BBRO BeetTech

Yield lag closing

Growers learned about progress being made to find solutions to virus yellows in sugar beet at the recent BBRO BeetTech 24 event. *CPM* joined delegates to hear the latest updates.

By Mike Abram

The yield penalty from sugar beet varieties with virus yellows tolerance is closing rapidly, as indicated by the latest results from BBRO trials. A total of 24 varieties were tested in 2023 against all three key virus yellow strains, explained Dr Alistair Wright at BBRO's Beet Tech 24 event at Newmarket Racecourse.

"We've seen some really promising results, with virtually all of the breeders putting forward promising candidates," he said. Candidate varieties were compared in the inoculated trials against five control varieties, including BTS1915, Daphna and Lacewing. The work also included plots without any virus yellows infection.

In the trial, BTS1915, the highest yielding variety on the current BBRO Recommended List, yielded nearly 100t/ha adjusted in the absence of virus yellows infection and had around a 35% yield loss in plots inoculated with Beet Virus Yellows — the most yield robbing of the virus yellows complex. "That's not as high as the 50% yield loss we typically see from Beet Yellows Virus," noted Alistair.

The work showed that Daphna is more susceptible to beet yellows with a 45% yield loss – which aligned to previous years' results, said Alistair, while having a similar yield to BTS1915 in the absence of virus yellows.

"We also use Lacewing as we know that's a good indicator variety, which shows severe yield loss (60%) and 95t/ha adjusted without virus infection."

Varietal tolerance

In comparison, the yield loss from the first commercial variety with a level of virus yellows tolerance, Maruscha KWS, is less severe but comes with a near 15% yield penalty in the absence of virus. That yield lag has been virtually eliminated in some of the newer candidate varieties.

For example, a variety coded G11, which is in its second year of BBRO trials, has a yield performance in the absence of virus of 98t/ha adj., virtually on par with BTS1915, while a second variety, G21 from a different breeder wasn't far behind.

Yield loss to beet yellows virus for the two candidates was between 28-32%, with lower yield losses for the other two virus yellows diseases. "It's encouraging this new material is showing yield tolerance ▸

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Good on-farm hygiene minimises initial virus pressure.

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By plotting the yields for each variety in the absence of virus to where each plant had been inoculated with virus, it's possible to calculate an approximation of the level of virus infection where it becomes beneficial to switch to a tolerant variety where the lines intercept.

Novel genetics

While for Maruscha KWS, beet yellows virus infections levels had to be somewhere between 25% (Lacewing), 60% (Daphna) and 100% for BTS1915, for the G11 variety it was only 10-20% for those three control varieties.

"It's going to become a good choice to start using these novel genetics as there won't be too much of a yield penalty, if any," explained Alistair. "That doesn't mean we won't see loss of yield to virus, so the rest of the IPM approaches are still valid until we have truly immune varieties which may come from gene editing approaches."

He reminded growers of the requirement for good on-farm hygiene to minimise initial virus pressure. "I'm sure you've all cleaned up your spoil heaps because they're a very good source of virus to carry over into future crops. Do pick up the beet that dropped out of the cleaner loader or were left behind the Maus or any groundkeepers coming in the field."

Other BBRO research is investigating the use of companion crops to camouflage the sugar beet with barley. Those trials have highlighted how it's crucial for the barley destruction timing to be spot on, ▸

Beet moth research continues

While 2023 saw nowhere near the same issues with beet moth as 2022, BBRO's Professor Mark Stevens believes the pest is here to stay. "It may be patchy and sporadic, but unfortunately because of climate change it's quite easy for it to overwinter," he said.

Beet moth larvae were found in plant samples recently sent into BBRO's plant clinic with black hearts that were able to survive -15°C temperatures, he explained.

Drought and crop stress – anything that exposes the crowns — and growing beet on lighter soils will increase risk, while heavy rainfall or irrigation will suppress adult moths.

BBRO employed pheromone traps at 12 locations to obtain baseline data in 2022, said Mark. "The good news is that beet moth wasn't a major problem with weather patterns, meaning the crop wasn't under the same stress as in 2022.

"There was an early invasion at several sites in late June into early July, and at one site where there was some drought we started to see some damage which enabled us to do a trial to limit the impact of moth larvae."

Professor Mark Stevens believes beet moth is here to stay.

Various treatments were tested, but with low moth pressure, there were no significant differences, said Mark. However, with beet moth larvae easy to rear, BBRO is carrying out further trials in controlled environments at their facilities in Norwich.

Cercospora strains threat

Comments from growers finding cercospora symptoms in sugar beet crops developing in October and November suggest the disease might be adapting to UK conditions, explained Professor Mark Stevens.

"It's something we have to keep an eye on because the last thing you want having invested so much money in the crop, is to lose the canopy, lose sugar and lose frost protection." Cercospora isolates collected by BBRO are being used to test that theory, he said.

BBRO is also looking at the impact of leaf wetness on cercospora infection levels. "We're aware of research suggesting that it might be more important than temperature and humidity.

"We had three monitoring sites based at the locations of our field events, where we had cercospora levels of 26%, 37% and 7%, and the key factor that was driving this seemed to be leaf wetness.

"It's something we'll research more because we believe those conditions are probably more important than temperature, as well as also looking at what temperature do we require in the UK to make infection happen."

In fungicide trials in Lincolnshire, two and three spray programmes were more effective than the one or no spray treatments, he added. "In October, we were seeing nearly 60% rust infections in those plots," said Mark.

The benefit in holding onto canopy biomass late was also evident in January in the two and three-spray programmes, which gave a yield lift of up to 20t/ha adj. over the untreated and 10t/ha adj. versus a single treatment. "There's a clear benefit in using those tools," Mark concluded.

Professor Mark Stevens says BBRO is looking at the impact of leaf wetness on cercospora infection levels.

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Regen beet premium?

Could farmers employing regenerative farming practices to grow sugar beet potentially receive premiums? That was what Slavoljub Eric, Nestlé sucrose procurement manager, appeared to suggest during a video presentation to beet growers at BBRO BeetTech 24.

The firm has set a target to be net zero by 2050, with earlier goals to reduce greenhouse gas emissions by 20% by 2025 and 50% by 2030. Sourcing food ingredients from regenerative agriculture is a key pillar in its strategy to meet those targets.

More than 75% of Nestlé's total CO_2e emissions came in the ingredients it sources, he said. "That's why it's important we join, talk and take action. We can put actions into our manufacturing and energy that we use but it's not enough. Without farmers and the sugar producers being on the same page, we won't be able to deliver most of the targets we've committed to."

Across its business, Nestlé is committed to sourcing a minimum of 20% of its key ingredients through farms using regenerative agriculture practices by 2025, increasing to 50% by 2030.

For sugar, there's a slightly higher target of 25% by 2025 because the firm believes that farmers growing the crop can move faster along a regenerative journey. "Regenerative agriculture is going to be mandatory," said Slavoljub. "We're currently talking about projects to work on and implement with our suppliers and farmers.

"Tomorrow, this is expected to become standard, and together with 100% traceability and zero deforestation, we're sharing a fair revenue and conditions for all the people working in the sugar industry."

Regenerative agriculture plays a critical role in improving soil health, restoring water cycles and increasing biodiversity, he said. "This is why Nestlé is investing more than CHF1.2bn (£1.1Bn) by the end of 2025 to spark regenerative agriculture across our supply chain."

In the UK, Nestlé is speaking to British Sugar and the NFU on project ideas to decrease emissions from beet production, he said. For example, he was hopeful that a project around nitrogen application reduction would be approved and implemented soon. Other areas of focus for Nestlé included reduction in tillage, use of cover crops, integrated pest management and digitalisation of agriculture.

"You're going to ask me what are the benefits for you, as we expect you to do a lot of things," he added. "First, you're going to have lower costs because applying less nitrogen or any fertiliser whenever it isn't required is going to reduce your costs, therefore your profitability should improve.

"You'll have fewer hours in the field with a heavy mechanisation, which should improve soil quality while reducing fuel consumption, again with a cost improvement.

"And hopefully all of these practices should lead to higher yields, and if we are able to sell these kinds of projects as a good opportunity for Nestlé, you can participate in the better premium scheme for sustainability income from Nestlé or any other customer interested in this topic," he suggested.

Nestlé believes that farmers growing sugar beet specifically can move faster along a regenerative journey.

That last point was met with scepticism by East Anglian sugar beet grower David Hoyles in the following Q&A session, which Slavoljub wasn't present for. "I was interested in hearing Slavoljub say you'll get better premiums for regenerative agriculture," said David.

"I'm wondering why I'm missing out because I've been offering LEAF marque accredited sugar beet for a number of years and I've been told it's not going to be rewarded. So I'd like to know what effective premiums might be available?"

With BBRO not involved in commercial operations, this was a question addressed to any British Sugar delegates attending. However, while likely a subject of ongoing discussion, no one at the event was able or willing to answer David's question.

▸ said Alistair. "It's not a silver bullet and can have a negative impact, so watch it carefully and consider destroying as soon as you see fit."

Rye windbreaks have proved effective at stopping virus spread in the inoculated variety trials, so could be viable options for infield strips, he added. "We're also planning to plant some brassica strips through commercial crops to see if that reduces virus incidents."

BBRO hasn't seen ongoing benefits from rotational flowering strips hosting beneficial insects and aphid predators in neighbouring beet crops. "If you can put them in permanently the literature suggests they'll do a better job, and that could now be possible through SFI."

Growing endophyte grasses which produce natural aphid toxins, is the subject of a one-year masters project funded by BBRO and The Morley Agricultural Foundation. Research in New Zealand has suggested the

beneficial impact of the endophyte can be transferred into the sugar beet.

"We do think there's hope," said Alistair. "But it's not going to be straightforward as there's interaction between the grass and beet competing for resources."

There are also some positive results from dyeing the soil to camouflage the beet crop, which has reduced aphid levels. "While aphids still went over threshold levels, whatever colour we used there was a reduction compared with the untreated, so there's definitely something about manipulating the sensing of plants by aphids."

Furthermore, a French company, AgriOdor, is researching using volatiles from perfumes to manipulate aphid sensing. "It looks like it can delay the point at which the crop reaches threshold by up to two weeks, giving beneficials more time to build up," said Alistair, noting that BBRO would continue to follow the research closely.

With better varietal tolerance and different IPM practices, BBRO has identified a requirement to review current insecticide threshold levels and whether they should be dynamic rather than the black and white current system, said Alistair.

BBRO trials in 2023 tested a total of 24 varieties against all three key virus yellow strains.

In response, BBRO has commissioned ADAS senior research entomologist Dr Sacha White to review the robustness of current thresholds. "The project will carry out a literature review to see if there are any grounds for change, and if so, whether the thresholds should be more dynamic," explained Sacha during a video presentation.

"Should they shift depending on the crop conditions? For example, taking account of weather on aphid population growth, the proportion of aphids carrying the virus, crop economics could all be important."

Another part of the project will review various models for virus epidemiology, aphid population dynamics and sugar beet growth. "We're looking for useful parameter values that we can use to build a decision support model. For instance, the rate at which a plant is infected by an aphid or the effect temperature has on the reproduction rate."

Ultimately, ADAS hopes to build a decision support system for virus yellows control, similar to the Acrobat BYDV assessment tool recently launched, he concluded. ■