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Technical Insiders view

A genetic triumph

Though sclerotinia doesn’t strike every year, when it does, it can be extremely damaging to oilseed rape crops. *CPM* reviews a new offering from Pioneer, which claims to be the first to offer resistance against the yield-robbing disease.

By Charlotte Cunningham

Sclerotinia is far from a silent killer, with very visual symptoms like bleached stems and visible fungal growth often tell-tale signs that a crop of oilseed rape has succumbed to a bout of infection.

The difficulty is that infection doesn’t occur every season, but when it does, losses can be devastating. As such, the majority of growers choose to adopt a preventative approach to spraying for the disease — which has implications from a resistance management point of view.

While resistant varieties are often a go-to for cereal growers looking to mitigate their risk of disease, breeding resistance for sclerotinia in OSR is something that hasn’t been possible.

Until now...

Combining high yields with the claim to be the first ever winter OSR variety with a tolerance to the stem disease sclerotinia is

Pioneer Protector Sclerotinia PT303 — the latest offering from Pioneer, the seed brand of Corteva Agriscience.

This claim of resistance arguably marks a big step up for OSR breeding, says Jean-Claude Pruvot, Corteva’s OSR research lead for Europe. This is thanks to the firm’s focus on improving yield genetic gain, delivering strong defensive traits and improving grain value.

Hybrid breeding

“Corteva’s program has been based on hybrid breeding since the start and our strategy is designed around exploiting heterosis and selecting for combining ability.

“We’ve implemented the newest breeding technologies like genomic selection and predictive breeding to improve speed and precision of our product development.

“We’ve also set up solid phenotyping capacities in fields and greenhouses to evaluate disease tolerance for either quantitative traits — like stem canker — or specific resistance like Rlm7, RlmS and clubroot genes.”

According to Jean-Claude, the winter OSR program is part of the global OSR programme and as such, Corteva has developed a strong expertise in transferring traits and technologies into elite European germplasm using molecular markers.

“Exotic material” (non-European) is an interesting trait source that brings diversity to winter OSR. It’s key for increasing genetic distance and heterosis between our male and female pool.

“PT303 — our first sclerotinia-tolerant

variety — is an outstanding example of this work.”

To glean the genetics needed to be able to claim that built-in resistance, Corteva’s research team developed sclerotinia-tolerant material through conventional breeding by collecting Asiatic sources and with several cycles of recurrent selection has accumulated genes contributing to sclerotinia tolerance with different mode of action.

“Several QTLs (genomic regions) have been identified,” explains Jean-Claude. “Our team in Europe have taken that source and adapted the sclerotinia phenotyping protocol to the European conditions.

“This material used in our hybrid breeding programme has demonstrated very good combining ability with high yield potential, showing the benefit of exotic genetics.”

The validity of this resistance has been proven in the firm’s own trials, tested in more than 100 yield locations and in five years of sclerotinia nurseries, with Corteva ▶



PT303 is the first OSR to claim resistance against sclerotinia.



The variety also delivers the highest gross output yields in each AHDB region.

▶ describing the breakthrough development of the first variety to help farmers manage sclerotinia as a “major milestone” in plant-breeding history.

In Corteva trials with sclerotinia infection levels at 25% or above, the severity of the disease was reduced by up to 75%. Trials also showed that the higher the severity of disease, the greater the benefit from the trait.

“PT303 gives farmers the ability to reduce the incidence of disease and manage their crop protection applications with greater flexibility and assurance,” adds Corteva’s

seeds and inoculants sales manager Andy Stainthorpe.

“As domestic agricultural policy evolves and farm businesses pursue a more efficient, productive future, PT303’s potential to limit the development of sclerotinia could be a significant component of disease control strategies.

“Sclerotinia only strikes every so often, but when it does it is hugely damaging to yield.

“Having identified a genetic source of sclerotinia tolerance, Corteva breeders have spent more than a decade crossing that source into our regular hybrids through traditional breeding.

“No products have previously offered any level of resistance to sclerotinia but with PT303, we now have a variety that has tolerance — a major milestone in our industry.”

Aside from the claim of sclerotinia resistance, PT303 offers a pretty good all-round package, says Andy. The variety scores 6 for light leaf spot resistance and 7 for stem canker — based on data from AHDB trials — and has proven Turnip



PT303’s potential to limit the development of sclerotinia could be a significant component of disease control strategies, says Andy Stainthorpe.

Yellows Virus resistance, adding an extra layer of protection for growers, he notes.

It also delivers the highest gross output yields in each AHDB region, including a UK yield of 111%, and was ranked first with a gross output yield of 116% in the East/West region and also topped the North region with a yield of 105%.

The PT303 hybrid variety has recently gained National Listing and the results from the independent AHDB Candidate List trials have been published, with UK farmers now

Sclerotinia resistance under scrutiny

Sclerotinia is something that effects OSR during flowering, meaning growers often have to wait the whole season to see it.

However, it’s a complex disease that requires a number of factors to fall into place for an infection to be visible on farm, says Faye Ritchie, plant pathologist at ADAS. “Sclerotinia infections start off with resting bodies in the soil that need a series of different temperature conditions in order to germinate. This tends to happen around March, when the spores are released into the air and end up in the crop. Minimum temperatures and humidity levels are then needed to cause infection.”

And while sclerotinia can be hugely detrimental to overall production, they’re not annual events and there’s been a lot done from understanding the weather risk, to how best to use chemistry to protect growers, she adds. “We’ve got much better at preventing outbreaks, and I’d say many growers still spray at least once as part of a preventative strategy.”

That said, while a preventative approach may be beneficial for protecting growers against infection, there are undoubtedly concerns over the impact this has on chemical efficacy, and so Faye says that genetic resistance has a really useful role to play in the future of sclerotinia control. “Genetic resistance against sclerotinia in OSR is really interesting and something we’ve never benefitted from before.

“While the chemistry is very effective, if genetic

resistance can provide protection then it can only be a good thing to not have to rely on canned solutions.

“One of the key issues with sclerotinia control is getting timing of the fungicide right, but by having good resistance already within the plant, there’s the potential to remove this problem and give growers some more flexibility in their approach.

“In the past, we’ve seen yield losses of up to 50% due to sclerotinia — even with late infections these losses can be between 1-1.5t/ha — so this is really positive news in terms of having something new in the armoury.”

Because of the lack of genetic resistance to date, official AHDB trials and Defra trials (conducted by NIAB) don’t specifically test for sclerotinia resistance. As such, trial protocols stipulate fungicide applications should be made to minimise the disease — in both treated and untreated trials.

So does the news of potential built-in resistance change anything? “Breeders claims have long been a part of variety marketing,” explains Colin Peters, break crops specialist at NIAB. “However, unless AHDB or Defra want to make sclerotinia an ‘official’ trait, then I can’t see the protocols being changed to allow the expression of any tolerance.”

Nevertheless, Colin reckons the development of resistance in PT303 has the potential to be hugely beneficial for the industry. “Personally, I think it’s



Yield losses as a result of sclerotinia infections can be up to 50%, says Faye Ritchie.

great. It’s a good all-round variety and has a very short flowering window which will no doubt help when it comes to preventing against sclerotinia infections, but if there’s a genetic breakthrough here then it’s something to be commended. Breeders have done a fantastic job over the past few decades of locating traits and breeding them into commercial varieties.”

He adds that he hopes to see more such traits coming onto the market in the near future. “I think it’s important to stress the difference between genuine genetic resistance and a breeder claiming a variety has some good activity against something. When genetic resistance is really developed, there’s the potential for it to be game-changing for the industry.”



Less reliance on chemistry is good for his end-users, says Andy Fussell.

able to order seed for sowing in autumn 2021.

While trade negotiations continue, CPM hasn't been able to glean comment from the seed trade on how they think PT303 may fair on the market.

However, we were able to speak to a number of growers who have been growing the variety "blind" this season to test the capabilities of PT303 without any bias.

Among these is Lincs grower, Nick Wright, who's currently growing a 3ha plot — in the middle of a 7ha field — comparing it directly against DSV Duke.

"We've been growing Clearfield trials for Pioneer for three years and when we were offered this to try, we were definitely interested. We were told nothing about the variety except for that it could have some good resistance against sclerotinia."

Nick routinely sprays for sclerotinia as a preventive measure after having a particularly bad experience with the disease a few years ago. "We aim for two sprays usually, however, I once missed a spray, for various reasons, and it was awful. The crop was completely flat. I never want to have to deal with anything like it again."

The crop was drilled on 23 Aug, into good conditions following spring barley. "It looked like a great crop going into winter, but the frost and low temperatures have left it looking a little sad and we've just lost the bottom leaves because of the

frost," says Nick.

"However, I dug the root out and it's got a good tap root and the main stem also looks well."

Initial observations have shown PT303 to have good early vigour, says Nick, and while it's too early to tell how the variety will perform, he reckons varieties with this built-in resistance are going to become an integral part of disease management strategies on farm. "Everyone knows that we're losing chemistry rapidly, and at some point, I believe the days of getting answers out of tins will come to an end. As such, I think it's going to be breeders that really help us out when it comes to tackling disease."

Having something with resistance in its DNA is also going to help flexibility on farm, he adds. "I think varietal resistance is going to become the number one thing we look for on the list. Weather patterns are constantly changing and very varied and if we do continue to get prolonged periods of rain that stops us from being able to get chemistry on, then having something with that resistance already in it is going to help take the pressure off.

In Yorks, Richard Hinchliffe also has 3.5ha in the ground this year, growing alongside InV1035 to compare performance.

As the farm routinely sprays for sclerotinia as a preventative measure, a variety with genetic resistance is particularly exciting for growers, says Richard. "Relying solely on plant protection products is a difficult position to be in. Therefore, bringing in traits that help us control diseases can only be a good thing. Of course, we don't actually know how robust the resistance will be until we see it, but it's a good sign."

In the South West, Andy Fussell has also, until now, always taken a preventative approach to sclerotinia and says the new resistance to the disease is an interesting opportunity for growers and consumers.

Andy is growing 13ha of PT303 this year, and at the time of sowing, wasn't told about its potential benefits against the disease. "Sclerotinia is something we haven't had for a while, but we always spray for it as a preventative strategy. From my point of view, the exciting thing with PT303 is that something that boasts 75% resistance means I don't necessarily have to spray for it."

As well as the benefits this has from a resistance management perspective, this is also an attractive prospect from a business view. "All the OSR I grow ends up in a bottle — we press it on farm and sell it through our farm shop.

"In terms of customer satisfaction, it's always good to be able to say we do our bit to use as little chemistry as possible. The innovation in PT303 is a great talking point and shows that the farming industry is trying to come up with ways of reducing chemical impact — it creates the trust and accountability that our customers need." ■

PT303 at a glance

Gross output (% control)	111
East/West region (% control)	116
North region (% control)	105
Treated seed yield (% control)	110
Oil content (%)	46.2
Resistance to lodging	9
Stem stiffness	8
Height (cm)	155
Earliness of flowering	4
Earliness of maturity	6
Light leaf spot	6
Stem canker	7
TuYV resistance	R

Source: AHDB Candidate List, Winter Oilseed Rape harvest 2021; agronomic features are scored 1-9 where 9 is high.

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