Application submission	**By Post:** Applications Sift, Chemicals Regulation Division, Mallard House, Kings Pool, 3 Peasholme Green, York, YO1 7PX, UK **By Email**: applications@hse.gov.uk **By ShareFile (cloud based file sharing system):** Please request details of CRD's ShareFile by emailing applications@hse.gov.uk
CRD contact details **Telephone**: 020 3028 1101 (**International:** (+44) 20 3028 1101) **Enquiries Email:** CRDInformationManagement@hse.gov.uk **Website**: http://www.hse.gov.uk/CRD/	

Application Form CRD 9

Submission under Article 53 Regulation No 1107/2009 (GB/NI)

When to use this form

Any applications from authorisation holders, growers or their representative organisations for an **Emergency Authorisation** under **Article 53 of Regulation (EC) No 1107/2009**

When not to use this form

Applications for:

1. **New commercial authorisation, permit for trial purposes** (use form CRD1).
2. **Administrative authorisation** (use form CRD2).
3. **Extension of Authorisation for a Minor Use** (use form CRD3).
4. **Official Listing of an Adjuvant** (use form CRD4).
5. **Administrative permit for trial purposes**, (use form CRD7).
6. **Standalone Technical Equivalence** (use form CRD8).
7. **Pre-submission meeting** (use form CRD10).
8. **Renewal of an existing plant protection product** (use form CRD-R).
9. **Biocidal product authorisation** (see http://www.hse.gov.uk/biocides/index.htm).

How to complete this form

1. Complete all parts of the form A to H as appropriate.
2. All correspondence and enquiries will be sent to the contact named in the applicant section (Part A) of this form unless otherwise informed.
3. **No sections of the form are protected. Take care not to delete or amend existing text.**
4. To check 'tick boxes', double click on the box, select 'checked' and press 'ok'.
5. 'Copy and paste' to add additional rows/tables where appropriate.
6. For questions about this form, see CRD contact details above.
7. All forms with supporting information must be submitted to the Applications Sift (see contact information above).
8. You must ensure all information necessary to support your case has been provided, as a paper based on Parts E to G may be submitted to the Expert Committee on Pesticides (ECP) for independent scientific advice.

HSE

Health and Safety Executive

Part A– Co-applicant details					
1	Applicant	Contact name	James Northen	Title*	Dr
		Organisation name	NFU Sugar (on behalf of)		
		Address	Agriculture House Stoneleigh Park Warwickshire CV8 2TZ		
		Telephone	02476 858614		
		Email	James.northen@nfu.org.uk		
		Date	29/06/2021		
			I confirm that the information given in this application form is true to the best of my knowledge, information and belief. ☒ (please tick to confirm)		
2	Address for invoicing	Contact name	Ruth Day	Title*	Mrs
		Organisation name	British Sugar plc		
		Address	1 Samson Place, London Road, Peterborough, PE7 8QJ		
		Telephone	07864 800406		
		Email	Ruth.Day@britishsugar.com		
3	Purchase order number (if needed)		TBC		

* for example: Mrs, Mr, Ms, Dr

Part A– Co-applicant details					
1	Applicant	Contact name	Peter Watson	Title*	Mr
		Organisation name	British Sugar plc (on behalf of)		
		Address	1 Samson Place, London Road, Peterborough, PE7 8QJ		
		Telephone	07801010729		
		Email	Peter.watson@britishsugar.com		
		Date	29/06/2021		
			I confirm that the information given in this application form is true to the best of my knowledge, information and belief. ☒ (please tick to confirm)		
2	Address for invoicing	Contact name	Ruth Day	Title*	Mrs
		Organisation name	British Sugar plc		
		Address	1 Samson Place, London Road, Peterborough, PE7 8QJ		
		Telephone	07864 800406		
		Email	Ruth.Day@britishsugar.com		
3	Purchase order number (if needed)		TBC		

Part B – Product details		
4	**Product name**	Cruiser SB
5	**MAPP number**	15012
6	**Active substance(s) and content (list all)**	600g/l
		75ml/l product equivalent to 45g thiamethoxam /100,000 seeds
7	**Authorisation holder**	Syngenta UK Limited
	Address	SYNGENTA UK LTD, CPC4 CAPITAL PARK, FULBOURN, CAMBRIDGE, CB21 5XE
8	**Registration or Authorisation number of product** **(imported/ currently authorised in the UK for other uses)**	Authorisation Number 2593 of 2013

9	Please tick which region your application applies to
☐	**Great Britain (Scotland, England and Wales) and Northern Ireland**
☒	**Great Britain Only (Scotland, England and Wales)**
☐	**Northern Ireland Only**

10	Plant Health Orders
If the emergency authorisation is for use with a Plant Health Order please provide details of the order below.	
Not applicable	

Part C – Comparison table proposed emergency use and current authorised uses	
11	Please complete the proposed emergency use section of the table below. Please use the comparison section of the table when extrapolating from an authorised product or previous emergency authorisation.

12 Product	Proposed emergency use/situation	Comparison product
On-label/Extension of Use/ Previous Emergency authorisation		
Product	Cruiser SB	Cruiser SB
MAPP number	15012	15012
Active substance(s) and content	600g / l thiamethoxam	600g / l thiamethoxam
Formulation type	A flowable concentrate for seed treatment formulation	A flowable concentrate for seed treatment formulation
Field of use (e.g. fungicide)	Professional – seed treatment	Professional – seed treatment

13	Uses	Proposed emergency situation		Current authorised use or previous Emergency authorisation	
Crop details	Identity of crop or situation of use[1]	Sugar beet (seed)		Sugar beet and fodder beet (seed)	
	Situation of crop[2]	indoor (non crop production)	☐	indoor (non crop production)	☐
		outdoor	☒	outdoor	☒
		protected (permanent or temporary cover)[2]	☐	protected (permanent or temporary cover)[2]	☐
		permanent protection with full enclosure (PPFE)	☐	permanent protection with full enclosure (PPFE)	☐
	Growing media used for protected uses	organic media (for example soil or compost, either in containers or on impervious surfaces)	☐	organic media (for example soil or compost, either in containers or on impervious surfaces)	☐
		soil (crops planted directly into the ground)	☐	soil (crops planted directly into the ground)	☐
		synthetic rooting media (for example rockwool or perlite)	☐	synthetic rooting media (for example rockwool or perlite)	☐
	Height of target	n/a applied as seed treatment		n/a applied as seed treatment	
	Number of crops per year[3]	1		1	

Individual target pest/disease/weed[4]		virus yellows-carrying aphids, principally the peach-potato aphid (*Myzus persicae*). MYZUPE	virus yellows-carrying aphids, principally the peach-potato aphid (*Myzus persicae*). MYZUPE leaf miner fly complex (e.g. *Pegomya hyoscyami* and related sub-species) e.g. PEGOHY
Max. individual dose		75 ml product / 100 000 seeds	75 ml product / 100 000 seeds
Max. total dose		75 ml product / 100 000 seeds	75 ml product / 100 000 seeds
Max. number of treatments		1	1
Earliest time of application (estimated date and BBCH code[5])		BBCH 00 – seed treatment before drilling	BBCH 00 – seed treatment before drilling
Latest time of application (estimated date and BBCH code[5])		BBCH 00 – seed treatment before drilling	BBCH 00 – seed treatment before drilling
Interval between applications		Not applicable	Not applicable
Proposed period of use (Dates)		March 2021	March 2021 (however, seed not treated as model was not triggered)
14	**Application**	**Proposed emergency situation**	**Current authorised use or previous Emergency authorisation**
Total amount of crop grown in the UK	Hectares	approx 100,000 hectares	105,000 hectares
	Tonnage where applicable	Approx. 7.5 million tonnes	Approx. 8 million tonnes

Total amount of crop treated	**Hectares**	0--100,000 hectares depending on 2022 virus yellows forecast			0-105,000 hectares depending on virus yellows forecast		
	Tonnage where applicable						
% Area of UK crop to be treated		0-99% depending on 2022 virus yellows forecast			0-99% depending on virus yellows forecast		
Geographical locations of proposed uses		Eastern counties of England surrounding four sugar factories in Norfolk, Suffolk and Nottinghamshire			Eastern counties of England surrounding four sugar factories in Norfolk, Suffolk and Nottinghamshire		
Application method(s) to be used			Protected/(PPFE)	Outdoor		Protected/(PPFE)	Outdoor
		Horizontal boom sprayer	☐	☐	Horizontal boom sprayer	☐	☐
		Broadcast sprayer with air assistance / variable geometry boom sprayer	☐	☐	Broadcast sprayer with air assistance / variable geometry boom sprayer	☐	☐
		Hand-held application – rotary atomiser	☐	☐	Hand-held application – rotary atomiser	☐	☐
		Hand-held application – hydraulic nozzle	☐	☐	Hand-held application – hydraulic nozzle	☐	☐

	Granule applicator – vehicle mounted or trailed	☐	☐	Granule applicator – vehicle mounted or trailed	☐	☐
	Granule applicator – hand-held	☐	☐	Granule applicator – hand-held	☐	☐
	Fogging – remotely operated	☐	☐	Fogging – remotely operated	☐	☐
	Fogging – hand-held	☐	☐	Fogging – hand-held	☐	☐
	Misting / low volume misting (LVM) – remotely operated	☐	☐	Misting / low volume misting (LVM) – remotely operated	☐	☐
	Misting / low volume misting (LVM) – hand-held	☐	☐	Misting / low volume misting (LVM) – hand-held	☐	☐
	Dipping	☐	☐	Dipping	☐	☐
	Application via conveyor, roller table or other similar equipment	☐	☐	Application via conveyor, roller table or other similar equipment	☐	☐

	Drip irrigation	☐	☐	Drip irrigation	☐	☐
	Soil drench	☐	☐	Soil drench	☐	☐
	Other – please provide details and provide photographs if possible	☐	☒ seed treatment	Other – please provide details and provide photographs if possible	☐	☒ seed treatment
Water volumes (range)	N/A			N/A		

15 Restrictions	Proposed emergency situation	Current authorised use or previous Emergency authorisation
Operator protection	a) Operators must wear suitable protective clothing (coveralls) and suitable protective gloves when handling the concentrate, handling contaminated surfaces or handling treated seed. (b) Operators must wear suitable protective clothing (coveralls), suitable protective gloves and suitable respiratory protective equipment* when cleaning machinery. *Disposable filtering facepiece respirator to at least EN149 FFP2 or equivalent.	(a) Operators must wear suitable protective clothing (coveralls) and suitable protective gloves when handling the concentrate, handling contaminated surfaces or handling treated seed. (b) Operators must wear suitable protective clothing (coveralls), suitable protective gloves and suitable respiratory protective equipment* when cleaning machinery. *Disposable filtering facepiece respirator to at least EN149 FFP2 or equivalent.
Environmental protection	1) To protect birds and mammals treated seed should not be left on the soil surface. Bury or remove spillages. (2) Seed coating shall only be performed in professional seed treatment facilities. Those facilities must apply the best available techniques in order to ensure that the release of dust during application to the seed, storage and transport can be minimised. (3) Adequate seed drilling equipment shall be used to ensure a high degree of incorporation in soil, minimisation of spillage and minimisation of dust emission. DO NOT CONTAMINATE SURFACE WATERS OR DITCHES with chemical or used container.	1) To protect birds and mammals treated seed should not be left on the soil surface. Bury or remove spillages. (2) Seed coating shall only be performed in professional seed treatment facilities. Those facilities must apply the best available techniques in order to ensure that the release of dust during application to the seed, storage and transport can be minimised. (3) Adequate seed drilling equipment shall be used to ensure a high degree of incorporation in soil, minimisation of spillage and minimisation of dust emission. DO NOT CONTAMINATE SURFACE WATERS OR DITCHES with chemical or used container.

15 Restrictions	Proposed emergency situation	Current authorised use or previous Emergency authorisation
Other specific restrictions	1) Returnable containers must not be re-used for any other purpose. (2) Returnable containers must be returned to the supplier. (3) Treated seed must not be used for food or feed. (4) Sacks containing treated seed must not be re-used for food or feed. (5) Treated seed must not be applied from the air.	(1) Returnable containers must not be re-used for any other purpose. (2) Returnable containers must be returned to the supplier. (3) Treated seed must not be used for food or feed. (4) Sacks containing treated seed must not be re-used for food or feed. (5) Treated seed must not be applied from the air.

Notes	
1	For ornamental plant production give details of whether all ornamentals or specific types e.g. pot grown, soil grown, cut flowers, shrubs etc List individual crops. Do not list crop groups. Use the basic crop terms as set out in the current crop definitions list. Do not use the parent or primary group terms 'crop definitions list'. Where is it situation of use be specific about exactly where the product will be used e.g. upland moorland
2	For protected crops describe whether permanent protection, if temporary protection detail when the in the growing cycle the protection is present, grown in soil or substrate, pots on hard surfaces, bench systems etc. Further information on crop situations can be found on the crop definitions list.
3	This may be a specific number e.g. 1 or a range such as 1-3 per year but be as specific as possible, include explanations where necessary
4	Individual crops and pests are given an EPPO code for harmonised identification. Please use the following link to obtain the required EPPO code https://gd.eppo.int/
5	The growth stages of crops are categorised using a scale. The following link provides a PDF document containing the growth stages for multiple crops BBCH scale.
6	Novel methods of application must be described in full and include pictures of how they are equipment is filled and operated (this can be provided in a separate document).

Part D – Repeat applications

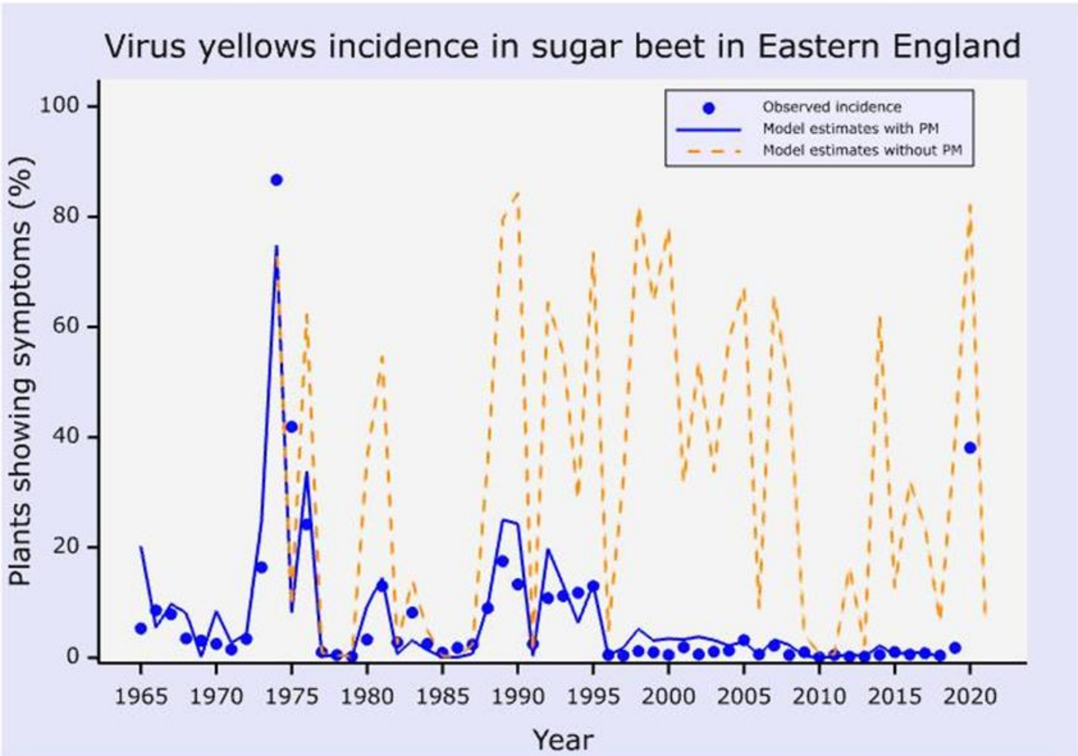
16	**Has HSE authorised a previous emergency use for the proposed crop/situation and pest?*.**	
	Yes (This is a repeat please complete Part D section 17 to 21 and Parts E to H) ☒	**No (Please go to Part E) ☐**
17	**COP number(s) and Notice of Authorisation number(s)(NANUMS) of previous authorisation(s)**	COP2020/01677
18	**If this application request is not identical to the use given above outline any differences**	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. 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. 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. A similar situation was experienced across Europe, especially France. The UK sugar beet industry, in light of this ongoing pressure, was granted a short term, limited and controlled emergency authorisation for the use of Cruiser SB on seed. Unlike anywhere else in Europe, our application included the long-standing virus yellows forecast (issued by Rothamsted Research) to determine if conditions triggered the application of Cruiser SB to sugar beet seed. **The 1st of March forecast predicted that 8.37% of the national sugar beet area will be affected by virus yellows by the end of August 2021. Under the terms of the emergency authorisation from HSE and DEFRA this meant that the use of Cruiser SB was not triggered and was not applied to seed in 2021.**

* A pest is defined as 'Any organism harmful to plants or to wood or other plant products, any undesired plant and any harmful creature.'

19	Justification for repeat authorisation

You must provide justification why a repeat authorisation is required.

Following the very cold January and early February, the well-established Rothamsted model predicted low levels of Virus Yellows in the crop for 2021. The model outcomes predicted around 1/10th of the virus levels of last year and below economic trigger level of 9%; first aphid flights were predicted to be 6 weeks later. With a predication of 8.3% (without any controls), the trigger was not met and therefore the seed was not treated with Cruiser SB in 2021.



It is to be welcomed that the emergency situation our industry faced in 2020 is not likely to be repeated in 2021. The application for emergency use of the seed treatment was just that – we committed to only treating the seed if the risk to the crop was significant. We have followed the science, using a proven model that has been in place for over 55 years, and minimised impact where possible. We will also continue to work to progress our plans to tackle Virus Yellows with an integrated crop management approach without the need for neonicotinoid seed treatments in future years, but for now the need for Cruiser SB remains.

20	Use and effectiveness of previous emergency authorisation		
Geographical location	East of England	**Amount of product applied per hectare**	**N/A**
Total hectare of crop	Approx 105,000ha	**% of crop treated**	N/A as virus yellows forecast not triggered
Estimated % of crop retained/saved due to emergency use	N/A as virus yellows forecast not triggered	**Estimated value of retained/saved crop (£)**	N/A as virus yellows forecast not triggered
Estimated % of pest(s) controlled	N/A as virus yellows forecast not triggered	**Estimated % yield quality due to emergency use**	N/A as virus yellows forecast not triggered
Please provide an assessment on how effective and beneficial the authorisation has been in controlling the pest and any other appropriate information.			
N/A as virus yellows forecast not triggered			
Please provide details of the monitoring information, how stewardship and data requirements have been met.			
N/A as virus yellows forecast not triggered			

21	Previous correspondence for repeat applications
Any relevant information previously discussed with HSE for the repeat authorisation (same crop and pest, (Please include references)).	
4 March 2021 Defra plant health call 19 April 2021 Defra plant health call 25 May 2021 Defra plant health/HSE call 18th June 2021 Defra plant health/HSE call 23rd June 2021 Defra plant health/HSE call Telephone conversations between BBRO and HSE	

Part E – Supporting information

22 Tick the boxes to confirm the items being submitted Click for further online guidance

Requirements	Completed	Not required
Application overview^	☒	
Cover letter^	☒	
Part C completed^	☒	
Part D completed^	☒	
Part E completed^	☒	
Part F completed^	☒	
Part G completed^	☒	
Supporting data submitted	☒	☐
Supporting data being sent to HSE separately	☒Once available	☐
Supporting information	☒	☐
Supporting information being sent to HSE separately	☒Once available	☐
Letter of access with declaration that authorisation holder will take back unused stocks at the end of the 120 day use period^	☒To be provided by Syngenta	☐

^ required for all applications

23	Previous correspondence for this application
Any relevant information discussed with HSE for this specific application (Please include references)	
4 March 2021 Defra plant health call 19 April 2021 Defra plant health call 25 May 2021 Defra plant health and HSE combined call 18th June 2021 Defra plant health/HSE call 23rd June 2021 Defra plant health/HSE call Telephone conversations between BBRO and HSE	

Part F - Emergency Situation	
24	Summary of available pest control options and nature of Emergency

A typical realistic spray programme showing any current available products, and timings and targets (which includes the requested emergency use) is attached in a separate document.	☒
Please summarise the nature of the emergency situation and why an emergency authorisation is required. As part of this you must explain why the pest cannot be treated by any other means, explaining, where possible, whether previously authorised products were used.	

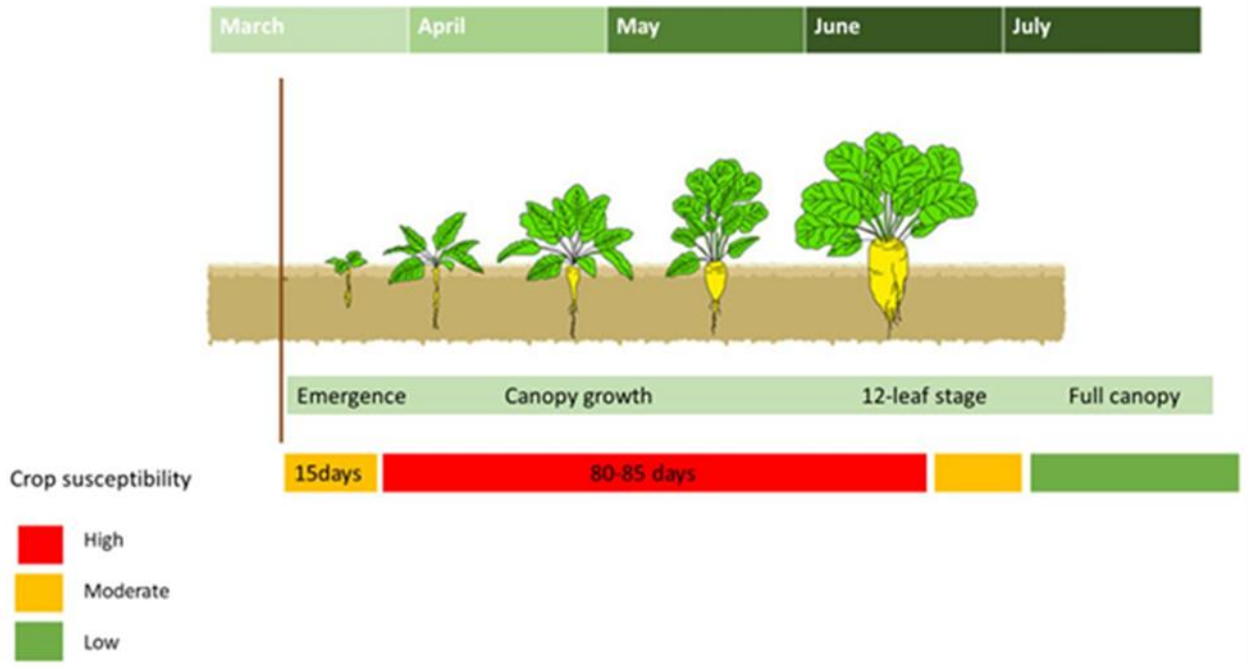
Last year, the UK sugar beet sector experienced its worst virus yellows epidemic since the mid-1970s. In 2020, two years since the EU withdrawal of the neonicotinoid seed treatments on sugar beet, 38.1% of the national crop was infected with virus yellows. Many growers in Cambridgeshire, Norfolk, Suffolk and South Lincolnshire experienced up to 100% infection despite the use of up to 4 aphicide sprays applied at the BBRO recommended aphid spray threshold. Virus yellows also compromised the BBRO R&D trials programme and eight of the 13 Recommended List trials, used to assess up to 120 entries each year to select future elite varieties for UK growers, failed independent inspections primarily due to virus infection with the loss of critical performance data.

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. Affected growers saw significant yield losses of up to 50% from decreased root weights and sugar content (and in some cases as much as 80%); sugar extraction was also impacted by increased impurities caused by the virus infection. A similar situation was experienced across Europe, especially France.

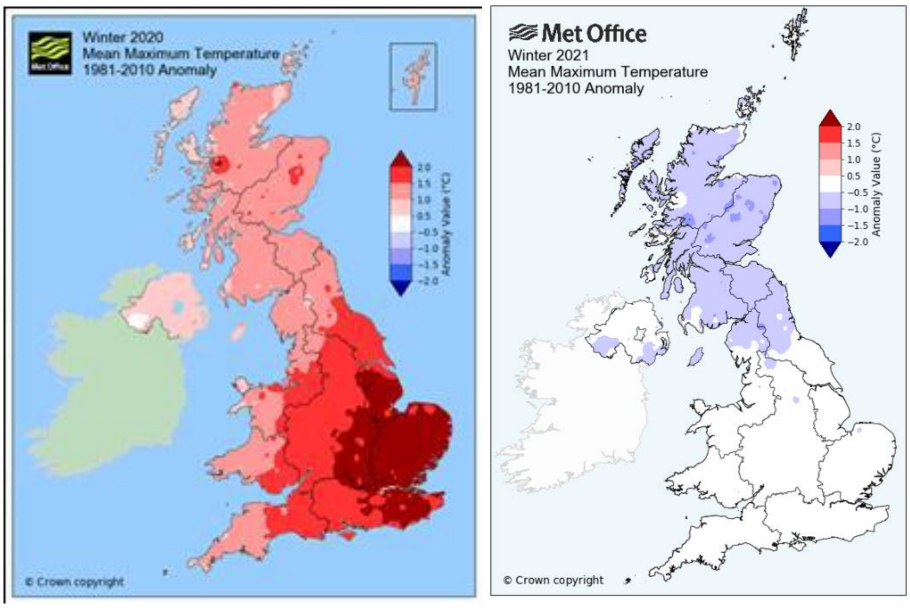
In September 2020, a new Virus Yellows Taskforce was established between British Sugar, NFU Sugar and the BBRO to accelerate and develop ongoing and novel pathways of research to limit the future impact of this disease across the UK industry. British Sugar and NFU Sugar have also introduced a new virus yellows assurance scheme, funded by British Sugar, for the next three years to mitigate a proportion of future losses incurred by growers from virus yellows. However, in 2021 the contracted areas reduced by around 12% due to the impact of virus yellows. We anticipate further consolidation if growers believe that yields are likely to be further decimated by virus yellows disease.

Why a seed treatment emergency authorisation is requested for 2022 to avert another virus yellows epidemic.

Without additional protection from sowing until the 12-leaf stage (the period when beet are most susceptible to colonisation by aphids and virus infection) there currently remain limited alternative control options for 2022 to prevent an increased threat from virus-carrying aphids in sugar beet.



Recent mild winters, with few significant frost events, are leading to the development of continuing high pest pressure situations for spring-sown crops such as sugar beet.



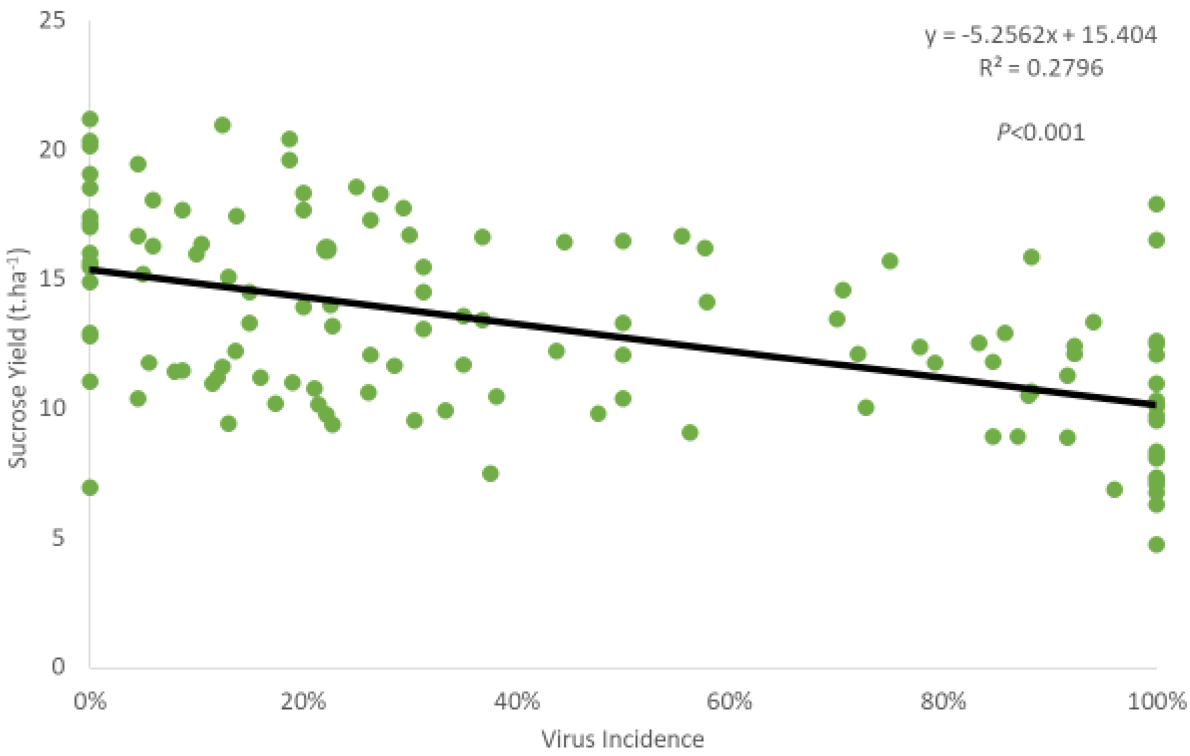
Without a cold winter and additional insecticidal seed treatment protection for 2022 the UK sugar beet sector will again be at high risk of widespread virus yellows infection. Previously, seed treatments provided effective and targeted aphid control, for up to 12 weeks from sowing, until the onset of mature plant resistance.

In 2020 and 2021, growers and agronomists have had valuable, but not always complete success (especially in 2020), in controlling aphids when using aphicide sprays. BBRO 2020 aphicide trials in Suffolk and Lincolnshire showed that aphicide sprays provided control, but treatments lacked persistence commercially, particularly at early growth stages when large numbers of aphids were invading crops, leading to high levels of virus infection and significant yield loss. It is difficult to know how treated seed would have fared in 2020 given the unprecedented aphid levels experienced.

However, we do know that seed treatments will protect this critical early period of growth and will decrease the overall need for foliar sprays (which clearly had to be applied frequently under the sustained immense aphid pressure of 2020 and to a more limited extent in 2021).

Following the 2019 season (first season without neonicotinoid seed treatments), virus yellows was observed in 55% of crops inspected and the national incidence was 1.8%. In 2020, virus yellows was observed in 99% of crops surveyed and the national incidence was 38.1%. In 2021, virus yellows is expected to be observed in 8.3% of the crop (without any pest management). However, following the last two years, there are now numerous sources of infection available from which aphids could acquire virus and infect the 2022 crop.

Detailed analysis by the BBRO of the impact of virus infection at 16 commercial aphid and virus monitoring sites in September 2020 has shown highly significant yield losses from virus yellows infection (data below).



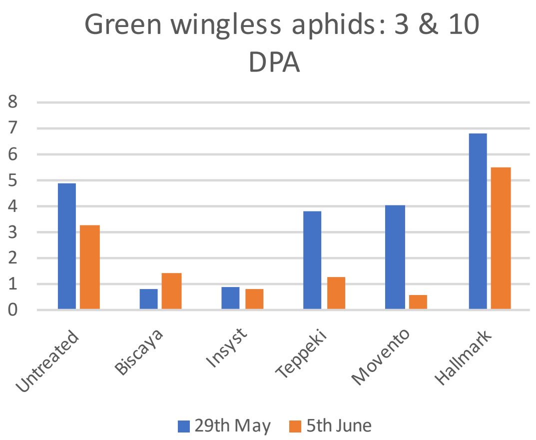
As highlighted, in 2021 the trigger for the use of thiamethoxam was not reached due to the impact of the previous cold winter.

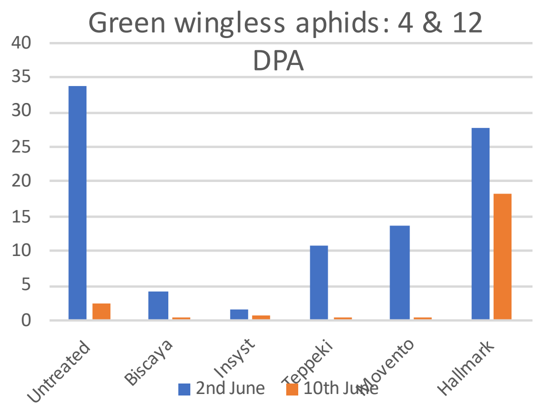
Regardless of the availability of seed treatments (if approved), aphicide sprays are required and justified if conditions result in aphid numbers exceeding recognised treatment thresholds. In 2007 for example, drought conditions affected the efficacy of seed treatments and necessitated the later use of sprays.

Currently for 2021, one spray of Teppeki, followed by one spray of InSyst is permitted for growers to control virus-carrying aphids (at the time of submitting this application we are awaiting the formal approval for our Emergency Authorisation application for use of 'Movento' in 2021).

Pyrethroid treatments (e.g. Hallmark) are available for pest control in sugar beet but these sprays are known to have a negative impact on beneficial insects that will naturally limit aphid build up as seen in BBRO trials in 2020 (see below). As a result, the BBRO does not recommend the use of these treatments for sugar beet.

BBRO Aphicide trials:Rougham & Bracebridge





DPA = days post applicatio

Over 80% of peach-potato aphids are also resistant to these pyrethroid treatments which would antagonise aphid control if used for this purpose, as seen in BBRO trials and commercial crops in 2020.

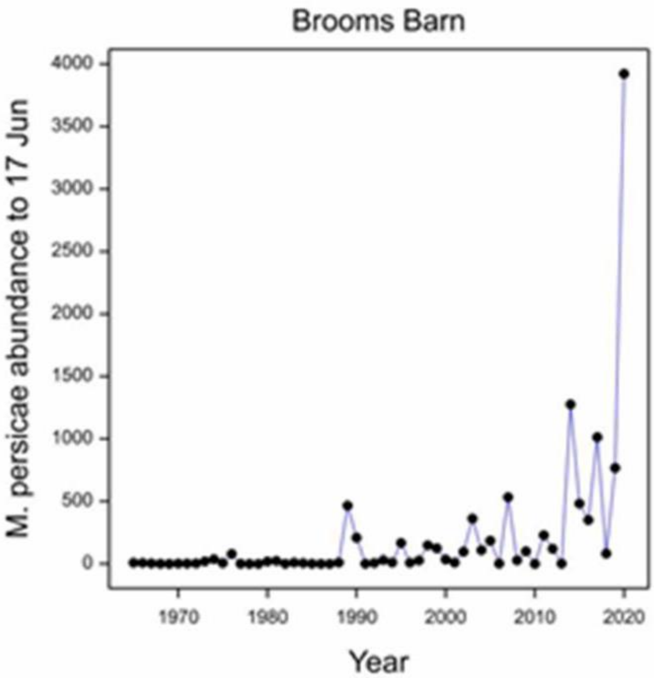
Some progress is being made with the development of virus tolerant sugar beet varieties and there will be one partially tolerant BMYV sugar beet variety (Maruscha KWS) commercially available for 2022. BMYV is one of the three yellowing viruses that form the virus yellows complex (BMYV, BChV and BYV). However, the yield potential of Maruscha KWS (in the absence of BMYV) is relatively low compared to existing, elite (susceptible) varieties. BBRO has calculated (from inoculated trials in 2019 and 2020) that growers would have to sustain 62% infection within fields before Maruscha KWS is economically viable.

Sources of infection and the number of virus yellows carrying aphids will continue to increase each year and is expected to do so unless there is significant cold weather (as seen in 2021) and the adoption of wider integrated pest management strategies to limit their build-up. Growers strive to follow BBRO best practice to ensure sources of infection are kept to a minimum.

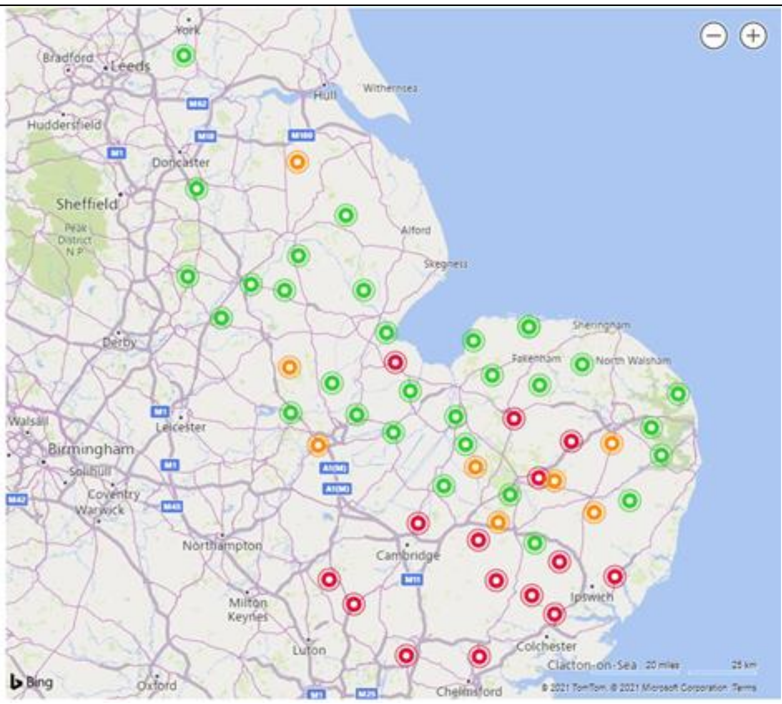
The 2020 season clearly highlighted the limitations of current control strategies without an effective replacement for the neonicotinoid seed treatments. The 2020 virus situation was unprecedented, following the exceptionally mild January and February. Initially, this was reflected in the virus yellows forecast issued by BBRO showing that 72-95% of the crop could become infected with virus without any control strategies applied. The warm, dry spring further compounded the situation and encouraged an early and sustained migration of large numbers of aphids, particularly *Myzus persicae*, to build up in spring crops such as sugar beet.

Agronomists and growers were finding the first crops above aphid threshold (one green wingless aphid per four plants up until 12 leaves) from early April and in many cases when plants were only at the cotyledon growth stage or the first pair of true leaves. In BBRO aphicide trials green wingless aphid numbers reached up to 40 per plant, and, in May, reports of over 100 per plant were received from agronomists in commercial crops. Consequently, growers were forced to use a range of sprays (including those products gained through emergency approval), and depending on if and when thresholds were reached, have used between 0 and 4 sprays. The mean number of sprays applied, as determined from the British Sugar specific field survey, was 2.5. The wide variation in the number of sprays applied reflects the fact that growers were highly active in monitoring aphid numbers field by field and only applying foliar insecticides where appropriate, in line with thresholds. Aphid populations are typically heterogenous in their distribution and strongly influenced by many factors such as wind strength and direction, topography, surrounding crops and field boundaries.

The 2020 Rothamsted Insect survey data from the suction trap at Broom's Barn, Suffolk also highlighted the unprecedented numbers of winged aphids compared to the previous 55 years. Almost 4,000 *M. persicae* were trapped by the reference date of 17 June 2020.

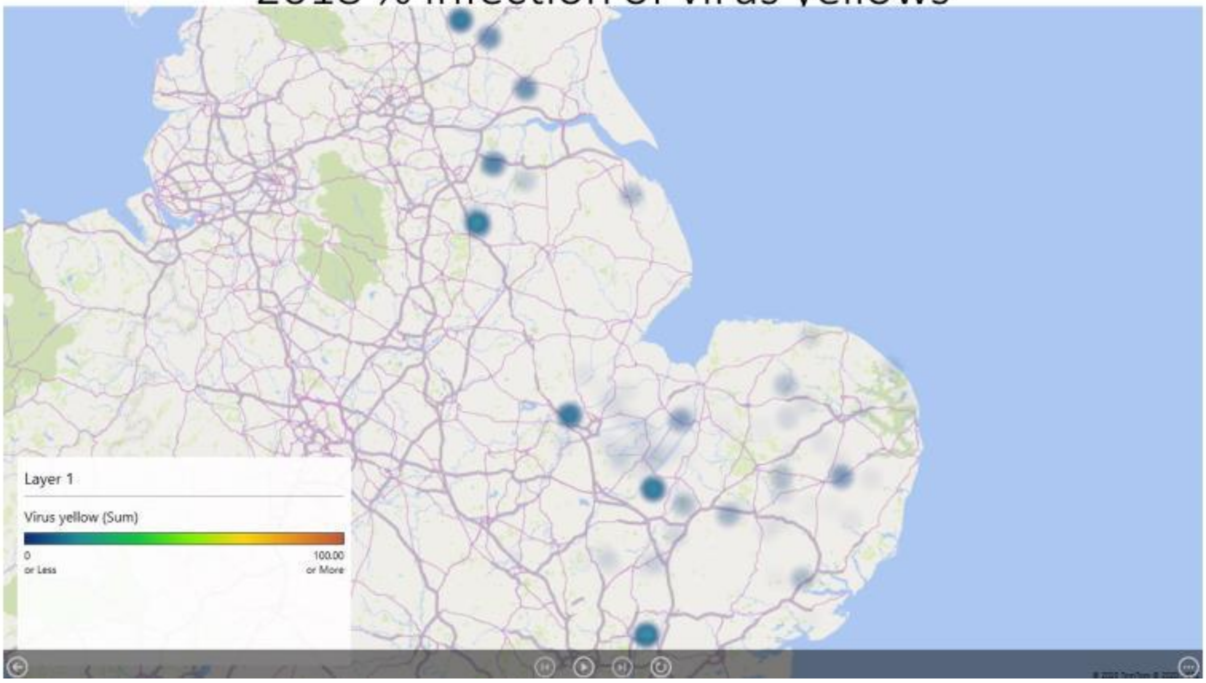


BBRO selected 51 sites across the sugar beet growing region for the 2020 yellow water pan and aphid monitoring survey. Although COVID-19 affected the ability to collect some of these data, sites were visited by British Sugar Contract Managers or agronomists twice a week (April to July), to photograph and empty the yellow water pans. Selected samples were then sent to the BBRO laboratories to confirm aphid species and to determine the infectivity of any *M. persicae* caught. Additional aphid counts were also made of the number of winged and wingless aphids on 2 sets of 10 plants within each field and this information was used to trigger spray programmes at these sites (e.g. Lawshall, Suffolk example below). This information was uploaded onto the daily aphid risk maps published on the BBROplus website (see example below) and included in the regular BBRO information bulletins that were sent to all growers and agronomists.

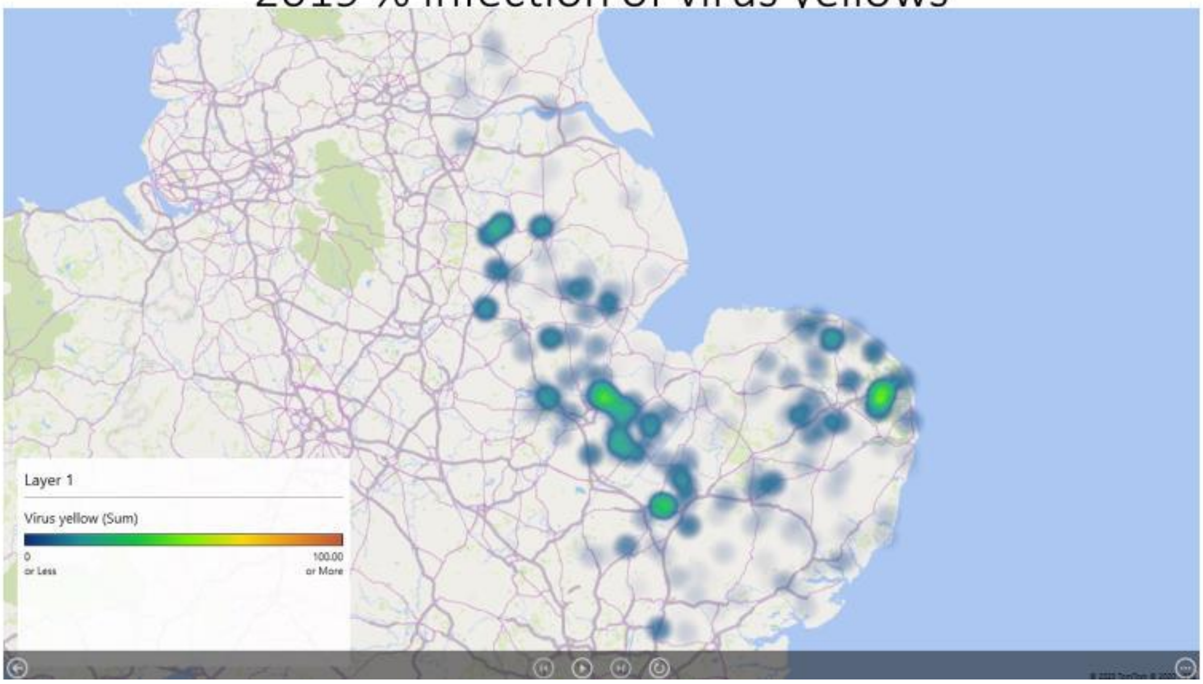


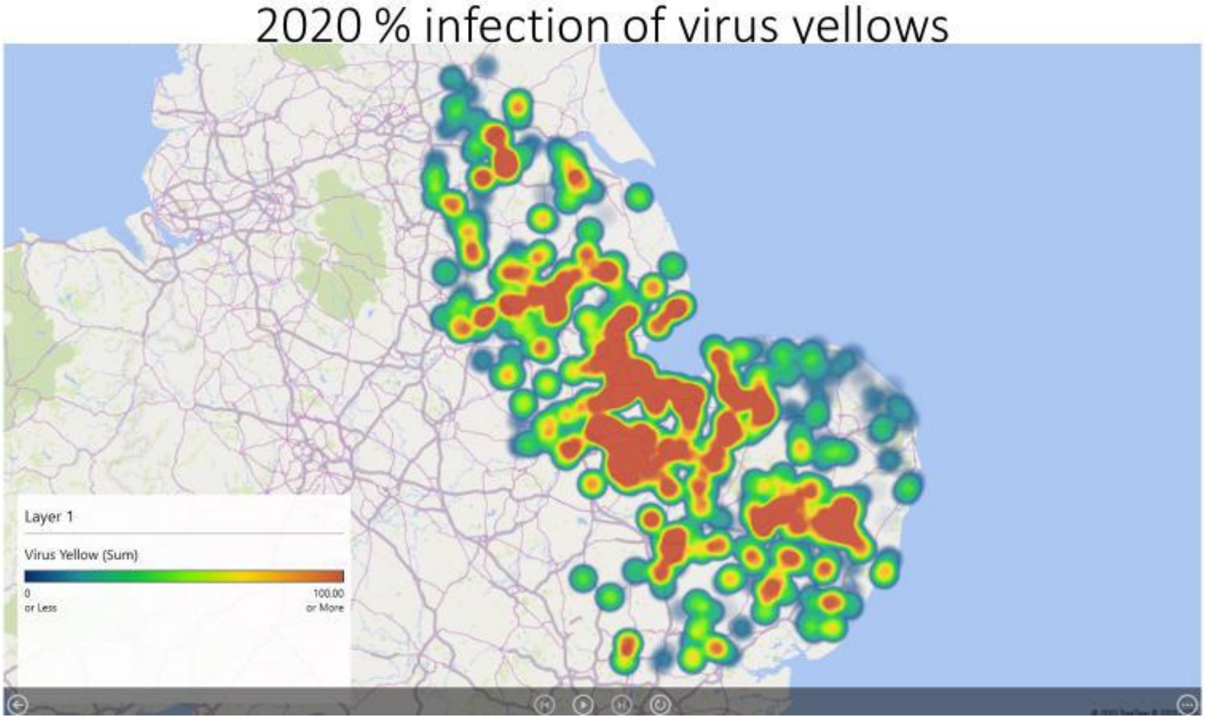
Due to the early and sustained aphid pressure in 2020, the first virus symptoms were observed by mid-June 2020. Widespread symptom development continued throughout the summer. British Sugar undertook the annual virus yellows survey at the end of August/early September 2020 across 484 sites (the annual Specific Field Survey). Nationally 38.1% of the crop was infected with virus although infection levels ranged from 7% (Cantley) to 61% (Wissington) between the four factory areas. A comparison of the incidence and distribution of virus yellows in the UK from 2018 to 2020 is highlighted below. Beet yellows virus (BYV), the most damaging of the yellowing viruses capable of decreasing yields by up to 50%, also appears to be the most prevalent of the three yellowing viruses.

2018 % infection of virus yellows



2019 % infection of virus yellows





Currently, for 2022, the UK industry only has one foliar spray of Teppeki available for aphid control, without the approval of further emergency authorisations for insecticides. Sprays are valuable, but not completely successful, in controlling unprecedented numbers of aphids as seen in 2020. Grower vigilance, good on-farm hygiene, monitoring and targeted treatments will all be key to protecting the 2022 crop from virus infection and yield loss. The industry is committed to disseminating these messages to growers to minimise infection spread.

The UK industry submits this emergency authorisation application as a limited, short-term solution, to ensure the sector can develop the appropriate longer-term pathways of aphid and virus yellows control to protect the future of the UK sugar sector.

This application is made to protect the English sugar beet crop from virus yellows in 2022, as well as the need to protect the BBRO R&D and Recommended List trials programme (approximately 20 hectares) that was heavily affected by virus yellows in 2020.

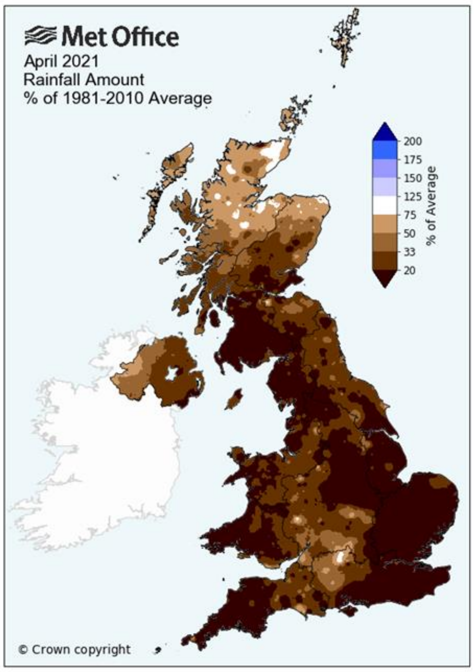
2021 sugar beet crop and aphid update (end June 2021)

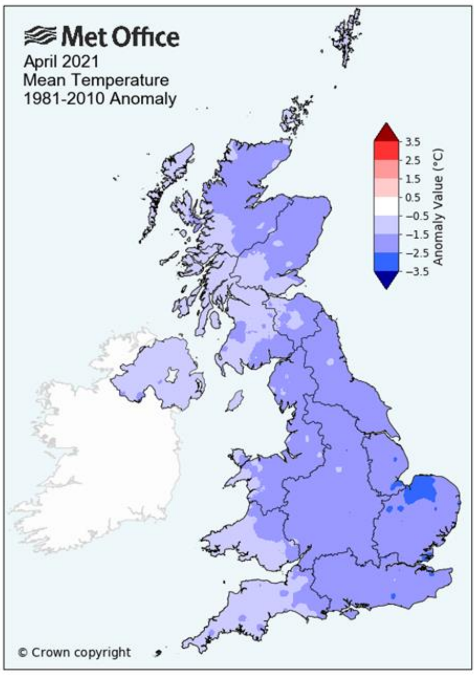
The Crop

In spring 2021, around 92,000 hectares of sugar beet were sown in the UK. Seed was delivered later onto farm for those growers who had requested the use of Cruiser SB (compared to previous years) as the Industry anticipated the outcome of the Rothamsted virus yellows forecast (1st March). The use of Cruiser SB treated seed was conditional on the 9% economical threshold for its emergency authorisation. Due to the previous cold winter this trigger point was not reached and hence none of the UK seed was treated with thiamethoxam. However, the impact of this decision meant that seed processing could not be completed until after 1st March.

Following the dry conditions experienced at the end of March, good drilling progress was made and 75% of the UK crop was sown by the week beginning 5th April and 99% by week beginning 26th April.

However, the crop has experienced one of the coldest and driest Aprils on record (see Met Office April charts below) which has been followed by a cool, but wetter, May. As a consequence, sugar beet germination and growth has been slow and protracted, and some of the crop area has been affected by frost and seedling pests; approximately 400ha has had to be resown.



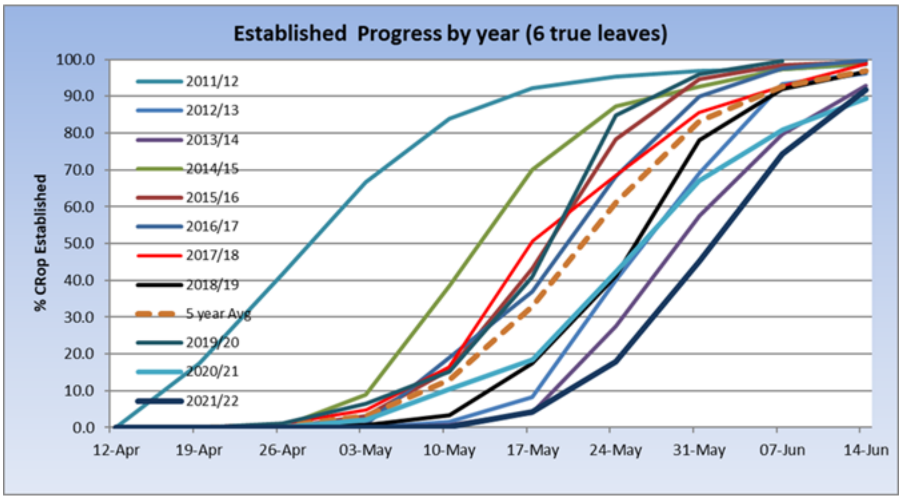


At the end of May the crop was at a wide range of growth stages from cotyledon to 8 true leaves across the four factory areas, with British Sugar estimating that only 18% of the crop had reached establishment (6 true leaves) by 24th May (see chart below); this was the slowest development of the crop for the last 10 years.

However, as the chart below shows, throughout June crops have improved due to the warmer weather following the May rainfall, with many plants now at or beyond the 10-12 leaf stage. However, growers remain vigilant in checking slower developing and gappy areas of the crop for aphids as these remain attractive to aphids.

From the 12th-leaf stage, sugar beet becomes an increasingly poor host for aphids and the number of progeny/young produced by winged adults declines. This reduces secondary spread and infection with virus within the field.

Aphid numbers have continued to increase through June, and growers are able to track this on the BBRO yellow water pan network which shows the migration moving northwards across the beet area. Many crops in Suffolk, Cambridgeshire and Norfolk have now exceeded the threshold and been sprayed with Teppeki, with some receiving a second spray of InSyst.



The Aphids

Rothamsted Research originally predicted *M. persicae* flight in eastern England from the third week of May 2021 (six weeks later than 2020). In reality, the first *M. persicae* was caught in the Broom's Barn suction trap (near Bury St Edmunds) on the 27 April, followed by a second on 11th May. Up until the 20th June (latest available data at time of submission) the Rothamsted suction trap data showed that 190 *M. persicae* had been recorded at the Broom's Barn suction trap (compared to almost 4,000 in 2020).

The BBRO yellow water pan and aphid monitoring sites were established on the 30th April. Aphid numbers recorded at sites have been much lower than last year, although a north-south split has been observed with higher numbers of aphids being recorded in Essex, Hertfordshire, south Suffolk and Cambridgeshire. Up until 20th June only 50% of sites had received an aphicide spray and none of the 51 sites had received two sprays. The first symptoms of virus yellows were recorded in the 3rd week of June in Cambridgeshire and Suffolk.

Please provide details of any current authorised products with relevant claims explaining why these products are not providing sufficient control options for this season. You must provide details on why these products are not sufficient to control the pest (e.g. any practical limitations on use; resistance; sustained pest pressure; maximum number of applications already applied)

In 2020 growers and agronomists had access to Teppeki, and after the approval of emergency authorisations in April and May, Biscaya (now withdrawn), Insyst and/or Gazelle. However, many growers had limited success in controlling the unprecedented numbers of aphids when these products were applied, especially at early growth stages. BBRO trials showed that these products provided control but lacked persistence commercially when under sustained and prolonged aphid migration as experienced in 2020. Biscaya has now been withdrawn and the only foliar spray currently available to growers in 2022 is Teppeki, subject to further emergency authorisation applications.

BBRO received many questions from growers and agronomists regarding this difficult situation and a number of these are highlighted below to reflect the challenges experienced and to show why additional protection has been required in 2021 (with in season BBRO responses included), especially as the only product currently approved without emergency authorisation is Teppeki.

For the 2021 crop it was encouraging for growers to have the emergency authorisation approved for the Cruiser SB seed treatment. However, we were also pleased that, following a very cold January and February, the well-established Rothamsted model predicted low levels of Virus Yellows in the crop for 2021. With a prediction of 8.3% virus yellows infection (without any controls), the trigger was not met and as a result we did not treat any sugar beet seed with Cruiser SB this year.

Q: Why did the foliar insecticides appear not to be controlling aphids effectively in 2020?

A: Part of the problem in 2020 was the sheer number of aphids. The ongoing warm conditions resulted in a continual movement of large numbers of winged aphids and their subsequent progeny moving into and through crops which insecticides struggled to control, particularly when plants were small. Additionally, dry conditions may have reduced the systemic action of insecticides. However, in most situations insecticides were giving some level of control. Foliar sprays remain a vital part of a holistic approach to infection control.

Q: Are all the aphids being recorded *Myzus persicae*, or are there other non-virus aphid vectors being found?

A: The vast majority of aphids being found on sugar beet in both 2020 and 2021 were peach-potato aphids (*Myzus persicae*) with some potato aphids (*Macrosiphum euphorbiae*). Several other species were identified such as the sycamore aphid and the willow carrot aphid and the black bean aphid (especially in 2021), but we believe that at least 95% of aphids counted in fields were peach-potato aphids, the main virus yellows vectors, and therefore this warrants control when above threshold. Aphid numbers, so far, are much lower in 2021 compared to 2020.

Q: Why can I find live aphids on leaves shortly after spraying?

A: Teppeki works by affecting the mouthparts of the aphids ultimately preventing them from feeding. Aphids may still be present for up to 72 hours post application although they should not be spreading the virus further. Insyst should have a more direct and faster effect on aphid mortality.

Q: Can I stop applying insecticides at the 12-leaf stage and what if I have part of a field at the 6-leaf stage and the rest at the 12-leaf stage?

A: Sprays should be applied up until the 16-leaf stage when aphids are found at threshold, although the threshold changes to one green wingless per plant above the 12-leaf stage. However, with variable plant sizes being reported in some fields, keep monitoring, and in such fields treat at the lower threshold value until all plants are 12 leaves and above, i.e. one green wingless per four plants.

Q: Why were the numbers of ladybirds and other beneficial insects so low in the 2020 season?

A: 2020 saw far fewer early ladybirds present in crops compared to 2019, although numbers did build from June onwards, although this was after the main peak of aphid activity. It is not clear why this was the case, but the wet winter may have had an impact and/or their lifecycle was out of synchronisation with the rapid build-up of aphids this year. The 2021 aphid flight is both lower in number and delayed and as a result there have been significantly more beneficial insects present on crop when the aphids arrived.

Q: Does Tefluthrin (Force) provide aphid control? **A:** Use of the seed applied pyrethroid tefluthrin (Force), to limit the impact of the sugar beet soil pest complex will remain available in 2022 and provides an ongoing option for control of these pests, but when used as a standalone treatment it is not as effective as when it is used in combination with the neonicotinoid. Tefluthrin is not systemic and relies on vapour phase activity. Also, the combined use of the neonicotinoid and pyrethroid on the seed is more effective in controlling the soil pest complex on those soils with a high pest pressure (**Hauer et al., 2016; Dewar et al., 2000**). Tefluthrin has no efficacy against foliar pests in sugar beet such as aphids or leaf miner, so will not provide any protection against these pests.
Please provide details of any available non-chemical alternative control options.
There are currently no effective alternative non-chemical control options for virus-carrying aphids in sugar beet. However, growers are increasingly interested in trying additional novel solutions to limit virus spread such as the use of weed buffer strips within or around crops to encourage beneficial insects or to 'push' aphids away from beet plants or by introducing beneficial insects directly (such as lacewings) into fields. In 2020, the use of under sown barley in beet to prevent wind-blow damage appeared to have decreased virus infection in some fields too by affecting the attractiveness of beet as a host for aphids at an early growth stage. See: undersown-opinions.pdf (bbro.co.uk). BBRO is investigating this concept further in 2021 but crop growth stage is critical for success. Winged *M. persicae* cannot be prevented from entering sugar beet crops and feeding on individual plants and covering plants with plastic as a barrier is uneconomic. Therefore, crops are potentially at risk from virus infection every year until a long-term solution is found through the sustainable pathway being delivered by the 'VY Taskforce' referred to earlier. The BBRO provides advice to the industry on minimising the development of initial foci of infection and subsequent secondary virus spread. The BBRO provides such advice to the industry via bulletins, real-time information from the plant clinic and current trials, conferences, workshops and open days to adopt relevant, commercially available and appropriate integrated control options. These options include removing sources of infection and the use of cultural practices to help reduce, but not eliminate, the risk of infection. Growers are advised to sow early, where possible after the 1st March and when soil/weather conditions allow while balancing the risk of plants bolting and then flowering and not developing a storage root if they experience too many cold days during the spring), to achieve maximum yields. Older plants are known to be less physiologically attractive to aphids (Williams, 1995). Therefore, by sowing early there is a greater chance that plants will have gained increasing mature plant resistance before peak aphid migrations. Later sown crops are more susceptible to infection as winged *M. persicae* are attracted to the yellowish-green leaves of younger sugar beet plants and these will not have reached the appropriate growth stage for inherent mature plant resistance. The reason for the resistance of mature plants is still unclear but is the subject of ongoing investigation and PhD research.

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Hauer, M., Hansen, A.L., Manderyck, B., Olsson, A., Raaijmakers, E., Hanse, B., Stockfish, N. Marlander, B. (2016). Neonicotinoids in sugar beet cultivation in Central and Northern Europe: Efficacy and environmental impact of neonicotinoid seed treatments and alternative measures. Crop Protection 93, 132-142.

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Williams, C. T. (1995). Effects of plant age, leaf age and virus yellows infection on the population dynamics of *Myzus persicae* (Homoptera: Aphididae) on sugar beet in field plots. Bulletin of Entomological Research 85, 557-567.

25 Details of pest problem

Please provide details of the pest (specific danger to be controlled) including life cycle, mode of action and severity of the threat posed to the crop/situation. Include details of relevant pest threshold levels, where known, and the results of any recent or ongoing relevant monitoring or surveys of pest numbers. Please indicate whether this is a new problem.

Overview

In the UK, neonicotinoid seed treatments have been used to control up to 15 different pests (and associated virus diseases) that can be found across all the sugar beet growing area in Eastern England (**Foster and Dewar, 2013**). These treatments control similar or additional pests across north-west Europe too (**Hauer et al., 2016**). The pests can be divided into three key sub-groups:

1. the critical **virus yellows-carrying aphids**, principally the peach-potato aphid (*Myzus persicae*);

2. the **leaf miner fly complex** (e.g. *Pegomya hyoscyami* and related sub-species);

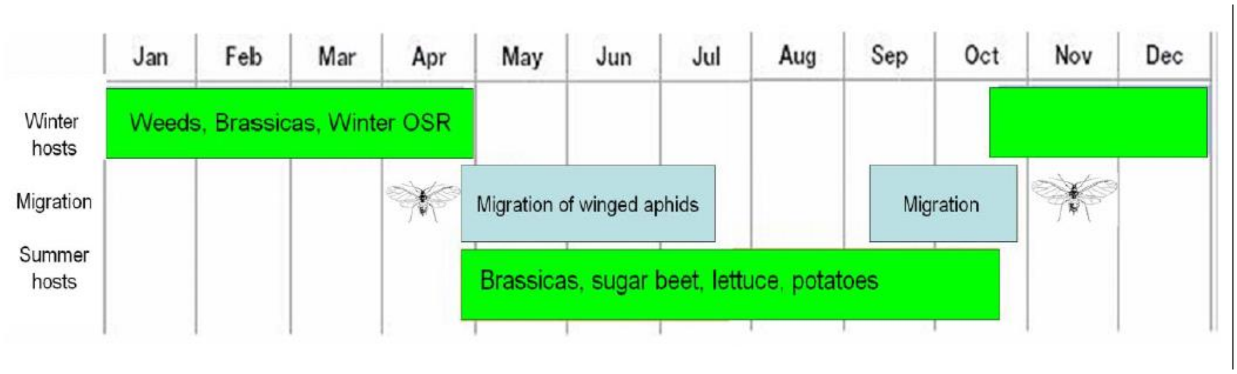
3. the **soil pest complex** (e.g. springtails, symphylids and millipedes) that cause generalist root grazing, damage and/or plant loss (reviewed by **Dewar, 2000**) but can be reasonably controlled in low/medium pest pressure situations by ongoing use of tefluthrin (Force) as previously used in the late 1980s/early 1990s prior to the first registration of the neonicotinoids in the UK in 1994.

We set out details of pest thresholds and ongoing monitoring results for aphids and virus yellows.

Virus yellows transmitted by aphids

The peach-potato aphid (*M. persicae*) is regarded as a major pest on a range of crop species including potatoes, brassicas, legumes and sugar beet. It is the most important pest and virus vector aphid in the UK due to its wide host range and proficiency in transmitting more than 120 plant viruses. Most peach-potato aphids overwinter as winged and wingless forms on weeds and brassicas. Winged individuals then migrate from winter hosts to summer hosts from late April and numbers usually peak in July. This aphid species does not form dense colonies and rarely reaches levels that cause direct feeding damage. However, its tendency to move short distances when crowded enhances its importance as an aphid vector.

Virus yellows is an aphid-transmitted virus 'complex' of three different viruses that includes the poleroviruses *Beet mild yellowing virus* (BMYV) and *Beet chlorosis virus* (BChV), and the closterovirus *Beet yellows virus* (BYV). *M. persicae* is regarded as the principle aphid vector, although the potato aphid (*Macrosiphum euphorbiae*) can transmit all three viruses to sugar beet too; the viruses are transmitted via persistent (BMYV and BChV) or semi-persistent (BYV) transmission mechanisms by both aphid species. Therefore, once an aphid has acquired BMYV and BChV it remains infective for the rest of its life, although the adult cannot pass this virus directly onto its progeny. Aphids carrying BYV remain infective for up to three days.



The two aphid species can overwinter on weeds (e.g. *Capsella bursa-pastoris* and *Senecio vulgaris*), oilseed rape, brassica cover crops or on beet 'volunteers' or spoilage heaps of root remnants following harvest (see timeline above). Although brassica species are not hosts for the sugar beet yellowing viruses, many common arable weed species associated with these crops and surrounding margins are hosts for these viruses. If aphids infect and/or acquire the viruses from these and migrate into spring crops such as sugar beet, then primary virus infection and secondary spread can occur.

Infection of sugar beet plants with the yellowing viruses causes chlorosis of leaves which in turn disrupts photosynthetic, respiratory and other metabolic processes. These changes increase the levels of amino nitrogen, sodium and potassium in roots which adversely affects extractability of sugar during factory processing. Also, yellow leaves are susceptible to attack by secondary fungi such as *Alternaria alternata*, which may destroy the leaf, further exacerbating yield loss.

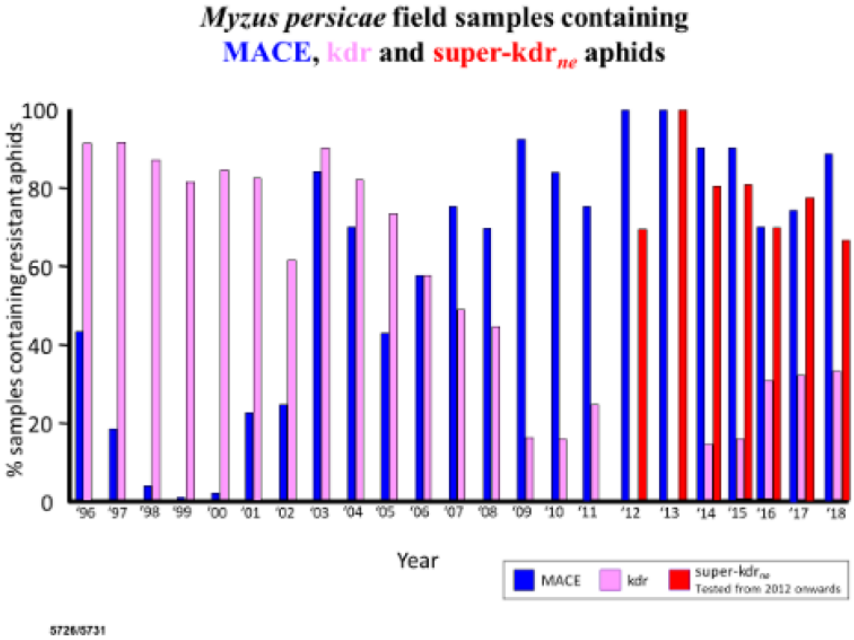
As the UK sugar beet crop is grown under contract by growers for British Sugar plc, each grower has access to a Contract Manager (22 in total across the four factory areas) who provide support and advise on agronomic factors such as aphid control. Each year the industry is provided by the BBRO with pre-season forecasts, produced by Rothamsted Research, of the incidence and abundance of aphids and Virus Yellows. These forecasts are issued at the beginning March and are based on the relationship between virus incidence and winter temperature (January and February mean temperatures being critical to the analysis), the timing and size of the spring aphid migration (as recorded by the suction traps managed by the Insect Survey group at Rothamsted Research), crop emergence date, and the use of insecticides, including neonicotinoid seed treatments since their first introduction (**Qi et al., 2004).** These annual forecasts are then supplemented by season-long real-time information on the incidence of the virus vectors, their resistance status and infectivity from both the Rothamsted suction trap and BBRO-managed yellow water pan networks run in association with British Sugar staff, growers and agronomists at approximately 30 sites from the end April/early May until the end of July each year. Both networks have been working in tandem since 1990 and currently this information assists growers who have not used seed treatments or treatments have been compromised by specific weather conditions (e.g. too dry or too wet as occurred in 2007 and 2012 respectively) allowing the aphids to build up above threshold levels for the need for subsequent foliar aphicide application (if available).

From historical aphid monitoring and infectivity testing by the BBRO (between 1994-2004), when the neonicotinoid seed treatments were first introduced into UK sugar beet production, a total of 20,255 *M. persicae* were caught in the yellow water pan network across the UK sugar beet growing area; 222 BMYV-infective aphids were identified using diagnostic tests. Therefore, the proportion of viruliferous aphids was approximately 1% of the population of winged aphids. Although the total number of aphids can differ significantly from one factory region to another, and between years depending on winter weather, the proportion of viruliferous aphids has remained constant and has not significantly differed from one percent, although at several sites in certain weeks and years up to 5% of aphids have been found to carry BMYV.

The industry has continued to support the BBRO aphid monitoring programme and 8109, 5029 and 4970 *M. persicae* were caught in yellow water traps at the 30 locations in 2015, 2016 and 2017, respectively. Equivalent virus testing showed that none of the individuals caught in 2015 or 2016 contained BMYV. Three *M. persicae,* all caught in Cambridgeshire, were viruliferous in 2017. Although these recent data suggest the infectivity of aphids has decreased over time since the late 1990s/early 2000s, and this decline in infectivity might well be linked to neonicotinoid seed treatment use, it must be stressed that there were cases of high levels of virus yellows infection in UK fodder beet in 2017, particularly in the west Midlands, south-west England and in the borders of Scotland. Neonicotinoid seed treatments were not used on these crops, although the seed was treated with tefluthrin, and clearly demonstrates that virus yellows has remained in the UK and would rapidly return into the sugar beet areas if not controlled. In addition, in 2017, several commercial sugar beet crops in Normandy, France, where neonicotinoid seed treatments were not used or partly used in fields by growers (although up to three pyrethroid sprays were applied), showed levels of virus infection of up to 40%. Assessments made by ITB (the French equivalent of BBRO) showed yield losses of around 32% on average in the French crop in 2020 (picture below).

New molecular (qPCR) diagnostics have now been developed at Rothamsted Research for BBRO enabling aphids to be tested for all yellowing viruses simultaneously (rather than just BMYV), further refining the data collected and improving the understanding of the risk associated with virus yellows infection in the future.

The current UK model for seed variety procurement by the British Sugar and NFU seed committee is that varieties are ordered, alongside seed treatments, six to eight months before drilling commences the following spring. Therefore, the decision by growers to order seed treatments (if successful in this application) has been based on previous risk analysis and on-farm experiences. If necessary, foliar sprays are then applied (if available) following the recognised aphid threshold. Historically, sprays have been important if crops were left untreated at drilling, if weather compromised plant uptake of the seed treatment, or if the main aphid migration is later in the season. However, it must be emphasised that there is only one product currently registered for aphid control in the UK (Teppeki) due to widespread MACE and/or kdr/super kdr resistance in *M. persicae* populations to pyrethroids and carbamates respectively, as monitored annually across the UK by Rothamsted Research (see figure below).



When foliar insecticides are available for aphid control then the existing threshold for application is one green wingless aphid per four plants (**Hull, 1968**). This threshold was revised to consider the reduced susceptibility of plants to both aphids and virus infection with plant maturity. Therefore, after the 12-14 leaf stage the threshold for aphicide sprays decreases to one aphid per plant and after the 16-leaf stage no further control measures are necessary as plants become unpalatable to aphids (**Kift et al., 1997**). At this stage of the season the black bean aphid (*Aphis fabae*) can become an issue. However, this species can only transmit BYV and is usually controlled by the large number of predators and parasitoids found in the crop at this time of the year and usually control measures are not recommended by the industry.

Our industry is working hard to develop long-term solutions through a sustainable pathway to virus yellows control. (See section 34 for details of the industry's Virus Yellows Pathway). At present, there are no virus yellows tolerant or resistant sugar beet varieties commercially available to any of the yellowing viruses. In 2022, there is one partially resistant sugar beet variety (Maruscha KWS) commercially available which has mild resistance to one of the three yellowing viruses that form the virus yellows complex (BMYV, BChV or BYV). The yield potential in the absence of virus is low compared to existing, elite (susceptible) varieties. BBRO has calculated (from inoculated trials in 2019 and 2020) that growers would have to sustain 62% infection within fields before such varieties become economically viable.

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Qi, A., Dewar, A., Harrington, R. (2004). Decision making in controlling virus yellows in sugar beet in the UK. Pest Management Science 60, 727-732.

26 Potential pest risk

Please give details on the estimated risk to public health and/or economic impact of the pest should no authorisation be granted, for the proposed use for the crop/crop group.

The maritime climate of the UK has favoured the growth and increasing yield potential of sugar beet. Sugar beet is a non-flowering crop grown, almost exclusively, across the eastern counties of England. The current crop area is approximately 92,000 hectares, grown to supply the four British Sugar factories at Bury St Edmunds, Cantley, Newark and Wissington, supporting over 9,000 jobs within the sector. Sugar beet provides key ecosystem services (e.g. habitats for stone curlew, skylark and lapwing and food for almost 90% of the world's population of overwintering pink-footed geese) as well as rotational benefits as a spring break crop to limit other important arable issues such as blackgrass. However, in many years, the climate is also highly favourable for the build-up and development of damaging pest and disease threats. Consequently, the beet industry has developed and adopted a range of methods and thresholds wherever necessary. These include plant protection products and the use of neonicotinoid seed treatments between 1994 and 2018. The seed treatments were the only option to control and limit the impact of aphid pests and associated virus diseases on establishment, growth and yield, reducing the need for follow-up secondary applications of insecticides, when these treatments were available in the past.

Neonicotinoid seed treatments, combined with valuable foliar sprays when needed, remain the only viable method to successfully control for virus yellows in the short term. 2020 showed that there are currently limited effective alternative chemical or non-chemical treatments available to protect the UK industry from virus yellows. As happened in 2020, the economic (yield loss) and environmental risks (further active ingredient being applied as sprays) should no authorisation be granted, could be very significant if no authorisation is granted.

Using the virus yellows model we can estimate that between 2011-2016, the losses from growing beet without neonicotinoid seed treatments, as a result of virus yellows, would have been conservatively estimated as costing from £0.11M in 2011 to £51.55M in 2014, with an average of £17.30M annual loss over that period (the table below sets out this analysis). These losses are conservative because they are specifically due to the effect of virus yellows, and exclude:

1) any consequences of leaf miner damage, which we believe nationally to have been small, although would have produced significant local losses in affected fields (BBRO trials in 2015 showed losses of up to 9% specifically due to the second and third generation of this pest); and

2) the effect of the soil pest complex, which can be reasonably controlled in many cases using the pyrethroid element of the seed treatments (e.g. Force, active ingredient tefluthrin).

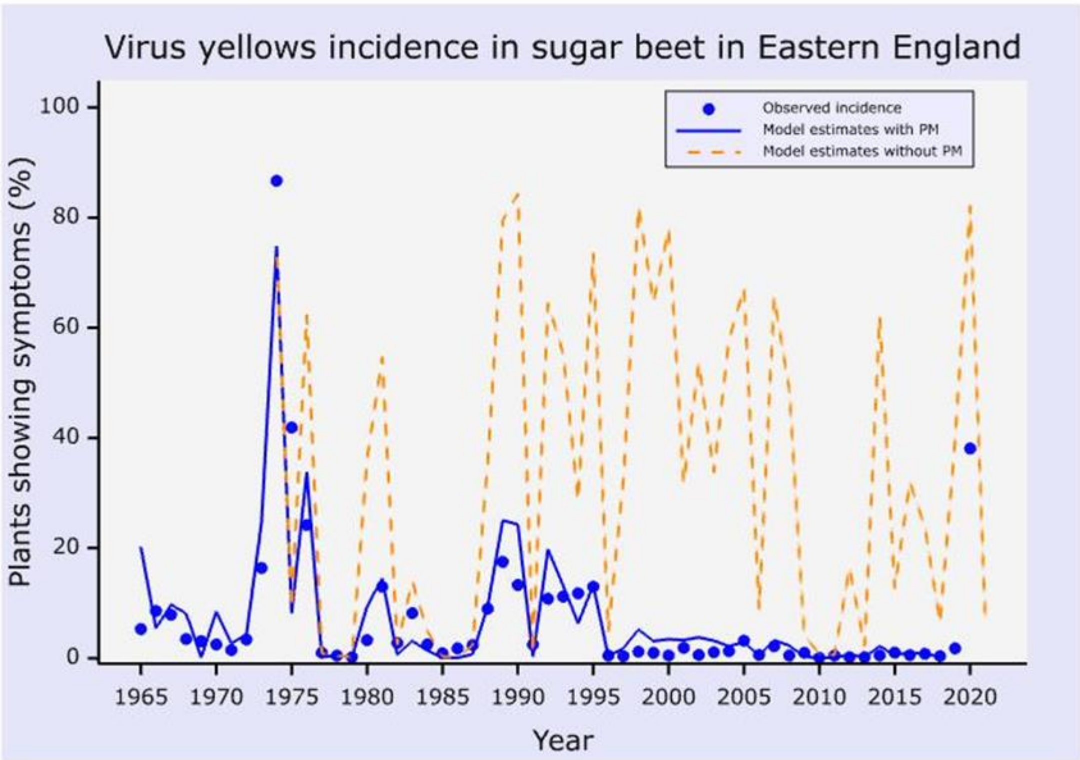
It is estimated that the costs to growers in the 2020 season was approximately £43m and subsequent impact to the processor of a further £24m.

As previously highlighted, the extent of disease and hence potential losses is determined by winter and early spring weather prior to the sowing of the crop.

30th March drill date							
Virus Prediction %	2011	2012	2013	2014	2015	2016	
Bury	0.6%	19.50%	2.16%	62.10%	12.70%	32.10%	
Cantley	0.50%	10.30%	1.38%	65.50%	29.40%	39.80%	
Wissington	0.60%	19.50%	2.16%	62.10%	12.70%	32.10%	
Newark	1.10%	19.70%	2.92%	74.20%	32.10%	48.90%	
Average % infection	0.70%	17.25%	2.16%	65.98%	21.73%	38.23%	
Infection with treated	0.52%	0.25%	0.18%	0.52%	1.03%	1.00%	
Potential Impact	0.18%	17.00%	1.98%	65.46%	20.70%	37.23%	
Assuming 25% yield loss per affected plant and 1% infected on treated							
Total Crop Volume	8504100	7291418	8431600	9309184	6217431	600000	Est
DEFRA Crop Value £M	£251	£231	£266	£315	£173	£160	Est
Potential Loss £M	£0.11	£9.82	£1.31	£51.55	£8.95	£14.89	Est
5 year Average	£17.30						

Virus yellows prediction using the Virus Yellows Model for a crop drilled on 30 March for 2011 – 2016 and associated potential losses

The Virus Yellows forecast has been in operation for the UK sugar beet crop since 1965 and is one of the longest running predictive models available anywhere in the world, used to indicate the level and potential impact of an economically important plant disease. The forecast is validated by the assessment of the UK sugar beet crop each year by the British Sugar Contract Managers at up to 500 geographically diverse sites each year (represented by the blue dot in the diagram below). The model can be used to give an overall level of virus yellows infection at the end of August each year for the UK crop (see below), either without any pest management (PM) intervention or with the best pest management practice available at that time. Over the decades, pest management practices have evolved and changed due to many different reasons. These have included the use of specific organophosphate, carbamate or pyrethroid insecticides, neonicotinoid seed treatments, and cultural control methods. This clearly indicates the potential consequences of virus yellows infection if not controlled and the clear benefits provided by the neonicotinoid seed treatments.



Local versus national virus yellows forecasts

It is not currently possible to localise the virus yellows forecast, as there are only two suction traps in the sugar beet growing region. However, the BBRO is working closely with Rothamsted Research to explore options, via the yellow water pan network, for regionalisation of the forecast in future years.

27	Control of pest problem and benefit of proposed product

Please provide a detailed reasoned case, with reference to any available supporting data, justifying how the proposed emergency authorisation will provide a sufficient level of benefit (pest control, reduction in damage etc.) to warrant the use. Where applicable, please provide historical information.

The UK maritime climate favours overwintering survival of aphids more so than any other EU country. Monitoring shows that the UK sugar beet crop, primarily grown across the eastern counties, would have experienced nine virus epidemics of over 50% infection since 2000 without effective control options such as the neonicotinoid seed treatments (see chart and table in section 26). In 13 years between 2000 and 2017 these treatments prevented economically significant crop losses due to virus yellows alone. Between 1994 and 2018, neonicotinoid seed treatments ensured that virus yellows levels remained at around just one percent of the national crop being affected.

The consequences and economic impact of a ban on neonicotinoid seed treatments on the EU sugar beet sector have been studied by LMC International in 2017 (a report commissioned by Syngenta AG). The authors conclude that a ban on neonicotinoid seed treatments will decrease farm incomes through loss of yield and increase yield volatility. Also, losses will be greater in milder maritime areas, such as the UK, regions that currently produce some of the highest yields across Europe. We have now experienced the damaging impact of this emergency situation with the author's predictions demonstrated across the growing area in 2020. *The full report has been previously provided to HSE for reference.*

Previous studies and grower experiences have shown that neonicotinoid seed treatments are highly effective to protect sugar beet from the significant impact of pests and viruses on yield. Studies have shown that the earlier the infection with virus yellows the greater the yield loss, therefore protecting the plants from aphids from emergence until the 12-leaf stage (before the phenomenon of mature plant resistance develops) is crucial. We note in particular:

• Without control, the poleroviruses BMYV and BChV cause the greatest yield loss when the plants are infected at an early growth stage with infection reducing light interception by up to 40% (**De koeijer and van der Werf, 1995**) and final yields decreased by up to 30% (**Smith and Hallsworth, 1990; Stevens *et al.*, 2004**). Later infection, when the plants have more than 20 leaves, is currently thought to have little effect on yield. For example, previous neonicotinoid seed treatment trials (**Tait et al., 2012**) showed significant yield responses when virus-carrying *M.persicae* were introduced and then controlled by seed treatments after 7 weeks post sowing. Control of later infections produced positive yield responses, but these were not always significant.

• As with BMYV, without control, sugar yield losses due to BYV depend on the time of infection; late infection (i.e. after mid-July in northern Europe) has little effect, whereas early infection can decrease yield by up to 47% as well as increasing the level of impurities (**Heijbroek, 1988; Smith and Hallsworth, 1990; Clover *et al.*, 1999**). Plants infected with BYV show a reduced formation of leaf area compared to healthy or BMYV-infected plants. Also, leaves developing after infection are smaller than healthy or BMYV-infected sugar beet (**De Koeijer and van der Werf, 1999**).

Infection with virus yellows decreases the overall weight of sugar beet plants. **Clover et al. (1999)** concluded that infection with BYV reduced total dry matter yield of sugar beet by 20% from 18.7 to 15.1 t/ha. The decrease was primarily due to the reduction in the yield of storage roots (3.3 t/ha; 25%) rather than foliage (0.4 t/ha; 7%). It is the reduction in the size of storage roots in diseased plants which is the main cause of yield loss in BYV-infected sugar beet. In field experiments five cultivars in the UK, **Smith and Hallsworth (1990)** observed decreases in fresh storage root and sugar yield of 13-47% and 16-47%, respectively.

• A minor component in the loss of sugar yield in BYV-infected sugar beet results from the decrease in the concentration of sugar in infected storage roots. The size of the decrease in sugar concentration in infected sugar beet is very dependent on cultivar and the time of infection and **Smith and Hallsworth (1990)** observed a reduction in the sugar concentrations of fresh storage roots of between 0 and 0.5 percentage points. There was no reduction in sugar concentration in plants infected after the end of July. **Clover et al. (1999)** reported similar reductions (0-0.3 percentage points) in sugar concentration in three field experiments on one cultivar infected with BYV in the UK.

• Sugar is extracted from the storage root of sugar beet by a complex industrial process that involves clarification using lime, evaporation and crystallization. The pH value is critical during each of these stages and the presence of impurities such as sodium and potassium that increase pH during lime clarification, and amino-nitrogen which decreases pH during evaporation, affects extractability. Without controlling the aphid vectors, virus infection will significantly increase the concentration of sodium, potassium and amino-nitrogen impurities in the storage roots of sugar beet **(Smith and Hallsworth, 1990).** In common with other components of yield loss, the extent of this loss in quality is determined by the time of infection and sugar beet cultivar (**Smith and Hallsworth 1990; Clover et al., 1999**).

References

Clover G. R. G., Azam-Ali, S. N., Jaggard, K. W., Smith, H. G. (1999). The effects of beet yellows virus on the growth and physiology of sugar beet (Beta vulgaris). Plant Pathology 48, 129-138.

Clover G. R. G., Smith, H. G. Azam-Ali, S. N. Jaggard, K. W. (1999). The effects of drought on sugar beet growth in isolation and in combination with beet yellows infection. Journal of Agricultural Science 133, 251-261.

De Koeijer, K. J., van der Werf, W. (1995). Effect of beet yellowing viruses on light interception and light use efficiency of the sugarbeet crop. Crop Protection 14, 291-297.

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LMC International (2017). The economic impact of a ban on neonicotinoids on the EU sugar beet sector. 1-10.

Smith, H.G., Hallsworth, P. B. (1990). The effects of yellowing viruses on yield of sugar beet in field trials, 1985 and 1987. Annals of Applied Biology 116, 503-511.

Stevens, M., Hallsworth, P. B., Smith, H. G. (2004). The effects of Beet mild yellowing virus and Beet chlorosis virus on the yield of UK field-grown sugar beet in 1997, 1999 and 2000. Annals of Applied Biology 144, 113-119.

Tait, M. F., Stevens, M., Dewar A. M. (2012). The effect of climate on the efficacy of thiamethoxam with tefluthrin seed treatment against aphids and virus yellows in sugar beet. Aspects of Applied Biology 117, 177-184.

28 Limitation and Control

Please provide details of how the use of the product will be limited and controlled. Include details of the decision process governing the use of the product (e.g. agronomic factors, pest thresholds and monitoring); a reasoned case justifying the scale of use (% crop that may be required to be treated, including geographical location); or other limitations on use (e.g. period of use); bespoke product stewardship arrangements, and the rationale underlying these proposals.

Overview

As in 2020, to address a potential emergency facing the UK industry in 2022, the UK sugar beet sector is prepared to commit to the following proposed limitations and controls on use, should the authorisation for Cruiser SB be granted. These limitations will result in the UK sugar sector incurring significant costs and modifying existing procurement and seed processing timelines. The industry is committed to the responsible use of plant protection products. For a summary of the stewardship programme refer to the attached document entitled '2022 Cruiser SB Neonicotinoid Stewardship Document'.

Sugar beet is precision sown which avoids soil surface contamination. We also acknowledge the previous HSE analysis in 2018 regarding Hanslope soils flow exceedances if late winter/spring is wet. If sugar beet was sown after the drain flow period of approximately 30th April on these soil types it would be economically unviable for those growers with this soil type. **Consequently, the industry is proposing to sustain the reduced rate of thiamethoxam applied from (the normal) 60g to 45g per 100,000 plants to lower potential risks.**

Our approach highlighted below is substantially more prescriptive than any other European country currently applying for emergency authorisations for seed treatments for 2021 (M. Stevens BBRO personal communication via the International Institute of Sugar Beet Research) as the UK approach is based on forecasting and threshold trigger points for seed treatment application. The successful trigger mechanism in 2021 showed IPM in practice – the industry did not treat sugar beet seed with Cruiser SB as the Rothamsted virus yellows forecast predicted low levels of infection for the 2021 season.

In addition to the robust trigger mechanism, if Cruiser SB is used, the industry is committed to multiple measures, outlined below, with the specific intention of reducing the level of risk to pollinators.

Outline of the proposed limited use

Under the proposed limited use, the neonicotinoid treatments would be applied by either the UK seed processor Germains in Norfolk; by KWS in either Einbeck, Germany, Buzet-Sur-Baise, France, or Holeby, Denmark; or a proportion may be applied by SES Vanderhave in Tienen, Belgium, or Cappelle-en-Pévèle, France. This is a significant undertaking by the sugar sector, as the neonicotinoid seed treatment would be purchased by the companies but only used if deemed necessary (as described below). Once again, it is hoped that this commitment will be seen as a step-change to developing a greater integrated approach, using the virus yellows model to rationalise seed treatment usage and moving away from prophylactic application, while alternative approaches are developed, verified and registered for the crop.

If neonicotinoid seed treatments were not required, due to a low risk of virus infection from the 2022 forecast, product would be returned to the supplier as per the 2021 season.

If seed had to be treated, the exact amount required would be known from the seed ordering process between growers and British Sugar by the end of 2021. This is anticipated to be over 90% of the crop (based on previous usage data) because of the serious threat that virus yellows complex poses to the impact and viability of the entire UK sugar beet sector. However, no further additional seed would be treated for any fields that may have to be resown in 2022 due to poor weather conditions affecting germination and/or crop establishment.

Once treated and packaged, seed would be delivered to growers from March 2022 onwards. A direct consequence of this approach is that the seed could be delivered and sown later than recommended (usually the crop is sown from 1st March onwards once temperatures are at or above 5C). Delaying sowing due to later on-farm seed delivery, especially into April, will decrease the biological yield potential of the crop, affecting both grower returns and British Sugar income. A yield loss of 6, 8, 13, and 21% is experienced for every week of delay throughout April (BBRO Reference book). However, the industry is prepared to accept this yield penalty to ensure the crop is protected against the more damaging virus yellows infection.

As in 2020, to determine whether neonicotinoid seed treatments would need to be used on the 2022 crop, the Virus Yellows forecast will be produced by Rothamsted Research and a decision will be taken as to whether a seed treatment should be applied to the crop based on the outputs of the model available on 1st March 2022. Due to the maritime climate of the UK, and the small footprint of the UK sugar beet crop within the eastern counties of the UK, the virus yellows regional models usually predict, when conditions are favourable, that all the cropping area would be at an economic risk from virus infection. Therefore, the value of current regional models is valid. Also, the current virus yellows forecast is being refined and regionalised by Rothamsted Research via a four-year BBRO-funded project that started in autumn 2019 to target and rationalise, as well as localise, insecticide usage in sugar beet and to support any future emergency authorisations. With a limited number of suctions traps available (there are only two in the main sugar beet growing region) to cross correlate the data and the analysis of using yellow water pan from the 50 sites we will retain the current single national threshold for the 2022 season.

This decision has been taken on the strength and robustness of the model outcomes since its first introduction in 1965 and its value to provide an integrated pest management approach, although, a consequence of this approach, as already highlighted, is seed delivery could be delayed. However, if the UK experiences a cold winter in the months of January and February 2022 and the virus yellows forecast **is below the economic threshold of the cost of the seed treatment** then these treatments will **not** be applied. **Therefore, under these conditions, neonicotinoids would not be used under the emergency authorisation in 2022 by the sugar beet Industry, even if approved by DEFRA.**

Calculations of the economic threshold are based on the current crop price, cost of neonicotinoid seed treatments and the economic impact assessment of virus yellows (**Qi et al., 2001**) where the **cost of crop damage for the grower is greater than the cost of seed treatment**. The 2021 economic threshold for use of neonicotinoid seed treatments for virus yellows was 9%. ***The same formula will be used to calculate the economic threshold for 2022 once the 2022 sugar beet contract price and Cruiser SB price is known.***

In addition, following the virus yellows impact in 2020, British Sugar and the NFU have agreed a new virus yellows compensation scheme for all growers. This started for the current (2021) year and will last for three years. Individual growers who are eligible for compensation will be able to claim for up to 35% yield loss. The first 10% of lost yield acts as an excess and is deducted from the total yield loss.

British Sugar will pay 45% of the remaining loss of yield at the agreed contract price. For a grower to be able to claim they will have to:

• Plant enough area to fill their total contract tonnage (CTE) when multiplied by the growers 5-year average yield (at the current level before the 2020 crop).

• Deliver all the beet contracted and grown on the fields declared to British Sugar.

• Be contracted to grow beet for the following year and not in breach of contract obligations.

• Inform British Sugar in the annual crop declaration if crop damage results in a plant population falling below 80,000 plants per hectare.

• Register the presence of Virus Yellows in crops by a specified date.

• If requested, provide evidence (e.g. invoices or spray records) of the aphicide sprays applied if aphid thresholds reached in accordance with BBRO recommended practice.

Steps involved in determination of use

As highlighted, all UK sugar beet is grown under contract to a single customer – British Sugar. Grower contracts are negotiated annually between British Sugar and the NFU Sugar. This contractual situation affords a unique level of control over production.

The proposed steps to enable the UK sugar beet sector to control neonicotinoid use under an Emergency Authorisation are as follows:

• The 2022 seed contract offer letter, jointly agreed by British Sugar and the NFU Sugar, will be re-issued to all sugar beet growers post-decision taken by HSE/CRD/ECP/DEFRA regarding any future emergency use of neonicotinoid seed treatments in sugar beet.

• If the emergency authorisation is granted growers will be given the option to buy treated seed on the seed offer letter described above, but it will be stipulated that neonicotinoid treatments will only be available if the economic threshold for treatment is triggered in March 2022.

• Growers will always have the option to buy untreated seed.

• Autumn/early winter 2021, seed and neonicotinoid seed dressing will be purchased by and delivered to the ESTA accredited and the UK processing facility at Germains, Kings Lynn and other European seed producers as highlighted above.

• Seed will be processed, primed and pelleted but not neonicotinoid treated, or film coated.

• The pelleting process ensures 100% traceability of product. This procedure is an exact process leading to minimal dust levels (the industry led (ESTA) reference value for dust emission from seed treatment, at point of despatch, is 0.25 g dust/100,000 pelleted seeds) limiting any impact to both operator and environment. (In 2017, the average dust level at the Germains factory was well below this minimum dust level at 0.02g/100,000 seeds).

• Similarly, the seed purchased by growers from KWS will be treated and imported into the UK following guidelines and restrictions as above.

• Await the Virus Yellows forecast to be issued at the beginning of March 2022.

• Below **X%** infection for national crop at mid-point forecast (30th March) – no neonicotinoid treatment to be applied. The 2021 economic threshold for use of neonicotinoid seed treatments for virus yellows was 9%. ***The same formula will be used to calculate the economic threshold for 2022 once the 2022 sugar beet contract price and Cruiser SB price is known.***

Above **X%** infection - treat seed as requested by growers via ordering process. The 2021 economic threshold for use of neonicotinoid seed treatments for virus yellows was 9%. ***The same formula will be used to calculate the economic threshold for 2022 once the 2022sugar beet contract price and Cruiser SB price is known.***

• BBRO to monitor winter aphid and virus levels on weeds, cover crops and unharvested beet (e.g. for anaerobic digestion) in January to April 2022.

• March 2022 onwards treated seed delivered and sown on farm following BBRO recommended guidelines in the BBRO Reference book provided to all growers and agronomists.

• All treated crops and associated field-areas to be recorded via the British Sugar CRM database and monitored by their team of 22 agricultural contract managers.

• Beet is precision sown and covered, usually at 2.5cm depth, which avoids the ecotoxicological risks to birds from eating pelleted seed. However, the industry will provide spill kits to contractors and growers in case any seed accidentally remains on the soil surface.

• We propose the introduction of a new following crop restriction clause into the Inter Professional Agreement (IPA) between British Sugar and NFU (the IPA is an extensive document that governs the relationship between NFU Sugar and British Sugar, the terms of the IPA are incorporated into each grower's contract) that stipulates that **growers must follow the following crop rules summarised in the table below.**

The following-crop restrictions are as follows:

	Non-restricted	Restricted
Rules	**No restrictions** following Sugar Beet	A **minimum of 32 months** from drilling of Sugar Beet
Crops	*1. Wheat (including Durum Wheat)* *2. Barley* *3. Millet* *4. Sorghum* *5. Oat* *6. Maize / Corn* *7. Rye* *8. Triticale* *9. Canary seed* *10. Spelt* *11. Potato* *12. Cabbage* *13. Kale* *14. Swede* *15. Lettuce/ Babyleaf/ Spinach* *16. Onions* *17. Leeks* *18. Carrots* *19. Parsnips* *20. Cauliflower* *21. Broccoli* *22. Turnip*	*23. Oilseed Rape* *24. Linseed* *25. Mustard* *26. Soya Bean* *27. Pea* *28. Bean* *29. Buckwheat* *30. Clover* *31. Phacelia* 32. Chicory 33. Radish 34. Vetch 35. False flax 36. Lucerne 37. Sunflower

Any crop excluded from the above table should be considered 'restricted' i.e. a minimum of 32 months from drilling of Sugar Beet.

Cover crops (including mixes) must follow the above restrictions.

We have strived to address the concerns raised by HSE in response to the 2021 application by moving crops that are bee-attractive before harvest, such as mustard and linseed, into the restricted category meaning that they may only be planted a minimum of 32 months from the drilling of sugar beet.

- No further use of thiamethoxam seed treatments (including any re-drilling of treated sugar beet if crop lost due to wind blow or capping) on the same field area for 46 months from the date of sowing treated sugar beet seed in 2022. This is to minimise the risk of any residues being acquired by succeeding flowering crops or weeds and hence exposing bees and/or other pollinators to neonicotinoids.
- Robust herbicide programmes (following guidance from the pest, weed and disease charts published and distributed annually by the BBRO) to be adopted by growers and their agronomists to minimise the number of flowering weeds within treated sugar beet crops and reduce the risk of indirect exposure of pollinators to neonicotinoids. This is standard best practice and only applies in field, not next to or around the field, i.e. field margins.
- Monitor aphids, their resistance and infectivity at up to 15 sites in each of the four factory areas from first flights until the end of migration each year to provide advice on future control strategies for virus yellows and analyse existing data sets to 'fine-tune' the advice currently given to the industry so new thresholds for treatment can be evaluated and developed if required.
- Post-monitoring of a statistically robust sample of neonicotinoid-treated sugar beet fields in 2022 onwards to determine any neonicotinoid seed treatment residue levels in soil and plants.

It must be re-iterated that this application is **only being made for the sugar beet crop of England** (and not for fodder or bioenergy beet grown more extensively across the whole of the UK). Consequently, the extent and use of the neonicotinoid products would be limited to those counties that grow the sugar crop, and treatments then only applied if needed, on the trigger of the virus yellows forecast in March 2022.

References

Qi, A., Dewar, A., Werker, R. and Harrington, R. (2001). Virus yellows forecasting in sugar beet and the impact of Gaucho. British Sugar Beet Review, 69, 36-39.

29	Additional risk(s)

Please provide details of any additional risk mitigation measures proposed to protect humans, the environment and wildlife and the rationale for these proposals.

The proposed modelling and monitoring-based approach for targeted seed treatment use in 2022 has been taken as the UK sugar beet sector is fully aware of the recent published papers that suggest that neonicotinoid residues can be found within soils/water following a neonicotinoid seed-treated crop.

The proposals made in this application to limit seed treatment use are assisted by the nature of the UK sugar beet crop itself. For example, compared to winter cereals and oilseed rape grown across the British Isles, the UK sugar beet is regarded as a 'niche' non-flowering crop with around 100,000 hectares grown each year. Sugar beet is an important rotational spring break crop, grown, on average, one year in four, across eastern England, primarily around the four processing factories.

Sugar beet seed is precision drilled, usually at 18cm apart and 50cm between rows to achieve a final BBRO-recommended field population of 100,000 plants per hectare, with the neonicotinoid treatments being incorporated into the seed pellet and then sealed via film coating (unlike cereals) at the processing factory such as Germains following ESTA guidelines (http://esta.euroseeds.eu/Standard/Dust). Consequently, dust is not regarded as an issue and seed is not left on the soil surface.

To mitigate risks to soil, water and pollinators the Industry will undertake the following:

• Decrease the rate of thiamethoxam on seed by 25% from 60g to 45g/100,000 plants. This would result in 1,130kg less neonicotinoid active being introduced into the environment (based on 2018 Pesticide Use Statistics)

• Only use treatments when the virus yellows forecast is above the economic threshold

• Monitor all treated crops and associated field-areas

• To continue the following crop restriction clause into grower agreements

• No further use of thiamethoxam seed treatments (including any re-drilling of treated sugar beet from crop loss due to wind blow or capping) on the same field area for 46 months from the date of sowing treated sugar beet seed in 2022. This is to minimise the risk of residues being acquired by succeeding flowering crops or weeds and hence exposing bees and/or other pollinators to neonicotinoids.

• Follow industry recommended herbicide programmes to minimise the number of flowering weeds within treated sugar beet crops and reduce the risk of indirect exposure of pollinators to neonicotinoids. This is standard best practice and only applies within field, **not** next to or around the field, i.e. field margins.

• Monitor neonicotinoid-treated sugar beet fields post-harvest to determine any neonicotinoid seed treatment residue levels in soil and plants.

Clearly, there is a paucity of relevant residue data for sugar beet; limited studies have been conducted by FERA and in the sugar beet growing region in northern Spain. **Jones et al** (2014) undertook a preliminary study at FERA to evaluate neonicotinoid concentrations in UK arable soils following seed treatments and included one field (of the 18), 'Norfolk 2', that had previously included thiamethoxam-treated sugar beet and clothianidin-treated winter wheat in 2012.

These FERA studies demonstrated that neonicotinoids could be detected in soils following previous usage but imidacloprid (no longer used in beet) tended to show the highest levels. Also, previously the clothianidin soil half-life had been estimated at between 148 and 1,155 days in aerobic soil and for imidacloprid between 1268-1233 days. Jones et al found the DT_{50} values (half-life) for the UK soils studied were lower than previously reported; for clothianidin between 277-1386 days and thiamethoxam 75-109 days. They concluded that thiamethoxam levels were below 2ug/kg and saw no appreciable build-up of this chemical in the fields studied and both clothianidin and thiamethoxam were less persistent than imidacloprid. It was unclear what concentration would arise in succeeding pollen/nectar but speculated that less than 1.5ug/kg soil would need to accumulate to impact the succeeding flowering crop.

More recently, in 2016/17, a soil study was conducted by the Instituto Tecnológico Agrario de Castilla y León (ITACyL) in Spain to meet the Castile and León beet sector's demand for scientific and impartial information on the persistence of neonicotinoid insecticides after use of such products on sugar beet crops. The reasons for this report were based on the sector's concern about the possible loss of use of such insecticides due to their negative impact on pollinators. In the farmers' view, this loss will have an extremely negative impact on the viability of beet crops in Spain.

The objective of this Spanish study was to evaluate the persistence of the insecticides clothianidin, imidacloprid and thiamethoxam in soils in which sugar beet crops treated with these insecticides were grown in 2016 and then crops not treated with insecticides and not attractive to pollinators were grown in 2017. Based on the early results obtained (the full report is attached within the additional papers submitted with this application), the following conclusions were made by the authors:

- There is no persistence of neonicotinoids in soils in a rotation of treated sugar beet followed by an untreated non-flowering crop that is not attractive to pollinators.
- Following the crop sequence described above, since there is no persistence of neonicotinoids in soils, crops that are attractive to pollinators may be grown with no risk to the pollinator population.
- Considering the significant importance of pollinators, it would be appropriate to conduct a systematic evaluation of the potential presence of neonicotinoids in soil before planting species that are attractive to pollinators. Testing methods with lower limits of quantitation should be used for this purpose.
- Likewise, evaluations should be conducted to assess the potential presence of neonicotinoids in nectar and pollen samples from the following pollinator-attracting crop after the described crop rotation to categorically ensure there is no persistence of these insecticides.

Additional supplementary data from Syngenta, addressing some of the concerns raised by ECP in 2018, were submitted as part of the 2020 CRD9 application for Cruiser SB.

References

Jones, A., Harrington, P., Turnbull, G. (2014). Neonicotinoid concentrations in arable soils after seed treatment applications in preceding years. Pest management Science 70 (12) 1780-84.

Instituto Tecnológico Agrario de Castilla y León (2017). Persistence of clothianidin, imidacloprid and thiamethoxam in soils after sugar beet crops and subsequent crops that are not attractive to pollinators. 1-8.

30	Safety assessment cases
Please provide details about how each risk assessment area will be addressed using supporting data and/or a robust case. **You must detail whether there is likely to be any increase in risk/hazard posed by your proposed use.** **If data is being used to support any risk assessment area and has previously been submitted to HSE, please provide the product's name and COP number.**	
Operator, Worker, Bystander/Resident Exposure (Predictive operator exposure models can be submitted)	
Fully supported by the extant authorisation for Cruiser SB, COP 2013_02236	
Consumer exposure (supporting data or case must address UK specific requirements)	
Fully supported by the extant authorisation for Cruiser SB, COP 2013_02236	
Environmental fate (supporting data or case must address UK specific requirements)	
Fully supported by the extant authorisation for Cruiser SB, COP 2013_02236	
Ecotoxicology (supporting data or case must address UK specific requirements)	
Fully supported by the extant authorisation for Cruiser SB, COP 2013_02236	

Part G – Permanent solution

31 Proposed permanent solution

Please outline the steps that will be taken by you or the authorisation holder to transfer this emergency authorisation to an on-label recommendation or extension of authorisation of minor use. Please outline the most likely time frame for a permanent solution to be available (See guidance in Part G).

Not applicable. Alternative permanent solutions to neonicotinoid seed treatments for sugar beet are being sought as a matter of priority.

32 Alternative product(s)

Please provide details of ongoing work aimed at developing alternative products to address this pest problem. Include information on the active substance and anticipated timelines for availability of the data or application for the alternative solution.

There remains significant research and trial work being undertaken on an accelerated basis to develop alternative, sustainable solutions to the use of neonicotinoids and the Industry has established a new Virus Yellows taskforce in 2020 to identify pathways to provide new and integrated aphid and virus mitigation strategies for the future. The timeline is highlighted below:

Area of Development	2021	2022	2023	2024	2025	2026	2027	2028 onwards
VY assurance fund	Established fund to assure the worst hit growers for VY (£12m BS investment)			Possible extension for "early years" post derogation				
Improved grower practices	Improved husbandry Increased hygiene measures Cover crops Increase beneficial insects	Alternative spray trials programme (e.g. raffinate) Improved husbandry Increase beneficial insects Increased hygiene measures Cover crops						Potential for bio plastics Improved husbandry Increase beneficial insects Increased hygiene measures Cover crops
Improved seed germination	Improved pellet coatings to establish crop and earlier sowing to reach 12- leaf stage							
Traditional Seed Breeding	First partially resistant variety launched "Maruscha" (yield penalty compared to standard varieties)	Potential further varieties available	ID Aphid/ Mature plant resistance genes	More varieties with partial BMYV/BYV tolerance/resistance, but with continued yield drag relative to the susceptible alternatives.				More varieties with partial BMYV/BYV tolerance/resistance
Sustainable spray programme	EAs for current sprays + Teppeki	3 - 4 established sustainable sprays (not requiring EAs) InSyst, Movento + x + x						3 - 4 established sustainable sprays
Gene Editing	Gene mapping Identification of potential genetic changes	Regeneration into viable plants		Multiplication into sufficient volumes to trial Lab trials to ensure VY resistance expresses in practice Lab trials to screen other detrimental traits Field trials to ensure performance in field conditions National Listing trials			Multiplication into commercial volumes Recommended List 3rd year	Continued multiplication Commercial availability
					EU food/feed approval process for products derived from specific GE sugar beet event Approval for products to enter EU market through international supply chains (from 2030)			
Neonics Derogation	3-year derogation to allow for development of practices / seed varieties / sustainable sprays							

In 2022, growers will have access to the first generation of virus tolerant sugar beet. Maruscha KWS is partially tolerant to BMYV. As with all new traits, this variety is lower yielding than conventional varieties, and should not be sown until after mid-March due to its higher levels of bolting. This is clearly a positive step to finding alternative integrated solution to virus yellows. However, it is important to remember that there are at least three yellowing viruses that affect sugar beet and this trait is only against one of these, highlighting the ongoing challenges of breeding for virus (and vector) resistance.

The industry continues to use advanced seed technology for enhance germination/establishment to ensure plants reach the 12-leaf stage as quickly as possible and currently Enrich 200 (Germains) and EPD 2 (KWS) treatments are available to growers when they purchase their seed. In addition, BBRO are working with all breeders and seed technology providers alongside the British Sugar/NFU seed working group, to evaluate additional approaches for improved pelleting and further enhanced germination/establishment.

BBRO continue to support ongoing glasshouse and larger-scale field trials to determine the efficacy of existing and novel aphicides as well as other novel products and botanicals (e.g. garlic-based products and jasmonic acid) and potential viricides. The products being analysed are currently not approved for use on sugar beet, but do not have resistance issues within current *M. persicae* populations in the UK, so could be potentially exploited for their control in the future. These trials are in addition to specific company confidential trials that the agrochemical sector commission with the BBRO utilising our inhouse trials and science teams. Ultimately, this information will be used to support and/or accelerate registration or the extension of use of these products for sugar beet in the future.

The field trials either use natural populations of *M. persicae*, representing the local insecticide resistance status or, if necessary, aphids are introduced into the field (if the natural population remain below the spray threshold) from the BBRO insectary. Aphid populations are then assessed at specific time points post application to determine the efficacy and ultimately virus control of the different aphicides. Data from 2017-2020, showed that several key aphicide products continue to be effective at controlling *M. persicae* when applied as a foliar spray to sugar beet. However, as anticipated, the use of Hallmark 'increased' the number of aphids significantly and is likely the result of the aphicide decreasing the numbers of beneficial insects within these pyrethroid-treated plots.

To accelerate the outcomes of this work and to maximise data capture, the BBRO have undertaken additional trials in the autumn by sowing beet in early September and taking aphid assessments during October/November. These autumn data reinforced the summer findings regarding aphid control, and this pro-active approach enables the industry to gain additional information within the same year.

More detailed laboratory and growth room assays and assessments are also ongoing in the BBRO facilities in Norwich. We are investigating further aphicides that are currently in their earlier stages of development and determining whether specific products, currently registered as foliar aphicides, could be deployed as seed treatments. The outputs from ongoing aphid projects within the current AHDB SCEPTREplus programme are also being closely monitored for outcomes that could be beneficial for *M. persicae* control in sugar beet.

33	Non-chemical solutions

Please provide details of any alternative non-chemical methods of control that are under development and whether any of these measures have already been implemented or when they will be implemented.

The BBRO has been working with breeding companies since the early 1990s to identify alternative genetic solutions for controlling virus yellows. Although progress has been made and is accelerating, this is a complex problem compounded by the need to identify resistance genes to three different viruses. To date no single major sources of virus resistance or tolerance has been identified to the three viruses BMYV, BChV or BYV (in contrast to rhizomania and beet cyst nematode sugar beet varieties that are now used widely in the UK).

The BBRO recently completed a five year, £1.13M collaboration with two sugar beet breeders (SES Vanderhave and MariboHilleshog) via an InnovateUK project (project number 102098; a novel pre-breeding strategy to reduce dependence on insecticides for virus yellows control in sugar beet; 2015-2020) and is exploiting and developing the genetic diversity found in beet relatives and identifying candidates exhibiting resistance and tolerance to virus yellows (see picture below). From this, we have developed a novel phenotyping approach to quantify resistance/tolerance traits and have worked to identify genes which protect against virus yellows foliar damage. Using this toolkit, we have undertaken a two-tier pre-breeding strategy. Firstly, tolerance quantitative trait loci (QTL) are currently being introgressed into modern breeding material, with hybrids being assessed for foliar health and yield. Secondly, new resistant candidates are being characterised, QTL identified, and molecular markers developed for future breeding. The outputs from this pre-breeding project are currently being consolidated by the breeders and will enable future production of new virus resistant or tolerant commercial varieties, bringing significant economic and environmental benefits.

In addition, BBRO continue to work under specific confidentiality agreements with three of the main European sugar beet breeding companies directly to develop and assist with their own in-house breeding efforts with the identification of additional virus yellows resistance (see picture below). In 2020 and 2021, the BBRO produced sufficient viruliferous aphids to inoculate over 90,000 plants in a number of separate field trials across East Anglia to accelerate breeding efforts to continue to identify solutions for this problem.

Due to the complex nature of this disease and the lack of major sources of virus disease resistance developing commercial varieties is very difficult. Even then these varieties will potentially only provide resistance to the individual viruses; stacking of any resistance traits alongside yield and bolting resistance would then need to be developed further. The concept of using gene editing to accelerate the development of virus yellows resistant sugar beet varieties is currently being discussed and we await the outcome of the recent government consultation on this technology.

Alongside our variety screening work, we have an extensive series of projects and trials looking at other aspects of virus reduction. BBRO has placed aphid and virus research at the very centre of its research programme to accelerate new pathways to provide integrated approached for the future as highlighted in the 2021 BBRO Annual Report BBRO Annual Report - BBRO. Examples of new/ongoing projects include:

• Evaluating the effects of undersown cover crops to help protect the sugar beet from aphids, especially the impact of undersowing with barley which has shown some positive effects in 2020 (Stevens & Bowen, 2021, Bowen, 2021, undersown-opinions.pdf (bbro.co.uk).

• Studying a range of flowering mixes to attract beneficial insects in the autumn to help boost beneficial numbers in the spring, ensuring they are present in sufficient numbers at the right time.

• Alongside flowering mixes, we are looking at the use of brassica species between rows to act as an attractant to aphids to pull them away from the sugar beet at the vulnerable time for infection.

• Following interesting work in New Zealand, BBRO are looking into the use of endophyte grasses to boost natural resistance in the sugar beet crop. There has been good data to support this theory for soil borne pests and the industry is interested to see if this can be replicated on aphids.

• We continue to look at the use of biofilms to protect crops against aphids. Whilst this presents challenges on several other fronts, its value for virus control is being investigated.

• We are also trying to understand more about the infection cycle within the plant and how this can change with different drilling and harvest dates to see if there are any local mitigation strategies that can be deployed.

In tandem with these practical approaches BBRO are involved in two PhD projects, which have started at the University of East Anglia and Wageningen University targeting some of the underlying science around aphids and virus (Beet Review May 2021 pages 34, 35). These are looking at:

1) Understanding the molecular strain variability of the virus yellows complex present in the UK and how this relates to breeding programmes

2) The mechanism of how mature plant resistance is triggered in plants and whether this can be used to identify novel control strategies.

This highlights the various and wide-ranging approaches BBRO is taking to help combat virus yellows in sugar beet. There is no quick solution, but complimentary activities, as highlighted above, could hold the key.

34	Progress from previous authorisation
Where this is a repeat application, please explain the progress towards a permanent solution that has been made since the previous application. Include timelines and projections for data/application for the permanent solution.	
See Virus Yellows Pathway table in section 32. The industry engaged in the Government's genetic technologies consultation and is committed to finding breeding solutions to virus yellows disease. Commercial discussions are ongoing with breeding companies to find solutions.	
Where this is the 3rd or more repeat, please provide justification why no permanent solution is available.	

Part H – Guidance

An emergency authorisation is granted under Article 53 emergency situations in plant protection of Regulation 1107/2009 (GB/NI).

The following link provides guidance on the process of how an emergency authorisation is granted.

Emergency authorisation webpage - http://www.hse.gov.uk/pesticides/topics/pesticide-approvals/pesticides-registration/applicant-guide/the-applicant-guide-emergen.htm

The Expert Committee on Pesticides (ECP) provide independent scientific advice on most applications submitted to HSE before an authorisation is granted. The following link provides guidance on the ECP process: http://www.hse.gov.uk/pesticides/topics/pesticide-approvals/pesticides-registration/applicant-guide/acp-guidance-on-emergency-a.htm

There must be a permanent solution planned for the emergency situation. This can be achieved either by a submission of an application for a new product, addition of use and/or pest to an existing product (Article 33), applying for an extension of authorisation for minor use (Article 51) or by other specified means.

I confirm ☒ (please tick to confirm):

1. **I have read the above guidance and accept a permanent solution to the emergency situation is being sought and details are supplied above.**
2. **Failure to confirm and provide the correct or sufficient information will result in this application being rejected.**

Note: Information held on a website may be used to provide further evidence to support an application. Hyperlinks used to direct HSE to the website can break, therefore, HSE requests that applicants copy the text into a separate document referencing the website at the end (Author. Website Date. Title of Page. [Date Accessed]. Copy of URL in full). This maintains the information should it be relied upon at a later date.

Using personal data

HSE is under a legal duty to protect any personal information we collect and we will only use that information in accordance with the law, including the General Data Protection Regulation (GDPR) (Regulation (EU) 2016/679), Data Protection Act 2018, the Freedom of Information Act 2000 and the Environmental Information Regulations 2004. We meet our obligations as part of UK Government to safeguard data and prevent any unauthorised access to it through use of technical, personnel and procedural controls. More details on Government security can be found on the Gov.UK Web site [https://www.gov.uk/government/collections/government-security]. In order to carry out our functions and respond to enquiries effectively, we will sometimes need to share information with other government departments, the emergency services, law enforcement agencies, public authorities (such as local authorities and the Environment Agency) and organisations acting on our behalf. However, we will only do this where it is required or permitted by law.