

PROTECTING THE SUGAR BEET CROP

VIRUS YELLOWS PATHWAY UPDATE

VERSION TWO - DECEMBER 2024

STATE OF PLAY: THE VIRUS YELLOWS CHALLENGE

The British sugar beet crop continues to be threatened by Virus Yellows disease. In recent years, the disease has caused crop losses of up to 80%. With the impact of climate change bringing warmer and wetter winters, this provides a breeding ground for aphids over the winter months. Enabling early spread and infection of spring-sown sugar beet crops in the growing season.

The UK sugar beet industry continues to pursue its broad portfolio of work, led by the Virus Yellows Taskforce, to develop long-term, sustainable solutions to the threat posed by Virus Yellows. This involves exploring solutions in gene editing, seed breeding, integrated pest management, and sustainable spray programmes.

We welcomed the Government's announcement in September 2024 that it intends to move forward with secondary legislation of the Genetic Technology Act 2023, which will support our research into gene editing. With these changes in the pipeline, strong cross-industry collaboration, and positive signs from the various strands of ongoing research, we remain hopeful that solutions to Virus Yellows disease will be available in the coming years.



FINDING SOLUTIONS - UPDATE

The Virus Yellows Taskforce has been working on trials to explore novel integrated pest management (IPM) practices and their impact on the sugar beet crop, its seed germination and speed of establishment.

Trials which are showing promise include:

- Use of companion crops, beneficial hosts (wildflowers), camouflage and deterrents.
- Application of coloured dyes, masking the colour distinction between plant and soil relied upon by aphids in flight to recognise a host crop.
- AgriOdor™ pellets which repel aphids through scent.

There are plans in place to explore if utilising compounds derived from mature sugar beet can help to limit Virus Yellows infection and this work will get underway from 2026 onwards.



Seed model

This year, NFU Sugar and British Sugar announced reforms to the UK sugar beet seed model which gives growers more choice and flexibility, support innovation and bring Virus Yellows tolerant varieties to market sooner to accelerate adoption.

Sustainable spray programme

Work continues in trials to test new aphicides for the sugar beet crop, with the aim to work towards full approval of a 3-5 established sustainable spray programme from 2026 onwards.



GENETIC EDITING RESEARCH - UPDATE

British Sugar has entered a collaboration with the agriculture biotechnology company Tropic, to explore how to genetically edit (GE) sugar beet to confer resistance to the three yellowing viruses that makes up Virus Yellows disease.

The project makes use of Tropic's Gene Editing induced Gene Silencing (GEiGS[®]) technology platform, to make minimal and precise gene edits in sugar beet enabling durable resistance to Virus Yellows.

In early 2024, the project received £660,000 of grant funding from Innovate UK's Farming Futures R&D Fund. This was jointly awarded to British Sugar, Tropic and the world-leading plant science institute The John Innes Centre (JIC). The British Beet Research Organisation (BBRO) is also supporting the project.

Work to date has focused on mapping the sugar beet genome sequence, generating short interfering RNA (siRNA) expression data and defining the viral target genes. Tropic have successfully generated Gene Editing DNA solutions (GEiGS[®]) and tested their efficiency in cells. Multiple solutions with high silencing efficiencies are available for the next stage of the project, where they will be tested for their efficiency in plants. Alongside this work package, JIC will be developing the Sugar Beet transformation platform which will enable the generation of the GE plants.

By the end of the decade, it is hoped that the project team will have confirmation of Virus Yellows resistance in GE plants in the lab. Performance will then be assessed in field trials in the years that follow. Resistance to Beet Yellows Virus (BYV) is the priority, given it is the most damaging to the crop, but it is hoped that resistance will be achieved against all three viruses that make up Virus Yellows disease.



WHAT IS GENE EDITING?

Gene editing sees precision plant breeding techniques used to change a selected, very specific sequence within the genome of a crop.

It is different from genetic modification because no new genes from other species are incorporated into the plant; instead, changes are made to the plant's own DNA. This process can and does happen in nature, but gene editing speeds up the process to deliver results faster.

FURTHER INFORMATION

To find out more about the specific industry strategies for the control of Virus Yellows in sugar beet, please see our pathway document [here](#).

