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A step ahead of an evolving threat

Technical Disease delve

Septoria may have been atypically absent as a serious risk to many wheat crops last season, but that doesn't mean it can be safely ignored. CPM assesses the disease that robs yield more than any other.

By Mike Abram

If ever there was a season that needed a silver lining, 2020 was it. And while in the grand scheme of things, the absence of septoria in many areas as a meaningful wheat disease was only a very tiny sliver of a silver lining, it did at least ease growers into the post-chlorothalonil era.

This season will be the first where that multisite will no longer be available, after its use up ran out just before most flag leaf sprays were applied last season.

“A lot of people don't realise just how much protectant activity it brought to our programmes,” says Jonathan Blake, principal crop research scientist with ADAS.

Septoria is the most damaging disease in wheat crops in the UK, he says. “That's not because it always creates the largest yield loss, as yellow rust can be more damaging in terms of direct yield impact, but because it affects all varieties to a greater or lesser extent as there is no effective complete varietal resistance to septoria.”

Yield losses from septoria can be nearly

50% in severely infected crops, but more usually it ranges from five to 30% yield loss, he adds.

Its success, a bit like yellow rust, is built on a diverse and continually changing septoria population that challenges both varietal and chemical control.

“As we grow new and more resistant varieties, such as the Extases and Theodores, the more we select for the isolates that are able to multiply on those varieties.

Drift in resistance

“And that selection process means the more we grow them, the larger the proportion of the population those isolates represent, so gradually over time we see a drift in the resistance ratings as the population adapts to the varieties that are brought through,” he explains.

A very similar process is happening in parallel with fungicides. “The more we apply, the more we select for isolates that are less sensitive. That's particularly acute for actives with a single site mode of action as then just a small change in the pathogen can result in the chemical being unable, or only partially able, to bind to the active site and result in complete or partial resistance.”

That drift in performance through partial resistance has been ongoing withazole fungicides for years as mutations in the pathogen DNA continue to accumulate, and a similar slide is starting to occur with the newer SDHI chemistry.

It's a change that's occurred over a three- or four-year period with the general trend of a decrease in sensitivity of septoria

to SDHI fungicides, he says. “But there's some contradictory evidence from last year in terms of field performance from some SDHI fungicides, such as Ascra (bixafen+ fluopyram+ prothioconazole), being reasonably good last year in the AHDB fungicide performance curves.

“This was despite laboratory studies showing an increase in the insensitivity of the septoria population to SDHIs (see chart on p20).

“The cautious approach would be to consider last season as an odd one,” he suggests. “In the performance curves we saw almost all products give higher levels of control than we might expect. For example, folpet was giving 82% control.

“I suspect when conditions are less than perfect for the pathogen as they were last year when it was so dry through May, the chemistry might work better than you might expect.

“So I wouldn't necessarily hang my hat ▶



T1s should be applied when leaf 3 is fully emerged, says Jonathan Blake.

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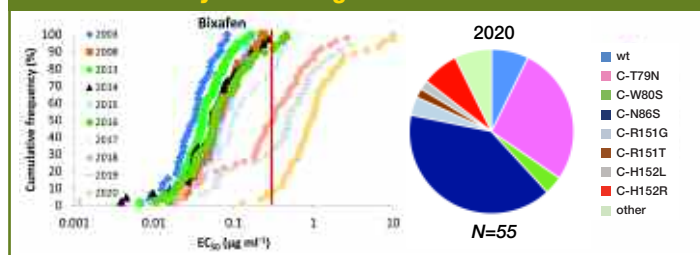
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SDHI sensitivity monitoring and 2020 Sdh mutations



Source: AHDB, 2020; early season untreated septoria population at Rothamsted; Bixafen shows strong cross-resistance with other SDHIs.

▶ on seeing a repeat performance again in the fungicide performance trials if conditions are more conducive to septoria.”

Two septoria isolates that are considered moderately insensitive in the population, C-N86S and C-T79N are now dominating the UK population, accounting for approximately 70% of the isolates tested, he reports.

“Reassuringly the isolate that is considered highly insensitive, C-H152R, and has been around for some time, hasn’t increased as fast as we feared, which possibly suggests it has some form of fitness penalty.”

Many more mutations have been found that affect the binding site of the azole fungicides with the result that performance from that group of

Early drilling will increase risk

Average wheat drilling dates are probably at least a week earlier this season especially when compared with last season, and that can have a big influence on septoria risk, points out Syngenta’s Iain Hamilton.

“With the exception of East Anglia and parts of the Midlands, where they can’t drill early because of the blackgrass issues and the weather intervened, the big window was the second and third week of October, with everything from mid-September through to when weather prevented further drilling.”

A month’s difference in drilling date from late September to late October can reduce septoria levels by anything up to 90% depending on variety, he says.

Evidence for that kind of change came from a 2019 Syngenta trial in Shropshire where three varieties with septoria resistance ratings ranging from 6.8 with Graham to KWS Barrel’s 4.2 showed a 90% reduction in septoria level with Graham from drilling later.

“It makes quite a difference, particularly for varieties with better resistance,” he says.

For KWS Barrel the reduction was less — around 40% — and in this trial it was carrying more disease after treatment than the untreated later drilled Graham. “If you’ve got a variety with a good rating and haven’t drilled it early, the ease of management will be far easier, whereas an early drilled, low resistance variety in an extreme year can almost be unmanageable.”

In terms of control, he says all three chemical groups — azoles, SDHIs and multisites have a place. The latter is likely limited to folpet,

with mancozeb’s future uncertain.

Syngenta researched the relative impact of the groups in a set of four trials in 2019, where 50% doses of a SDHI (fluxapyroxad) and an azole (prothioconazole) were compared with a 1.0 l/ha dose of folpet. Each component was applied twice to crops of KWS Barrel, Iain says.

“Cost-wise there’s about a £10-15/ha difference between each of the components, with the SDHI most expensive and folpet cheapest.”

The levels of septoria control varied between sites, with the highest levels at the NIAB TAG Aby site and the lowest at ADAS Rosemaund (see chart to right), where there was very high disease pressure from early spring, Iain says.

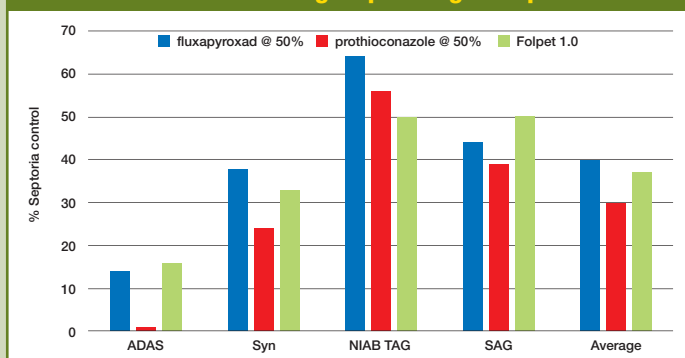
“On average we were getting between 30 and 40% control from each group, which is clearly not good enough, so our view is that you need all the chemistry you have available to manage septoria.”

The addition of folpet helps with resistance management, as well as disease control, he adds. “It helps delay the inevitable.”

Different SDHI active ingredients have different physical properties, as well as strengths of activity, Iain says. “We see one of the benefits of an active like Solatenol, that moves slower and more evenly through the leaf, is its greater persistency. If you look at the impact of different resistant strains the first thing you tend to lose is curativity; persistency you can hang onto, albeit at lower level.”

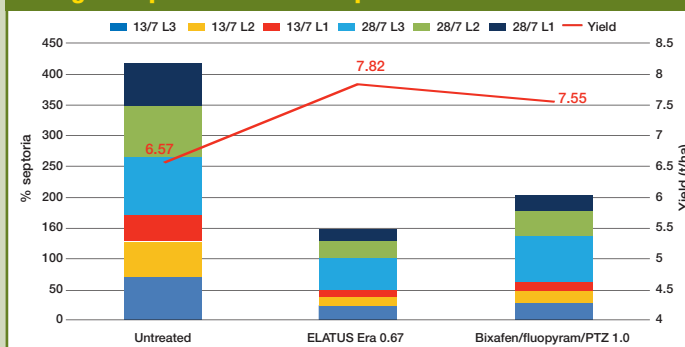
Those properties mean Solatenol-based products, such as Elatus Era (benzovindiflupyr+ prothioconazole) fits well at T1.

What different chemical groups bring to septoria control



Source: Syngenta, 2019; trials conducted at ADAS Rosemaund, Syngenta Rougham, NIAB TAG Aby, Scottish Agronomy Balgonie; cv KWS Barrel; T1 + T2 applications.

Fungicide performance comparison



Source: Syngenta, 2020; trials conducted at OAT, Yorks; cv RGT Gravity; %age disease for the top three leaves at both dates of assessment have been totalled for illustrative purposes. T1 as shown applied 14/5; T2 standard SDHI + azole applied 2/6.

“Because of the persistency in the way it locks onto septoria we would see it in a septoria situation fitting very well at T1. It’s also exceptionally good on rusts, so if you have a mixed population, we see a very good fit there too.”

Iain points to a T1 trial last season on RGT Gravity that suggested that Elatus Era’s persistency helped give it the edge over Ascrea (bottom right).

“The disease differences weren’t huge, but you’re looking at 20% less septoria on the Elatus Era plot

overall, with the biggest differences on the lowest leaves where the T1 is impacting.

“That does carry through to the upper leaves, and we’ve always said if you can keep disease down at T1 it makes the job of the flag leaf spray easier.”

While the yields from the late drilled trial were nothing special at 7.82t/ha for the Elatus Era treatment versus 7.55t/ha for Ascrea, the margin over input cost was £40/ha in favour of Elatus Era, says Iain.



Delaying drilling by a month can reduce septoria by up to 90%, Syngenta trials have shown, says Iain Hamilton.

pressure, but as it gets more widely used that will place it under greater pressure.”

The most common pitfall with septoria usually is applying T1 too early, he says. “You get a favourable week in early to mid-April and anyone who hasn’t applied a T0 starts to get itchy feet and rushes out to apply the T1 while leaf 4 is out but leaf 3 is only partly emerged.

“And that then leads to a large gap between T1 and T2. The T1 application is all about providing a degree of curativity on leaf three and four, while protecting the emerging leaf 2.

“So leaf 2 should be just starting to show when the T1 is being applied and leaf 3 fully emerged.”

With the run of dry springs (see panel) Jonathan is also concerned that could lead growers to consider dropping multisite fungicides from the programme. “I think that is a very dangerous step as they have been propping up fungicide strategies for some time.

“Should we have anything approaching a normal season, and a small change in sensitivity to SDHIs and azoles to which we are dependent, then the benefit of a multisite could be significant.”

That includes using them as part of the flag leaf spray, he says. “The past two seasons we’ve seen more benefit from multisites at T2 rather than T1, which is contrary to what a lot of people might perceive as the optimal timing.

“But T2 is when we see the biggest return on investment on fungicide. It is the logical place to use a protectant product so we can protect the upper two leaves for as long as possible.”

While folpet and mancozeb won’t give the same level of economic return as chlorothalonil used to, where septoria is likely to be problematic they will still give a positive return, he concludes. ■

Is climate change helping to control septoria?

Three of the last five Aprils and four of the last five Mays have been much drier than average across the country, Jonathan says. “That could lull growers into a false sense of security with septoria.

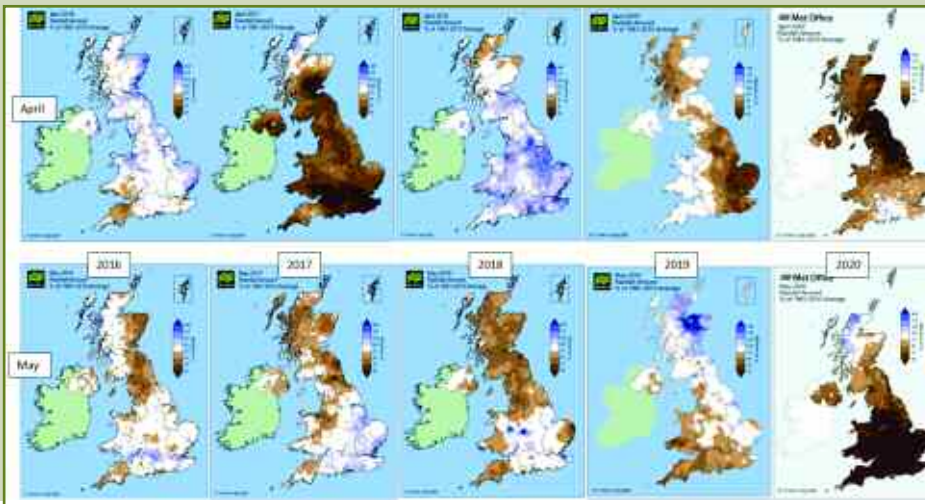
“Across the country we’ve generally had below average rainfall through May, and while June has been wet as a whole, that hides how dry it was in

the first half of June in both 2019 and 2020.

“We’ve had some very dry springs that haven’t been conducive to septoria.

“While this could be a sign of things to come with climate change, I think these things are more random than that, and we’ve just been lucky from a disease development standpoint and the climate has been helping to control septoria.”

Five years of weather data highlight the dry April and May pattern.



Microscopy images reveal the damage septoria does to a wheat leaf 20 days after infection – yield losses are typically 5-30%.

chemistry has gradually reduced over time, albeit that the level of control does seem to have broadly stabilised over recent seasons, he says.

“Prothioconazole and epoxiconazole now provide anything up to 40-50% protectant control and very little curative activity.

“The new azole, mefentrifluconazole, is more active than that, and in 2020 was performing very well. Dare I say, similar to how prothioconazole and epoxiconazole were when they were first introduced.

“But exactly how long it will maintain that level of efficacy is uncertain. It wasn’t widely used last season because of the low disease

manage a problem if you know more about it.

Keeping disease out, rather than trying to cure it once established, is particularly important with a disease like *Septoria tritici*, that destroys green leaf area. This is why the powerful, long-lasting properties of Elatus Era fit so well in *S. tritici* situations at T1. Meanwhile, maintaining the multi-site firepower of folpet within programmes brings extra reassurance against less-sensitive strains.



Disease delve – septoria

Knowing your enemy is the first line of defence against disease — stay a step ahead and you maintain better control. But when it comes to key cereal diseases, it’s an evolving picture — the pathogen itself is mutating, research moves on apace and our understanding of the dynamics changes with every season.

To bring this picture into perspective, CPM has teamed up with Syngenta to take a deep dive into the key cereal diseases. Looking at septoria, rusts and the major pathogens in barley, these articles will explore the latest knowledge and deliver insight on cutting-edge research to bring growers bang up to date — it’s much easier to