have done had I not done the SwiftDetect test. The key change was to shift the bulk of primary chemistry into the T3 application."

With the wet weather in June, this turned out to be the right decision. The wheats in question stayed clean, hung on to their green leaf, and



Robin Aird puts fungicide applications under close scrutiny at Charlton Park.

yielded around 10t/ha when the combine went through on 11 August.

"I can't say for sure the test told me something I didn't already know. But it gave me the confidence to make what was in essence quite a radical change to the fungicide plan, and it paid off," notes Robin.

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OUR EFFORTS INTO  
PRODUCING AN ADVERT  
SHOWING AN ENDLESS SEA  
OF WHEAT, SET AGAINST  
A BEAUTIFUL  
GOLDEN  
SUNRISE.**

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GOING TO HELP YOU WHEN SEPTORIA,  
BYDV, YELLOW RUST OR OWBM  
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