

Horizon scanning for the problems of tomorrow



"We need to find solutions quickly, otherwise we will lose sugar beet in our rotations."

ACHIM JESSER

A sugar beet disease in Germany is making virus yellows the forgotten challenge. CPM reports from the recent IIRB Congress in Cambridge.

By Mike Abram

Virus yellows might be taking much of the sugar beet research focus in the UK, but in Germany and other parts of Europe, another challenge is equally, if not more, feared.

Syndrome des basses richesses (SBR) and rubbery taproot disease (RTD) (see box) have some similarities to virus yellows, in that the pathogens are vectored by an insect, and, in the case of SBR, cause yellowing of sugar beet leaves.

But rather than being a virus, SBR is caused by bacteria transmitted by planthoppers. First recorded in Burgundy in France in 1991, it's now Germany, Switzerland and Austria bearing the main brunt of infections.

Symptoms show up in late summer as yellowing and chlorosis of older leaves, lance-shaped or asymmetrical new leaves, with necrosis of vascular root bundles, which presents as brown rings in the cross-section a root. The roots don't rot and remain processable, but with losses of up to 5% sugar content and 25% root yield.

PATHOGEN COMPLEX

Like virus yellows, SBR is a complex of pathogens, with the proteobacterium *Candidatus Arsenophonus phytopathogenicus* (ARSEPH) implicated, while the 'A' and 'P' strains of the stolbur *phytoplasma Candidatus Phytoplasma solani* (PHYPSO) can also be present.



Cultural control

Research suggests that while there are economic questions regarding spring cropping, this could be part of the solution for SBR, posed Achim Jesser.



Field trials

Carsten Stibbe highlighted that research at KWS' field station near Frankfurt has found most yield damage happens during the period of peak planthopper flights.

ARSEPH was the classic main SBR pathogen in most countries, but in Germany the 'P' strain of the phytoplasma is now dominant. Where both or even all three are present together, which has been found in parts of Austria, the impact on crops is usually more severe.

A similar complicated picture occurs with the cixiid planthopper vector. At least three types have been shown to carry the pathogens. *Pentastiridius leporinus* is more common in western and central Europe, driving the classic ARSEPH bacterial infections in much of Germany, but also transmitting the stolbur 'P' strain phytoplasma in eastern Germany.

GENERALIST VECTORS

In Austria and further southeast in Europe, the principal vector of the 'P' strain is a reptalus species, but again it can transmit either pathogen type.

Both are generalists rather than specific to sugar beet. DNA sequencing of *Pentastiridius leporinus* by German researcher Omid Eini at the Institute of Sugar Beet Research (IfZ) found DNA from up to 32 plant species, including weed species such as nettles, bindweed, meadowgrasses and cocksfoot.

With no direct cure for infected beet plants – the pathogens are parasites that live and feed in the plant's phloem carrying sugars from leaves to roots, and therefore impossible to hit with a spray.

A longer-term control solution, and

ultimately probably more effective measure, will be through breeding, with some promising results from trials comparing SBR-tolerant varieties versus susceptible varieties.

In the meantime, agronomists and experts are concentrating on finding agronomic measures that reduce risk, again mirroring the UK experience with virus yellows.

"We're at the beginning of the race," admitted Südzucker agricultural research coordinator, Achim Jesser, who's been working in partnership with growers and grower associations in Germany to implement various control

practices on farm. "But we have to find solutions quickly, otherwise we'll lose sugar beet in our rotations."

Various research projects are starting to help suggest what could work on farm. For example, KWS research at its field station in Seligenstadt, west of Frankfurt, has found that most of the yield damage happens during the period of peak planthopper flights.

In 2024, that coincided with a 10-day period from 20 June, while in 2025 it was a slightly longer 20-day period in mid-June, explained Carsten Stibbe, KWS R&D head of field station at IIRB's recent 80th Congress in Cambridge.

What's the threat to UK beet crops?

The German experience means SBR and rubbery taproot disease are very much on the watch list for BBRO

According to Professor Mark Stevens, BBRO head of scientific endeavour, the explosion of SBR and rubbery taproot disease on the Continent is concerning. "But we need to be pragmatic, appreciate what's happening elsewhere and learn from the research findings in Europe."

A monitoring programme has been set up with the University of Sussex entomologist Dr Alan Stewart looking for planthoppers, particularly *Pentastiridius leporinus*, around the East Anglian and Lincolnshire coastlines from 2025.

The planthopper, also known as the reed glass-winged cicada or saltmarsh lacehopper, has been found by Alan, raised Mark. "So one of the key vectors is here, but to the best of our knowledge we don't have the phytoplasma or proteobacterium that cause the disease complex."

However, the risk is the disease could spread to the UK, for example, on imported material such as seed potatoes or other infected vegetables, as well as on infected planthoppers arriving from across the channel. "All the classic routes are valid for the particular pest-pathogen combination, exacerbated by its extremely wide host range."

As a further check, British Sugar agricultural managers have been tasked with reporting any strange



High alert

British Sugar agricultural managers have been tasked with reporting strange symptoms in beet crops, especially around the coastal areas, said BBRO's Professor Mark Stevens.

symptoms in beet crops, especially around the coastal areas, added Mark. "The challenge is it can look quite similar to virus yellows."

SBR SIMILARITIES TO VIRUS YELLOWS

- Looks almost identical in the field – both induce yellowing of leaves
- Pathogen is vectored by an insect – viruses by aphids (virus yellows); bacteria and phytoplasma by planthoppers (SBR)
- No direct cure – control for both is about limiting the vector or breeding tolerant varieties
- Both affect sugar economics, as well as yield – virus yellows infections raise amino nitrogen, sodium and potassium levels reducing how much sugar the factory can extract; SBR reduces sugar content directly
- Both have become worse since the neonicotinoid ban

- “The key finding is there’s a beginning and an end, which indicates a chance for a control system – we just need to be able to detect the beginning and end of flights.”

That could be one application of two complementary models using AI-based image analysis of sticky traps being developed by Dr Facundo Ispizua Yamati and colleagues from IfZ.

The first model identified cixiid planthoppers from other insects caught in traps to 94% overall accuracy, he reported, while the second model distinguished between the main SBR-relevant planthopper groups, with 99% accuracy.

KWS’ research also looked at the effectiveness of insecticides, finding the contact insecticide lambda-cyhalothrin gives up to 10 days’ control, with a combination with systemic insecticide acetamiprid providing some increased activity up to 15 days after exposure to planthoppers.

Südzucker’s research builds on those findings, trialling the use of combinations of insecticides and foliar fertilisers across small plot trials and

in around 60 on-farm split fields.

These too showed promising results, with the combination of three sprays of a tank mix of contact and systemic insecticides providing 10-14% higher white sugar yield; adding in a foliar fertiliser boosted that to a 16% increase in both small plot and grower strip trials over untreated controls, reported Achim.

“Importantly, it’s economically feasible for the grower. They make more money if they spray compared with doing nothing.”

PROGRESSIVE RESEARCH

A second project had an even more ambitious scope. In four regions, Südzucker designated that all the growers and fields in the region were part of the trials, explained Achim.

In these trials, growers were asked to adjust their cropping rotation to grow spring crops rather than the typical winter wheat after beet, as well as to use insecticides and foliar fertilisers to protect and strengthen the beet crop.

Researchers monitored planthopper emergence from the spring crops

versus winter wheat outside the designated project areas, finding 80% fewer planthoppers emerging in the spring crops.

“While there are economic questions [about growing spring crops], this could be part of the solution,” suggested Achim.

Visually, the beet in the region looked better too, he added. “But it’s all about did it improve yield? The short answer was yes, delivering around 20% more white sugar yield on average inside those regions compared with a 3km surrounding area.”

Armed with these results, last year Südzucker provided similar recommendations to all its grower base. The result, after three consecutive years of losing up to 1.3% sugar content year-to-year in the beet delivered to the factories in SBR-affected regions, was a 1% increase in sugars, said Achim.

“While it was a good year for beet, this gives us hope that these measures and farmers trying to do something about SBR are helping us to go in the right direction,” he concluded. ●

Why RTD persists in Serbia

Latest research presented at the IIRB Congress in Cambridge shows a wheat-sunflower rotation is instrumental in maintaining the persistence of rubbery taproot disease in Serbia

First observed in the 1960s, rubbery taproot disease (RTD) has caused widespread problems in Serbia and neighbouring countries in recent years, because it makes the beet rubbery and impossible to slice and process in factories.

Previous research by Živko Ćurčić and colleagues found that the *Candidatus Phytoplasma solani* pathogen causing rubbery taproot disease carries a particular gene marker known as ‘tuf-d’.

He also identified that the vector was the *Reptalus quinquecostatus* planthopper, but there was a gap in knowledge about how both the planthopper and pathogen persist outside of the sugar beet crop.

The first clue was an observation that RTD hotspots appeared on the border of sugar beet fields next to winter wheat after sunflowers, said Živko. “That changed our approach from just looking at sugar beet, to inspecting the roots of sunflowers and wheat.”

After finding nymphs on the roots

of both sunflowers and wheat, sunflowers were confirmed as an important reservoir of *Ca. P. solani* tuf-d that causes RTD. Further experiments where adult planthoppers were caught in emergence cages in wheat after sunflowers confirmed that the hidden nymphal stage completed development in wheat.

“Transmission trials using the planthoppers collected in wheat after sunflowers showed 10 out of 11 sugar beet plants in the cage were infected with RTD,” explained Živko.

The research has led to a newly revealed life cycle that involves the adult planthoppers feeding and egg-laying in sunflowers, before a nymphal stage underground developing on the roots of sunflowers and subsequent winter wheat crop, re-emerging in late spring or early summer as adults.

“Their flights last for 4-6 weeks, during which time they also feed on other crops, including sugar beet, transmitting the disease. But the planthoppers don’t produce a new generation in sugar beet – it’s just a host for feeding.”

The findings help to explain why RTD occurs in sugar beet fields where the crop hasn’t been grown for several



Research findings

Transmission trials using planthoppers collected in wheat after sunflowers showed 10 out of 11 sugar beet plants in the cage were infected with RTD, explained Živko Ćurčić.

years, he said, while having implications for control. “First, we know that we can’t wait until the vector enters sugar beet fields because by then it is too late.

“For farmers, it means they have to pay attention to surrounding crops, with sunflower, wheat sequences representing high risk. It also means we can now start to trial management practices to interrupt this hidden life cycle in the soil,” he concluded.