

Inatreq gets closer

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Technical Inatreq active

Approval for a new fungicide molecule is anticipated later this year, adding a much-needed further option for septoria control. *CPM* reports from a briefing by its manufacturer, Corteva Agriscience, and bring you the technical low-down on ‘Inatreq active’.

By Lucy de la Pasture

Approval for another new fungicide is expected hot on the heels of the recent approval for Revysol. The ‘Inatreq active’ molecule (fenpicoxamid) comes from Corteva Agriscience, and with agronomists reporting a noticeable slip in SDHI field performance this season, it couldn’t be a better time for the arrival of two new fungicides to take the pressure off existing chemistry.

“We anticipate approval in time for use in spring 2020,” says Stuart Jackson, field technical manager for Corteva.

“Inatreq belongs to the picolinamide group of chemistry and this will be the first registered for its use in cereal crops. It offers a different target site to other active ingredients that also inhibit mitochondrial respiration.”

Significant step

The Qo fungicides inhibit plant pathogens by blocking the pathogens ability to produce energy. The registration of Inatreq in cereals will be a significant step because it’s a quinone inside inhibitor (Qil) and the active binds to complex III at the Qi site on the cytochrome bc1 complex. The target site for strobilurins is also on complex III but at the outer binding site in the electron transport chain.

“The different binding site means Inatreq has no current cross-resistance to currently approved chemistry, even though the effect on mitochondrial respiration is the same as in the Qols,” explains Stuart.

SDHIs also work by interfering with the energy production process in fungi but the target enzyme is succinate dehydrogenase, complex II in the mitochondrial respiration chain. This is a functional part of the tricarboxylic cycle and linked to the mitochondrial electron transport chain but is a different stage in respiration process,

with a different target site and mode of action to Qo fungicides.

With the loss of chlorothalonil and a septoria population that’s constantly evolving insensitivity to the current fungicide portfolio, Inatreq will help take the pressure off the SDHIs while offering equal performance which, thanks



There was plenty of septoria in the untreated trial plots at Wellesbourne in Warwicks.

to its nifty formulation, has better persistence, he highlights.

So what exactly is the Inatreq molecule? Stuart explains that it's derived from a natural product, UK-2A, which is produced by soil-borne streptomycetes bacteria.

"We produce UK-2A by a fermentation process but it's not a photostable compound, so it

breaks down in the presence of UV light," he explains.

That meant the formulation whizz kids at Corteva had to photo-stabilise the UK-2A in order to make it work as a fungicide that's applied to the surface of the leaf. They achieved this by adding a carboxy unit to crystals of UK-2A which modified it to ▶

The risk of resistance

Resistance management is likely to be at the heart of Corteva advice for using their new fungicide product, though the actual label conditions won't be known until CRD have completed their evaluation.

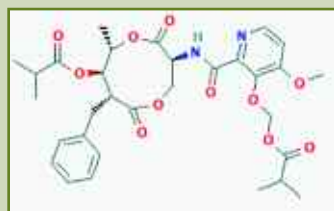
Extensive trials have been carried out to evaluate the potential for resistance, including testing on strains of septoria with known resistance. The results show no resistance or cross-resistance to azoles, strobilurins or SDHIs.

The strobilurin fungicides provide an interesting benchmark in considering the potential for development as they have also been used to control septoria, act on the same mitochondrial-encoded cytochrome *b* protein and appear to be affected similarly by the alternative oxidase pathway which can render the strobilurins ineffective.

The first strobilurins, kresoxim-methyl and azoxystrobin, were introduced commercially in 1996 and 1997 and resistance in septoria occurred in 2000 caused by the G143A substitution. Their activity was soon severely compromised.

In a paper published by Young, D H *et al* in *Pest Management Science* (2018), the question of resistance was looked at in depth and the authors concluded it was unknown whether a comparable mutation conferring a high level of resistance to fenpicoxamid can arise in the field population.

The paper also reports that in lab studies by Bart Fraaije



Researchers believe cross-resistance between fenpicoxamid and SDHIs caused by target site mutations is unlikely based on their different modes of action.

at Rothamsted Research, SDHI-resistant laboratory mutants of *Zymoseptoria tritici* do not show reduced sensitivity to fenpicoxamid. The authors suggest cross-resistance between fenpicoxamid and SDHIs caused by target site mutations would not be anticipated based on their different modes of action.

"The new fungicide containing Inatreq will be widely available as a co-form with prothioconazole and our advice will be to use just once in the programme at T2 because of its long persistence," says Stuart.

"A straight will be available through a limited distribution under strict resistance management guidelines," he adds.

● Reference: Young, D. H., Wang, N. X., Meyer, S. T. and Avila-Adame, C. (2018), Characterization of the mechanism of action of the fungicide fenpicoxamid and its metabolite UK-2A. *Pest. Manag. Sci.* 74: 489-498. doi:10.1002/ps.4743



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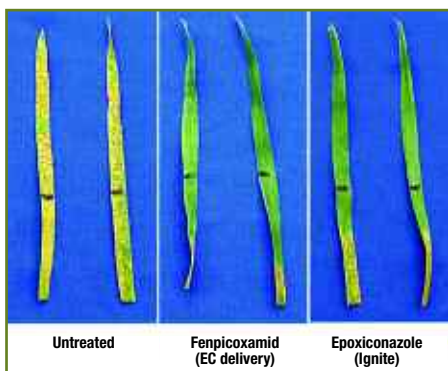
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Leaf bioassays showing redistribution of fenpicoxamid from mid-leaf points of application, compared with untreated and epoxiconazole.

Source: Owen, W. J. et al (2017), *Biological characterization of fenpicoxamid, a new fungicide with utility in cereals and other crops. Pest. Manag. Sci.*, 73: 2005-2016. doi:10.1002/ps.4588

► become UV stable and this is Inatreq active.

“Once Inatreq is applied to the leaf surface, carboxylase enzymes in the plant cleave off the carboxy unit, converting it

to the fungicidal molecule UK-2A, giving curative activity if the fungus has already invaded.

“The Inatreq is also stable within the leaf wax for many weeks, providing a reservoir of active ingredient which provides a long period of protection. As fungal spores land and put out their germ tube, the Inatreq is drawn up and converted by fungus carboxylase enzymes to UK-2A.

“The curative activity of Inatreq will

Septoria resilience stands out

It’s probably no surprise that the stand-out varieties at Bayer’s Callow Field Day were KWS Extase and AHDB Recommended List candidate variety, DSV Theodore.

Until June, disease at the site hadn’t manifested, and any differences in the fungicide plots were minor. But that changed rapidly after 124mm of rain fell in the first three weeks of the month and septoria pressure soared. Many untreated plots quickly succumbed, with KWS Santiago having little green leaf area left by the time of the plots were on show. But septoria also crept into the canopy of susceptible treated plots.

Plots with Bayer’s new development product with ‘Iblon technology’ (isoflucypram) looked good in trials, highlighting the potential protection afforded by what Bayer claims as the first third generation SDHI. With several popular and new varieties with a septoria rating well below 7.0, the pipeline fungicide could be a welcome addition in 2021-2022.

Bayer’s Will Charlton says, “There is a chemical difference between Iblon and the existing SDHIs. It contains cyclopropyl units so has more structural adaptability and its own FRAC classification. We expect it to deliver a 10% increase in disease control, with 95% control of rust diseases which is similar to Solatenol but with enhanced septoria control,” he explains.

In the variety demonstration, of the 37 treated

variety plots KWS Extase and DSV Theodore were the cleanest. For NIAB TAG’s Mike Perry these varieties are ‘game-changers’. “We haven’t had a variety like Extase before, where excellent septoria resistance is combined with good grain and straw characteristics. It offers a genuine opportunity to reduce fungicide inputs,” he says.

But it doesn’t mean that Extase is immune from disease and doesn’t benefit from a fungicide treatment, he points out. He sees the greater benefit from a variety like Extase being more flexibility for those with larger acreages, where fungicides can be prioritised by field risk.

He urged caution not to be tempted into using its resistance to allow early drilling.

“Extase is a fast developer and builds biomass quickly, which could be difficult to manage through the season.”

DSV Theodore was also particularly clean and, like Extase, untreated plots had coped reasonably well given the intensity of late septoria pressure. Currently rated 7.2 for the disease, should it obtain approval it will mean growers have a variety rated 7.0 or better in most nabim groups.

One of the new varieties that caught the eye was LG Detroit. Despite a ‘middling’ score for septoria, it has orange wheat blossom midge resistance which Mike feels will find favour as a premium wheat. For those a little concerned about its gross output, he points out this could be offset with a grain protein of 13.2%.

With the highest septoria rating of any Group 3 wheat, KWS Firefly is another premium wheat worth consideration, he says, but added he was concerned by brown rust. “It’s good for yield and short with stiff straw. Those in the South will have to be vigilant but brown rust control isn’t difficult with the range of chemistry options,” he adds.

Of the Group 4 wheats that dominate western wheat choices, LG Skyscraper and LG Spotlight looked promising. Topping treated grain yield charts at 106% and 104% respectively, and combined with good specific weight scores, he believes they’re bound to attract interest. “With



Bayer’s pipeline SDHI fungicide has structural differences to the current SDHI chemistry, explains Will Charlton.

a specific weight of 78.3% Spotlight is only bettered by Costello.”

Both are high input varieties but there’s a concern regarding their septoria resilience, he highlights. “The big weakness with these two is septoria. Both are rated at 5.2, although Spotlight plots looked that bit better. It’s also a bit stiffer which might give it the edge over Skyscraper.”

For western region growers wanting a strong feed wheat, his ‘benchmark’ variety was still Graham. He points to western region trials which put it just 1% behind Skyscraper. “With a treated grain score of 105%, there’s nothing between them really and it has plenty else going for it. It’s a consistent performer and particularly suited to an earlier drilling slot.

“It does have weaknesses but they’re small in comparison to the benefits. It doesn’t perform so well as a second wheat and is weak against eyespot, but so are most varieties on the list. With June’s wet weather a potential sting in the tail this season is fusarium, but prothioconazole is a good option for both.”

Yellow rust isn’t a disease you associate with Herefords but could be found in some varieties, notably Zyatt and Dunston. Mike suggests that it’s too early to say whether this is a breakdown or a new strain of yellow rust and reminds that the mild winter benefitted the disease. “Let’s await UKPVS data later in the year.”

Candidate variety DSV Theodore was one of the standout varieties at the Bayer Callow field day.



be in the first 7-10 days after septoria infection. If the fungus is more than half-way through its latent period at the time of application then there won't be any curative activity," reminds Stuart.

Inatreq doesn't move within the plants tissue so the formulation team at Corteva have come up with a patented formulation, named i-Q4, which has a special adjuvant system to help spreading on the leaf.

"We've found there's no drop-off in efficacy with different application parameters because the formulation helps the spray droplets adhere to the leaf and minimises bounce-off," says Stuart.



Plots treated with Inatreq were looking as good as leading SDHIs at equivalent field doses, though persistence is expected to be longer.

Stuart Jackson assesses the disease levels in plots at Wellesbourne that had received an industry standard fungicide treatment.

Droplet spread

The Spray Application Unit at Silsoe has studied the way spray droplets spread over time compared with industry standard, Aviator (bixafen+ prothioconazole). "The Aviator moved along the ridges of the leaf whereas Inatreq moved across as well as along the leaf. This gave 97.5% coverage of the leaf compared with 73.1% from Aviator when applied using a Lerap 3-star air induction nozzle at 1.4 bar in a water volume of 120 l/ha at 8kph.

"We believe the iQ-4 formulation gives Inatreq its curative activity, improves both penetration and redistribution on the leaf, enables application in low water volumes, through low drift nozzles and at high forward speeds," he sums up.

So how does this translate to disease control in the field? Trials results show levels of control that are much more consistent than the standard fungicide programmes used today, comments Stuart.

"Trials received a standard T1 treatment



of an SDHI plus azole + CTL followed by either Ascra (bixafen+ fluopyram+ prothioconazole) at 1.2 l/h or Inatreq at 1.5 l/ha at T2. At four weeks after application the levels of disease control were very similar but at six weeks leaf one was cleaner," he says.

Plots were taken through to yield and results show Inatreq 0.6t/ha ahead of the SDHI, although there was no statistical difference in the results. ■



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