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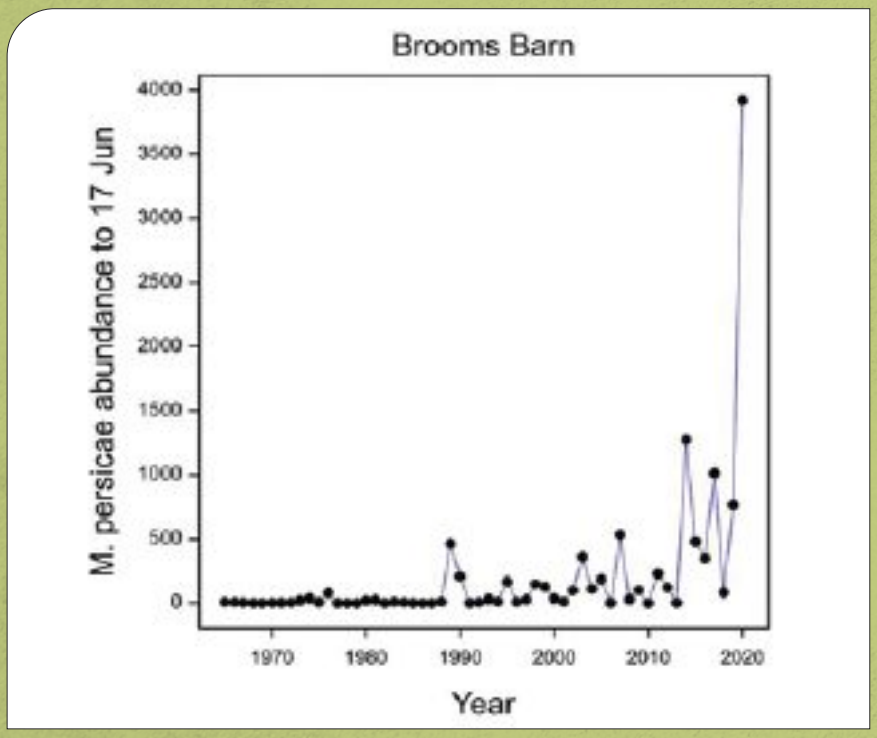
Virus feature

Learning through adversity

Aphid and virus control in 2021

Aphid monitoring at Brooms Barn 1965-2020



It could be argued that we would be unlucky to experience another similar and massive early aphid migration into the crop again in 2021. Already winter 2020/21 is different to that experienced 12 months earlier, but as we approach drilling and, especially if overwinter temperatures have not delivered sufficient hard frosts, we should and must plan for a repeat scenario. However, if the Rothamsted's Virus Yellows Forecast triggers the use of Cruiser SB on our seed (under the terms and conditions of the recent emergency authorisation granted by HSE) this will provide some confidence that the crop has up to 10 weeks protection from aphids and secondary spread of virus yellows at the critical early stage of the season. Experience should remind us all that, depending exactly when and how many aphids land in our crops in 2021, we must not rely on the seed treatment alone to protect crops from infection, a fully integrated approach is required.

Fig.1. Numbers of winged peach-potato aphids caught in the Broom's Barn 12.2 m suction trap near Bury St Edmunds, Suffolk between 1965 and 2020. It would be unlucky to get such an unprecedented number of aphids so early again in 2021 as we did in 2020 **BUT** if conditions allow we need to be prepared for a similar situation.

Emergency authorisation of Cruiser SB for use in sugar beet in 2021.

In 2020, the UK sugar beet sector experienced its worst virus yellows epidemic since the mid-1970s. In 2020, two years since the EU withdrawal of the neonicotinoid seed treatments on sugar beet, 38.1% of the national crop became infected with virus yellows. As we all know, many growers in Cambridgeshire, Norfolk, Suffolk and South Lincolnshire experienced up to 100% infection even with the use of up to four aphicide sprays applied at the BBRO recommended aphid spray threshold. Virus yellows also compromised the BBRO R&D trials programme too.

This crisis was brought about by the extremely mild winter of 2019/20 and unprecedented aphid numbers surviving, migrating and reproducing on young beet plants throughout April to June, despite the judicious and timely use of aphicide sprays to prevent re-colonisation and limit virus spread. As British Sugar factories continue to process the current crop, affected growers are seeing significant yield losses of up to 80% from decreased root weights and sugar content; sugar extraction is also being impacted by increased impurities caused by the virus infection. A similar situation is being experienced across Europe, especially France.

At the time of writing, the UK sugar beet industry, in light of this pressure, have been granted a short term, limited and controlled emergency authorisation for the use of Cruiser SB on seed. The details of its use are available on the HSE/CRD website, but it must be emphasised, unlike anywhere else in Europe, the UK Industry will only instigate its use if the virus yellows forecast, issued by Rothamsted Research, reaches the necessary trigger point. This information will not be available until mid-February at the earliest.

However, regardless of whether the seed treatment is used, there are many other recommendations and actions that we, as an industry, can undertake to limit the impact of aphids and virus yellows in 2021.

This article outlines the recommended approach to controlling aphids in your crops this season. The three key areas are:

1. **Reducing the potential source of virus infection**
2. **Detailed monitoring of aphid numbers in crops**
3. **Carefully timed first and any subsequent foliar insecticide applications (if threshold reached).**

1 Decreasing the potential source of virus infected crops – act responsibly now to help minimise the risk later

On-farm hygiene or biosecurity is crucial to decrease sources of aphids and virus as we approach drilling. Remember, virus can survive overwinter in infected beet material and other host plants. Infected aphids can overwinter on other crops (e.g. brassica crops) and vegetation too.

The highest risk will be from any overwintered beet left growing in the ground until late spring. This will act as a major source of infection to your crops, especially if aphids start migrating in April. It is imperative that this green bridge is destroyed. If AD beet is under your control, you are strongly advised to harvest or top this in advance of drilling your next sugar beet crop. Control any subsequent regrowth too. If the beet is not under your control, it will be important to have a conversation with the owner to highlight the risk to all beet crops in the area. From observations in 2020 many AD and fodder beet varieties appear to be very susceptible to virus infection and early symptom expression.

Difficult harvesting conditions have resulted in more beet being left in the field and in spoil. Monitor spoil heaps for growth and destroy as soon as possible. As temperatures increase during the spring, growth could be rapid.

Leaf growth on fodder beet clamps will also be a source of virus yellows, so this needs to be monitored and controlled.

Check fields which had beet last season for any regrowth on groundkeepers or crowns and scout the area around your beet crops to see what fields or non-cropped areas could provide potential sources of aphids. Assess around the farm for overwintering aphids in other crops and weeds and make sure cover crops which may host aphids and virus are destroyed at least 5-6 week before drilling your next beet crop.

In autumn 2020, BBRO issued the Brilliant Basics campaign number 5 ' Don't keep the virus alive' available at https://bbro.co.uk/on-farm/brilliant-basics/. This should be seen as the minimum standard to adopt to limit the impact of virus yellows in 2021.

Fig.2. Destroy regrowth in field and on spoil heaps

2 Detailed monitoring of aphid numbers in crops

As spring progresses, it is vital that you keep yourself up to date and briefed on the aphid risk in your area so you can plan your control strategy. Keep a watch out for the BBRO Advisory Bulletins for information and monitoring data plus the virus yellows forecast and updates, provided by Rothamsted Research, which will be issued from mid-February onwards. For more in-depth detail sign-up now for BBROplus, via the BBRO website (www.bbro.co.uk).

Aphid winter survival depends on temperatures (LT50 – the temperature when 50% of the aphids are killed) and is about -7°C for adults. Temperatures in January and February are often key and correlate well with what is found in the suction traps later in the spring. Aphid migration and movement can be as local as 'plant to plant' or 'field to field', longer distance migration must not be forgotten and issues that can influence aphid populations are factors such as wind direction, topography, as well as tree belts producing aphid deposition zones.

Assume the aphid population will be carrying more virus than in 2020. Whilst this will be a relatively low percentage, it represents a high number of infective aphids if we see tens of thousands per hectare in the crop. **At times in 2020, BBRO calculated that there were over 4 million green aphids per hectare in some areas!**

Each year BBRO, in collaboration with British Sugar Contract Managers, growers, agronomists and sugar beet breeding companies use a network of yellow water pans to provide information about numbers of winged aphids flying across the growing region. Also, in 2020, partly due to COVID-19 restrictions, more detailed counts on the crops were provided too. This season, BBRO will again have an extensive network of yellow water pan sites and numbers will be reported regularly. These can be found on BBROplus and we encourage you to use this service as an early warning approach to then monitor and act, if warranted, on your own farm. It is reported in real-time so please check regularly for the very latest information. Reports will also be published weekly in the BBRO Advisory Bulletins.

Fig.3. Information accessible via BBROplus in 2020

However, the yellow water pan network is only a guide and should be seen as an early warning system to encourage you or your agronomist to inspect your own fields for aphids. Remember, aphids may already be in your crop before they are detected in your nearest yellow water pan trap site. Last year showed how aphid numbers can vary at a local scale, between and within fields. Location in relation to sources of virus and prevailing wind are key, and aspect, topography and field margins can all have a significant effect and influence, so do not rely on information from other crops unless within a few miles of your fields. Listen to reports and agronomists, but again this is not a substitute for checking your own crops. Check higher risk beet fields as a priority such as those to nearby oilseed rape crops that could harbour overwintering aphids.

Commitment is essential as every crop or block of beet needs to be assessed separately. Last year highlighted that if you missed the early migration of winged aphids into your crop you were then fighting an uphill battle to control numbers and hence secondary virus spread.

Seed treatment applied? You still need to monitor.

- Remember depending on weather and the arrival of aphids, crops may still need a foliar insecticide application, as the protection period provided by the seed treatment only covers around the first 10 weeks. However, the aphid threshold would need to be breached to justify any additional application(s).
- Remember, that at the 12-leaf stage, crops do not become completely resistant to virus. This is a gradual and ongoing process.
- On average, the crop reaches the 12-leaf stage during the first two weeks of June (circa 40% crop cover) but don't assume your crop is average, check the growth stage regularly. It is essential that aphid activity is continually monitored for thresholds after 10 weeks and where necessary, foliar insecticides applied.
- Helping to ensure crops reach the 12-leaf stage must be recognised as a key tactic in 2021. The dry cloddy seedbed resulted in very uneven establishment and slow growth in many crops in 2020, increasing the period at which plants were more susceptible to virus transmission. Focus on timing of your cultivations in relation to gaining the best seedbed possible and during drilling target 100,000 plants/ha as evenly as possible across fields. Remembering that 'gappy' crops will encourage aphids into your fields. Make sure they receive all the nutrition they need at the right time and avoid herbicide damage which can 'knock-back' plant growth.

3

Carefully timed first and subsequent foliar insecticide applications.

In 2020, growers and agronomists had some valuable, but not complete success, in controlling the unprecedented numbers of aphids when using aphicide sprays. On reflection many crops received their first spray too late in 2020 to limit early virus spread. It is therefore critical that you keep a watch for the first winged and wingless aphids in your crop.

Fig.4. Use a magnifier to check crop as aphids are easily missed by the naked eye

Remember winged aphids can start producing live wingless aphids within minutes after landing on a leaf, so timing is key. **Do not delay treatment if at threshold.**

In young crops, numbers of more than 100 per plant even at the 2-4 leaf stage were recorded in 2020 but we did have reports from some growers unable to find any aphids. Make sure you check for aphids in the heart leaves or leaves close to the ground as these are the more sheltered parts of the plant. Use a magnifier where possible.

Continued over

Fig.5. The threshold of 1 green wingless aphid per 4 plants was clearly breached in 2020

- The current threshold is to apply foliar treatments as soon as there is **one green wingless aphid per four plants (or five aphids per 20 plants).** Control of the first aphids is important to limit the establishment of primary sources of infection from which widespread secondary virus spread can occur.
- Between 12-16 leaves, the threshold for treatment is one green wingless aphid per plant.
- The first application is key to minimising virus spread. Always follow label rates and ensure you use the recommended water volumes to maximise canopy coverage and penetration into heart leaves. High temperatures and drought stress can reduce efficacy so when at all possible, spray at cooler times of the day.

Follow up sprays (subject to availability and further EA's)

If additional aphicide sprays are available and warranted, pay close attention to the BBRO yellow water pan trap information on BBROplus to guide you on what the populations are doing across the factory areas **BUT**, keep checking your own crop, ideally every 4-5 days.

BBRO efficacy trials conducted in 2020 showed good control of green wingless aphids, although the plants were at the 6-8 true leaf stage. However, under sustained pressure new winged aphids may have landed and started to produce further offspring, so monitoring is key. If aphid pressure is sustained and thresholds breached (and product is available) apply again, following label recommendations. Do not delay.

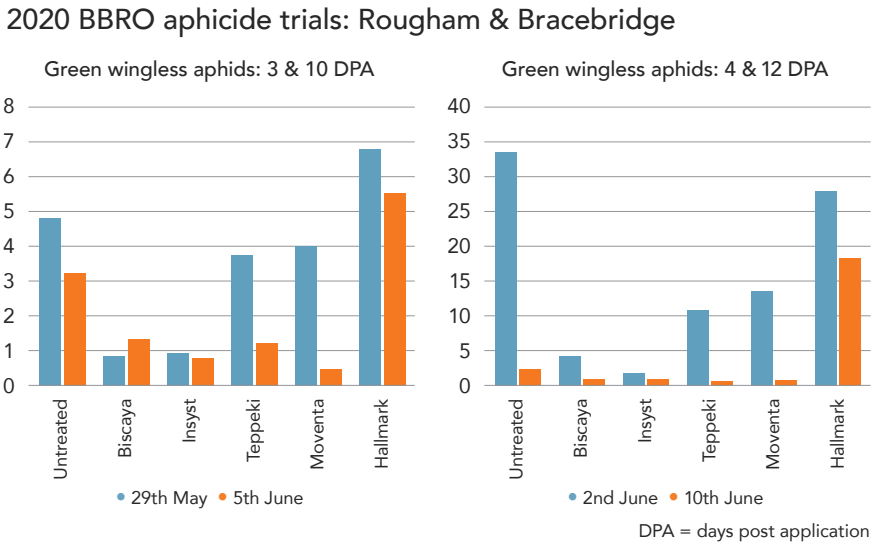


Fig.6. Data from the BBRO efficacy trials in May/June 2020

On average just over two sprays were applied by growers in 2020 but this disguises a wide range of different spray regimes that reflect the considerable variation in numbers of aphids between crops. Due to continued aphid invasion decreasing the time interval between sprays may have helped, we appreciate this can be difficult given the weather, tank mix compatibilities and other pressures on farm.

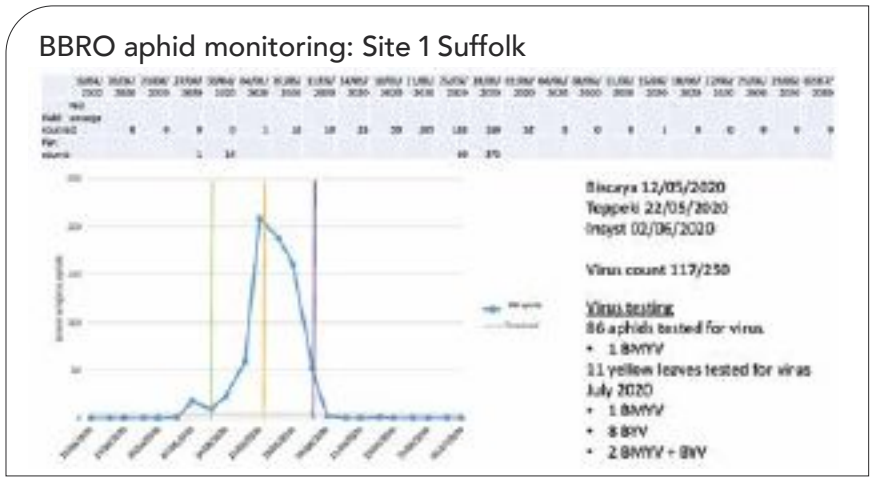


Fig.7. Early intervention with 2nd spray (14th May rather than 21st) may have decreased virus incidence

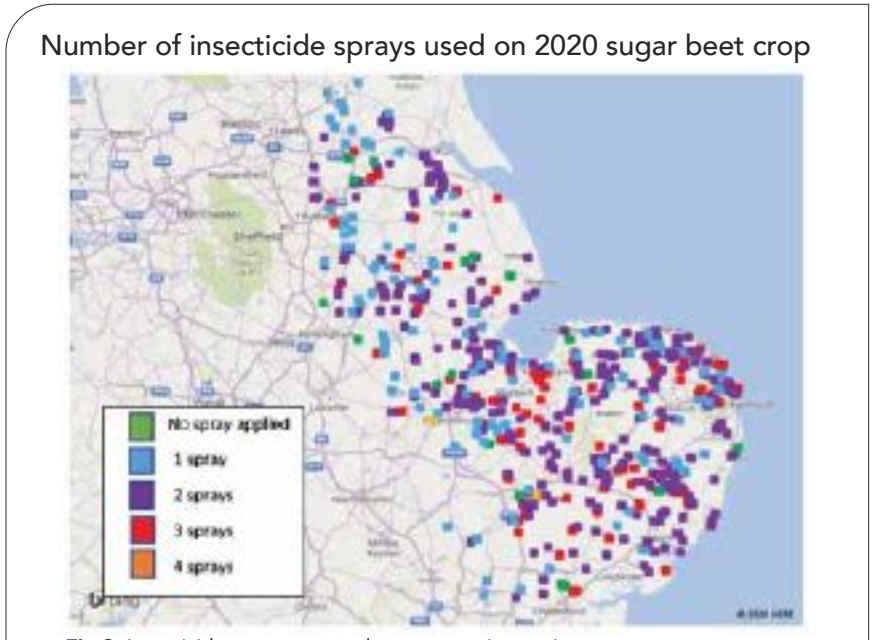


Fig.8. Insecticide usage mapped across growing region

What other actions can be taken to help reduce virus levels in crops in 2021?

Get back to basics! Prepare your seed bed, check your seed rates, monitor crop health and nutritional requirements and treat weeds, remove weed beet and bolters. All of these can add stress to the crop, so make sure you give your crop a fighting chance.

Alongside our variety screening work, we have an extensive series of projects and trials looking at other aspects of virus reduction. BBRO has put aphid and virus research at the very centre of our research programmes and are undertaking a number of projects, further details are available via our website. However, there are a couple worth mentioning here.

Bringing all the tactics together

BBRO's Virus Yellow tactics 21 plan summarises the key actions you need to take to decrease the impact of virus in 2021. It is vital that you consider implementing all the integrated actions to provide the best control strategy and limit the impact of virus yellows.

As the season progresses BBRO will provide further information, updates and actions regarding the risk from aphids and virus yellows in 2021. To keep fully up to date, please follow the latest information on the BBRO Advisory Bulletins, BeetCast recordings alongside BBROplus and our general website.

Additional things you can do to protect your crop:
Use under-sown barley, especially where an early aphid migration is expected. Encourage beneficials to your farm.

Do the basics brilliantly:
Good seed bed prep, select seed rates to give optimal plant population of 100,000 plants/ha, drill as soon as conditions are right, focus on drill accuracy, ensure adequate nutrition for rapid growth, carefully targeting weed control whilst avoiding herbicide damage.

Check your crop for aphids at an early stage:
Keep up to date with latest info on aphids from BBRO. If Cruiser SB used it will help to protect the crop for 10 weeks after drilling. Keep checking crops for aphids from emergence and especially towards the end of this 10-week period.

Check – does your crop need a foliar insecticide?
Check your crops daily to assess whether the threshold of 1 green wingless aphid to 4 plants triggers the need for a foliar insecticide. Don't delay in applying when required.

BBRO Opinion

Use of an under-sown barley cover crop

There are some limited data that show where there is an early aphid migration, an under-sown barley crop can reduce virus symptoms. This is thought to be associated with reducing the ability of aphids to identify the young beet plants.

This tactic is considered to be most effective when aphids start flying early into crops with small canopies. It may be less effective in years when aphids migrate into fields later in the season when beet canopies are more established.

- Look to drill barley about a 50-60kg/ha seed rate, 5-7 days before drilling beet. If using the barley to stabilise windblow you will clearly need to drill the barley earlier.
- Ensure the beet canopy is well established, ideally beyond the 4-6 leaf stage before destroying the barley cover. The decision will need to be based on how vigorous the cover crop and the weather forecast to assess how quickly the barley cover will be killed. We have measured reductions in beet yields where the cover crop has been destroyed too late and has competed with the crop.
- Consider using a a graminicide as opposed to a more general herbicide with adjuvants will reduce the risk of herbicide damage to the beet. Remember to allow some time for the herbicide to work fully.
- The use of Conviso SMART beet varieties may be an option but don't compromise herbicide timings for the control of other weeds.

Without fail you must:

Remove or destroy any beet growth on clamps or in spoil heaps. Remove any energy/fodder beet in the vicinity of drilled crops & destroy any cover crops well ahead of drilling.

Encouraging natural predators (beneficial insects)

Hedgerow and field margins have been shown to support beneficials and to contribute to reducing aphid numbers in crops. Beneficial insects can increase when prey numbers are high although control tends to lag behind. When the aphid migration is very early, as in 2020 and beneficial numbers still low, their impact on virus transmission is decreased.

Consider establishing field margins or drill strips with plant species which encourage beneficial insects such as ladybirds, ground beetles, lacewings, hover flies and parasitic wasps.

Early establishment of field margins will help build beneficial numbers earlier in the season and have more impact.

Use a mix of grasses and wild flowers in field margins to provide ground cover and sources of pollen and nectar. Mixes including some of the following flowering species are considered to be effective: Oxeye daisy, buckwheat, Bird's foot trefoil, yarrow, common knapweed, wild carrot, chamomile, sainfoin, wild red clover, selfheal, phacelia and borage.

There is limited experience of the tactic of releasing beneficial insects into crops to predate on aphids. The number of predators and the timing of release is critical, especially to reduce early virus transmission. It is likely to be an expensive option to establish and maintain sufficient numbers of predators. However, BBRO is monitoring this option with growers and will provide further information as the season progresses.

Please remember to avoid using pyrethroid foliar insecticides for aphid control during the season. Aphids are widely resistant to these treatments and BBRO work has shown that their use reduces the number of beneficials, thus increasing the aphid numbers in the longer-term.

For more info on beneficials see the May 2020 issue of Beet Review