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Virus yellows

*Essential monitoring and control
measures for every grower & agronomist*

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Feature

A grower's essential guide to virus yellows



Dr Mark Stevens

With the first crop in 25 years not treated with neonicotinoid seed treatments now in the ground, the focus is on every grower and their agronomist to monitor crops closely for aphids, and take necessary action when aphid thresholds are reached.

Dr Mark Stevens, Head of Science at BBRO, takes growers through the 2019 virus yellows forecast, how to identify when a crop reaches its aphid threshold, recommendations for aphicide application, and how to tell the difference between foliar symptoms.



Region	Virus Yellows (%) on Sewing Dates of			Mean temperature
	15 March	30 March	15 April	
East (Bury, Cantley, Wissington)	29.9	39.5	54.3	5.28 °C
North (Newark)	22.0	31.2	47.00	4.60°C

Fig. 1 Virus yellows forecast 2019.

A look back at 2018

It is interesting to compare this year's forecast with that of 2018. The "Beast from the East" had a huge impact on aphid numbers. Indeed, the average mean temperature for the eastern regions was only 3.59°C compared to the 5.28°C seen this year. Unsurprisingly aphid numbers were relatively low last year with only 2,451 *Myzus persicae* caught in the BBRO yellow water pan network (compared to 4,970 in 2017).

However, aphid numbers did build through the summer. In addition, 292 aphids were caught at the BBRO autumn aphicide trial at Morley from September 2018 onwards, too, and aphids were still being trapped in the site's yellow water pans in the first week of December. This reflects just how mild autumn 2018 was and has enabled a large population of aphids to build up during this period, which have been little affected by the weather in January and February.

Monitoring your crop

The virus yellows forecast is only a prediction. One of the most important ways to protect your crop from virus will be diligent monitoring. With the approval of the emergency authorisation of two sprays of Biscaya (thiacloprid – see page 22, left hand column) alongside one spray of Teppeki (flonicamid), timely applications will be key to ensure maximum benefit from the protection it provides (in BBRO trials this has been up to 21 days).

IMPORTANT Aphid threshold

The threshold for applying aphicide is based on the number of green wingless aphids in your crop. BBRO recommends counting aphids on 10 plants across the field, each week, to establish if the crop has reached threshold.

If the threshold of 1 green wingless aphid per 4 plants up to the 12-leaf stage is reached, then treatment is justified.

Where to look for aphids:

- On the heart leaves
- Within the folds at leaf margins
- On the underside of leaves



Virus yellows is a concern, especially given the high 2019 virus yellows forecast. Though it should be remembered there are many other reasons for a plant to go yellow – virus is not always to blame. Let's first look at the 2019 Virus Yellows Forecast.

The Virus Yellows Forecast – why the jump?

The virus yellows forecast for 2019 has predicted a high risk of virus yellows this season (Fig. 1). During January the mean air temperatures were relatively low helping to limit aphid build-up and lower the risk of virus infection in the coming season.

Unfortunately (from the point of view of aphid control), we experienced exceptionally warm weather in the latter half of February. This has had a direct impact on aphid populations and explains the infection levels seen in the full 2019 virus yellows forecast.



Feature

Using the BBRO yellow water pan survey

By the time you are reading this the BBRO laboratory will be at its busiest, sorting through the 120 samples a week being sent in from the yellow water pans. For 2019 the number of yellow water pan sites has been doubled to 60, with British Sugar's Contract Managers managing just over half, and BBRO and its partners monitoring the remaining sites. The yellow water pan sites have a wide geographic spread across the UK sugar beet growing area.

For the first time, the information collected from these samples will be made available in real time for growers to access through the BBRO website, https://bbro.co.uk/on-farm/aphid_survey

This will include not just the number of *Myzus persicae* trapped at each site but also if any of those aphids carried virus. Thanks to the new state-of-the-art diagnostic equipment in the BBRO laboratory, this year we will be testing aphids for beet mild yellowing virus and also beet yellowing virus.

Crucially these data will not determine if the crop is at threshold, but it will provide an early warning of when aphids are flying in your area.

Biscaya emergency approval authorised for the 2019 sugar beet crop

The emergency authorisation for the use of up-to two applications of thiacloprid (Biscaya) has been granted by Health & Safety Executive (HSE). The emergency approval for Biscaya has been gained for the control of green aphids, in particular the peach-potato aphid (*Myzus persicae*), to limit and control the transmission of virus yellows.

The use of Biscaya is effective from 18th April and this approval is in place for 120 days. Application(s) should be made via a ground boom sprayer in a minimum of 200 l / ha with a maximum individual dose of 0.4l /ha.

It is imperative that any application of thiacloprid (Biscaya) is applied at industry-recognised aphid thresholds and used in alternation with flonicamid (Teppeki), to minimise the risk of pest resistance developing.

The HSE emergency authorisation approval document can be found on the BBRO website for further reference and outlines the conditions of use.



Fig. 2 Magnesium deficiency symptoms.

It might not be virus!

The most noticeable symptom of virus yellows is yellow patches within a field. This yellowing will be visible 2-4 weeks after inoculation depending on virus species, but it is important to remember yellowing is a common symptom of many plant health issues.

Nutrient deficiencies, particularly magnesium deficiency, can be easily confused with virus yellows (Figs. 2 - 3). There were also several cases in the BBRO Plant Clinic last year of varietal yellowing, an observation that has been recorded in previous years and potentially influenced by a number of in-season factors.

Trying to distinguish between beet mild yellowing virus (BMV) symptoms and beet yellows virus (BYV) is even more tricky. BBRO trials in 2018 confirmed previous studies and highlight that the viruses have different impacts on yield; in the 2018 trials BYV caused losses of up to 42% yield loss per plant, whereas BMV caused reductions of up to 20%.

As always, if in doubt, use the BBRO Plant Clinic. That way you can be sure of what is going on and, if it is virus, know which virus is responsible.

The BBRO Plant Clinic can be accessed through your British Sugar Contract Manager or directly using the contact details available at: bbro.co.uk/research/plant-clinic. We can also provide advice on how best to collect and package samples to ensure they survive their trip in the post and reach us in the best possible condition.



Fig. 3 The different viruses have subtly different symptoms; the leaf on the left is infected with BYV, the one on the right is infected with BMV.

Understanding foliar symptoms and yield

The long-term solution for virus yellows is tolerant/resistant varieties. The breeders are working hard and collaborating with the BBRO to achieve this, but in the meantime the BBRO is trying to establish how current varieties interact with virus.

In 2018 BBRO started a new project looking at the impact of virus infection on ten commercial varieties. BBRO doesn't normally release information on only one year's worth of data, but given the 2019 virus yellows forecast an exception has been made in this case. Please keep this in mind, and the fact that 2018 was a very unusual season with a wet March and summer drought, when reading about these initial results.

Every plant within the replicated plots was inoculated by hand with aphids, in early June, carrying either BYV or BMV. Although ten varieties were tested only the resultant yields for those commercially available in 2019 are shown in Figs. 4 and 5.

Notably, varieties which did not show such severe foliar symptoms were often lower yielding than those that "looked worse" in the field and vice versa. The hesitant conclusion we are drawing from this is that the state of foliage may not be a

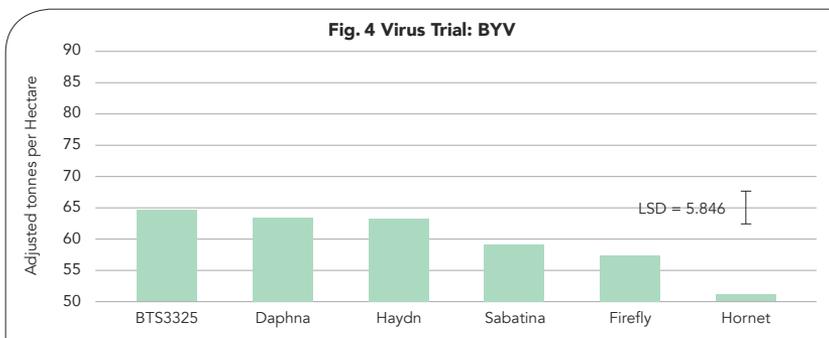


Fig. 4 Effect of BYV infection on yields of six current commercial varieties (based on one year of data).

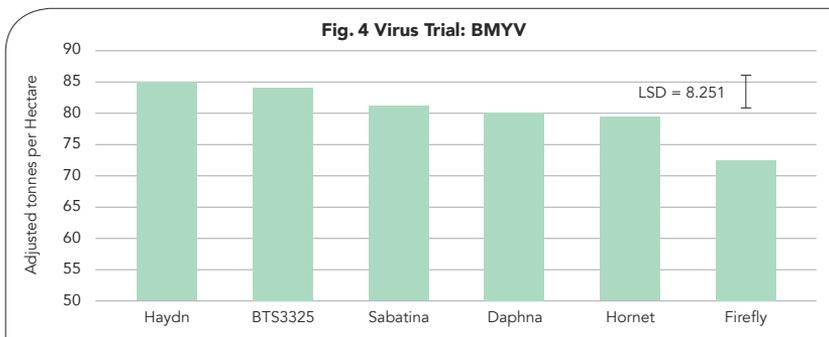


Fig. 5 Effect of BMV infection on yields of six current commercial varieties (based on one year of data from 2018).

reliable indicator of yield under virus infection. It is hoped this provisional data may help when reflecting on the order to harvest varieties infected with virus.

Please note this information is from a BBRO-specific research project and not directly linked to the Recommended List. These trials are being conducted again in 2019 so that we can better understand the relationship between foliar symptoms, yield and variety interactions.

Aphid Fact File

Aphids shed their hard skins (exoskeletons) as they mature, becoming adult in as little as seven days

- Host plant health and aphid density determine if an aphid develops wings
- Not all aphids develop wings
- In a typical summer, aphids go through 10 to 15 generations
- Aphids are not strong flyers, but they can travel hundreds of miles with the help of air currents

Grower checklist

- Read the BBRO Advisory Bulletins for latest virus and aphicide updates
- Regularly check the BBRO's virus yellows map to see yellow water pan results near you. Visit https://bbro.co.uk/on-farm/aphid_survey
- Use your BBRO magnifying glass to check your crops
- Look for aphids on heart leaves, within folds at leaf margins, and on underside of leaves
- Apply aphicide based on number of green wingless aphids in your crop. It is important you reach the aphid threshold
- Count aphids on 10 plants across the field each week. If the threshold of 1 green wingless aphid per 4 plants up to the 12-leaf stage is reached, then treatment is justified
- Use the BBRO Plant Clinic if you require clarification or wish to have a sample analysed