Grower Summary

FV 365a

The time of infection of overwintered cauliflower and Brussels sprout by Turnip yellows virus (TuYV) and the potential of insecticides to control the virus.

Final 2012

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Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

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Headline

This project has found ways for reducing aphid numbers in crops for better control of Turnip yellows virus.

Background

Turnip yellows virus (TuYV, formerly known as Beet western yellows virus) readily infects Brassicas, including oilseed rape and horticultural Brassicas e.g. Brussels sprouts, cauliflowers, cabbage, broccoli etc. It is transmitted by aphids and the peach-potato aphid, *Myzus persicae,* is considered to be the major vector.

Incidences of up to 55% and 60% were found in commercial Brussels sprout crops and commercial cauliflower crops respectively in the 2010-2011 season despite the relative lack of aphids during this period. Recent surveys have also shown up to 100% infection of plants in some oilseed rape fields in the UK.

Crop infection often goes undetected by growers as the symptoms are similar to those of stressed plants. However, the virus can have a big impact on crop quality and yield. It causes tipburn in cabbage. Project FV 365 demonstrated that yield loss caused by TuYV can be as high as 65% in some sprout varieties and 30% in some varieties of cauliflower and cabbage (FV 160b). The virus is especially common in areas where vegetable Brassicas are grown intensively (Lincolnshire, Kent, Cornwall) and also where they are grown alongside oilseed rape.

Oilseed rape represents a massive reservoir of virus which can infect horticultural Brassicas, putting crops with a long growing season (such as over-wintered cauliflower and Brussels sprouts) at particular risk of infection.

In order to determine the time of natural infection of cauliflower and Brussels sprout plants in the field by TuYV, experimental plots were grown within commercial crops in Lincolnshire and Kent. Plants in the plots were tested at regular intervals to determine when infection occurred during the growing season.

Fully replicated, controlled, glasshouse experiments were also carried out to determine the efficacy of various insecticide sprays, dummy seed-treatments and a pre-transplant drench in controlling TuYV infection.

Summary

- Turnip yellows virus (TuYV) causes significant reductions in yields of vegetable Brassicas, however growers are rarely aware of its presence, as infections are often symptomless.

- Levels of infection of Brassica crops with TuYV were strongly linked with peach-potato aphid numbers and infection is most likely to occur in June and July when numbers of aphids flying are particularly high.

- Results from insecticide trials in the glasshouse showed that some treatments, in particular those using dummy seed treated with Gaucho (Imidacloprid), or HDCI 043, were more effective than others in reducing TuYV infection. However, no treatments prevented plants from becoming infected. By combining such treatments with growing the least susceptible Brassica varieties (FV 160b and FV 365) and the best spray treatments (applied based on Rothamsted Insect Survey suction trap peach-potato aphid catches), growers can now start to optimise an integrated approach to TuYV control.

- Breeding crops with genetic resistance to the virus is likely to provide the best means of protection against TuYV and incorporating this in to an integrated control strategy will provide maximum protection against infection. In the meantime, the currently available components of an integrated control strategy need to be evaluated in the field.

Time of TuYV spread in the field

The amount of infection in experimental plots of Brassica plants growing in commercial fields in Lincolnshire and Kent was associated with the numbers of peach-potato aphids trapped in the Rothamsted Insect Survey suction trap closest to the experimental sites.

During the early summer months of June and July 2011, peach-potato aphid numbers were particularly high in Kirton, Lincolnshire, with over 1000 aphids trapped in the week beginning 4 July 2011. When sprout plants in the experimental plot were tested on 10 July 2011, 96% had become infected by TuYV. One month later all plants were infected. Given the loss of marketable yield (up to 65%) and quality that TuYV infection causes in sprouts, this level of infection could significantly reduce profitability.

Later in the growing season (September, October and November 2011), peach-potato aphid numbers were much lower (maximum of 44 caught in any one week during this period), resulting in much lower TuYV infection. Only 36% of sprout plants (which had been protected from infection by gauze sheeting up to late August) became infected.

Cauliflower plots transplanted in to the fields in mid-August in Lincolnshire and Kent had 8% and 2% infection respectively (maximum of 44 and 29 peach-potato aphids caught in any one week in Lincolnshire and Kent suction traps respectively during this period).

These results clearly indicate that infection is most likely to occur when numbers of peach-potato aphids caught in the local suction trap are high. In 2011, numbers were high in June and July in Lincolnshire, resulting in all experimental plants becoming infected. Later in the year after cauliflowers had been transplanted (August), the numbers of peach-potato aphids caught in the local suction trap were much lower and infection of cauliflower plants was also much lower.

In some years, the numbers of peach-potato aphids caught in suction traps later in the year are much higher and in such years later planted crops, such as overwintered cauliflower, will be at greater risk of TuYV infection than those in these trials.

The results from the project provide growers with knowledge of when their crops are most at risk of infection by TuYV and hence when control measures against aphids (e.g. insecticide applications) are required.

Efficacy of insecticide treatments in controlling TuYV

A robust, reliable and reproducible glasshouse assay for determining the efficacy of insecticides in controlling TuYV was developed, evaluated and successfully deployed in the project.

The experiments demonstrated that some insecticide treatments were more effective than others at controlling peach-potato aphids and reducing TuYV infection in Brassica plants.

The most effective treatments appeared to be those using treated dummy seed (Gaucho [Imidacloprid] and coded product HDCI 043).

With the exception of Movento (Spirotetramat) after 1 week, all insecticide treatments significantly reduced (relative to numbers on untreated plants) the numbers of peach-potato aphids on treated plants, after 1, 2 and 4 weeks of exposure to the aphids.

Despite reducing aphid numbers, none of the insecticide treatments prevented plants from becoming infected by TuYV. However, most significantly reduced the amount of virus detected in plants after exposure to peach-potato aphids carrying TuYV.

The insecticides Plenum (Pymetrozine), Movento, Biscaya (Thiacloprid), HDCI 040 (spray), HDCI 041 (spray), HDCI 042 (spray) and HDCI 044 (drench) significantly reduced the amount of virus detected in plants after exposure to peach-potato aphids carrying TuYV, though to varying degrees.

Plants sprayed with Aphox (Pirimicarb) did not have significantly lower levels of virus than control plants that received no insecticide treatment.

By using one of the effective dummy seed treatments combined with one of the best spray treatments, growers can now optimise TuYV control. That said, these treatments may not prevent the plants becoming infected, but hopefully will reduce the amount of virus in plants. At this stage there is no data on whether this will reduce the negative effects of TuYV on crop yield and quality.

Breeding genetic resistance to TuYV into crops is likely to give the best protection against the virus in future and could be the main stay of an integrated approach to TuYV control. In the meantime, currently available components of an integrated control strategy (including growing the least susceptible Brassica varieties with a dummy seed treatment and timing of foliar sprays to coincide with peak suction trap catches of peach-potato aphids) need to be evaluated in the field.

Financial Benefits

Using dummy seed treatments may reduce the amount of virus accumulating in plants in the field and thereby increase the yield and quality of crops, improving profitability.

Using the most effective insecticide sprays and timing their application(s) to coincide with peak peach-potato aphid flights (as detected in suction traps) will save time and money by avoiding applications that would have little, or no benefit.

Combining a dummy seed treatment with timed sprays of the most effective insecticides and less susceptible Brassica varieties (identified in FV365), will have associated financial benefits due to improvements in crop quality and yield.

Action Points

In order to control TuYV and reduce aphid numbers in crops:
When planting in May, June, or July, it would be advisable to use a dummy seed treatment (Gaucho). We would also advise monitoring your local Rothamsted Insect Survey suction trap catches of peach-potato aphids (*Myzus persicae*) and applying an effective foliar aphicide promptly when they start to be caught / numbers increase. Aphid bulletins can be accessed via the Rothamsted Insect Survey website: http://www.rothamsted.ac.uk/insect-survey/STAphidBulletin.php or on the HDC Pest Bulletin on the Syngenta Website.