Grower Summary

FV 416b

Brassicas: Treatments to control cabbage root fly

Final 2016

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Project title:	Brassicas: Treatments to control cabbage root fly
Project number:	FV 416b
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Report:	Final report, February 2016
Previous report:	n/a
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Location of project:	Warwick Crop Centre, University of Warwick, Allium and Brassica Centre, brassica crops in Cornwall.
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GROWER SUMMARY

Headline

Module-module variability in Dursban WG concentrations is higher than desirable. This problem could be more significant with a change in the products available for cabbage root fly control. Monitoring egg-laying can help to focus post-planting treatments. The cut-off time for an effective post-planting treatment appears to be between 7 and 10 days after egg-laying. It is possible for cabbage root flies to lay eggs on or through mesh netting covers which then will go on to develop into damaging larvae; there was an increase in damage as mesh size increased.

Background

For many years the cabbage root fly (*Delia radicum*) has been controlled on transplanted brassicas through the application of chlorpyrifos (Dursban WG) to the modules prior to transplanting. It was thought that the future of this treatment was uncertain; however it was announced early in 2016 that it will be available for the foreseeable future. Previous AHDB-funded projects (FV 416 and 416a) investigated the performance of the alternative treatment Tracer under sub-optimal conditions and the possibility of using other novel treatments. In addition, project FV 416a assessed application efficiency in commercial nurseries, which could become more significant with the likely removal of chlorpyrifos as a modular drench. Results raised questions about both the amount of insecticide applied to individual modules and the sampling approach that should be used to assess this.

There have been recent problems in Cornwall in relation to damage to overwintering cauliflower crops by third generation cabbage root fly. This has identified a need to re-assess control of this pest. Post-planting treatment is popular in Cornwall, so this project focussed on this treatment timing. However, counter to the situation with drench treatments, it was announced early in 2016 that chlorpyrifos will now no longer be available to apply post-planting.

Because there are no effective methods of insecticidal control of cabbage root fly most swede crops are enclosed with fine mesh netting. There are, however, problems associated with the use of fine mesh netting to exclude cabbage root fly from swede crops, particularly associated with pest damage occurring under the netting.

Specific objectives of the current project were to: 1) assess the application efficiency of module

drench treatments in a commercial nursery; 2) determine the utility of egg-sampling for determining the risk of damage to cauliflower plants in Cornwall and identify appropriate methods of cabbage root fly control and 3) identify and summarise the key problems associated with use of crop covers to control cabbage root fly on swede crops and determine whether changes in practice would improve control without compromising yield and quality.

Summary

Objective 1 Assess the application efficiency of module drench treatments in a commercial nursery.

Plant propagation modules were sampled immediately after treatment with Dursban WG in commercial plant raising nurseries. A total of 338 samples were taken from different nurseries and/or different applications. Samples were taken from across the glasshouse bay and from individual trays, frozen and transported to Warwick Cop Centre for analysis of chlorpyrifos residues. Mean dose and module-module variability were calculated (Table A).

Table A Residues in plant propagation modules (mg chlorpyrifos/module)

Batch	**A-28/05**		**A-17/07**		**B-01/06**		**B-20/07**		**C-24/07**		**D-22/09**	
Location	**Bay**	**Tray**	**Bay**	**Tray**	**Bay**	**Tray**	**Bay**	**Tray**	**Bay**	**Tray**	**Bay**	**Tray**
Mean	5.26	2.97	2.17	3.58	3.52	3.30	2.40	1.80	-	2.22	1.49	2.20
sd	2.95	0.98	1.01	1.87	1.19	1.22	1.22	0.90	-	0.76	0.68	1.00
CV %	56.2	33.1	46.3	52.4	33.9	36.9	50.8	49.9	-	34.2	45.3	45.7
Minimum	1.37	1.48	0.62	0.76	1.03	0.70	0.36	0.11	-	0.33	0.53	0.44
Maximum	11.33	4.87	4.63	8.91	6.35	5.77	4.37	3.40	-	3.47	2.80	5.03

The mean target dose (4.5 mg/module) was exceeded in one sample and in 5 samples the mean dose was less than 50% of target. Module-module variability was similar in all samples with most samples containing modules with very low doses which would probably not have provided adequate control of cabbage root fly.

Objective 2 Determine the utility of egg-sampling for determining the risk of damage to overwintered cauliflower plants in Cornwall by third generation cabbage root fly and identify appropriate methods of cabbage root fly control.

Sub-objective 2.1 Sampling cabbage root fly eggs in commercial crops

Five sites across Cornwall were sampled for a period of 24 weeks, late April to mid-September. Samples were taken once a week from 20 plants per crop, the eggs were extracted by flotation and counted. The information was summarised and a report was sent to growers once a week and also posted in the AHDB Pest Blog and on the AHDB/Syngenta Pest Bulletin. The data collected were compared with the AHDB cabbage root fly forecast output for Cornwall. Mean numbers of eggs across the five sites are displayed with the cabbage root fly forecast in Figure A. Overall the largest numbers of eggs were laid in the first generation and numbers recovered during the subsequent generations were surprisingly low, although growers reported some damage during this period. The forecast accurately predicted the first generation, but because the egg numbers were very low subsequently it is more difficult to distinguish the second and third generations.

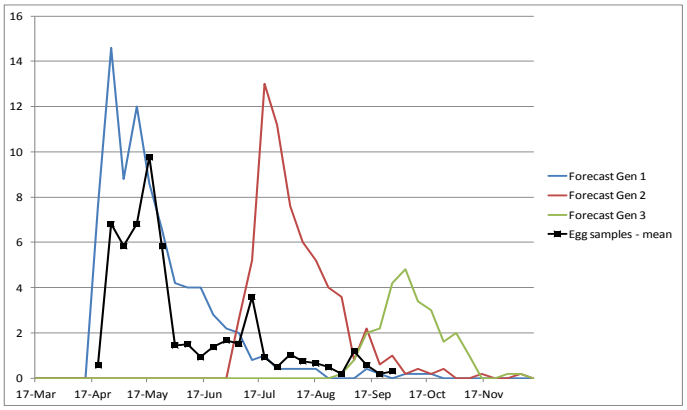

Figure A. Forecasts of egg-laying by cabbage root fly (percent per week) generated using weather data for Hayle in Cornwall, compared with the mean numbers of cabbage root fly (eggs per plant per week) averaged over all sites sampled in Cornwall.

Sub-objective 2.2 Potential approaches to control of cabbage root fly with post-planting treatments of approved and novel treatments

Trial 2a

This was undertaken to compare post-planting treatments (11 treatments). This was done in late summer (similar conditions to those at the time of third generation cabbage root fly activity in Cornwall – when temperatures are declining gradually). Cauliflower plants (cv Triomphant) grown in 308 Hassy trays were used. The trial was covered with insect-proof netting to exclude

the natural population of cabbage root fly as this might have confounded the results. Twelve plants per plot were inoculated with cabbage root fly eggs (10 eggs per plant) on 26 August. Treatments included a variety of individual plant, band sprays and overall sprays both with and without wetter. Disappointingly, the level of damage was low, possibly because conditions were unfavourable for survival of larvae, and there were no statistically significant effects of treatment on weight or the root damage score but it appeared that the overall spray treatments increased stem damage compared with the other treatments.

Trial 2b

This trial was undertaken to determine effect of treatment timing on level of control. Cauliflower plants (cv Triomphant) grown in 308 Hassy trays were used. The trial was covered with insect-proof netting to exclude the natural population of cabbage root fly as this might have confounded the results. Twelve plants per plot were inoculated with cabbage root fly eggs (10 eggs per plant) on 28 August. A post-planting drench treatment (Dursban WG – containing chlorpyrifos) was applied at different times (0, 4, 7, 10 14 and 21 days) after egg inoculation based on knowledge about the effect of temperature on cabbage root fly development. The aim was to answer the question 'when is it too late to try to control established infestations of larvae'? The results are shown in Figure B. Disappointingly, levels of root and stem damage were relatively low, possibly because conditions were unfavourable for survival of larvae, and there were no significant differences between treatments. However a clear reduction in levels of control can be observed between 7 and 10 days.

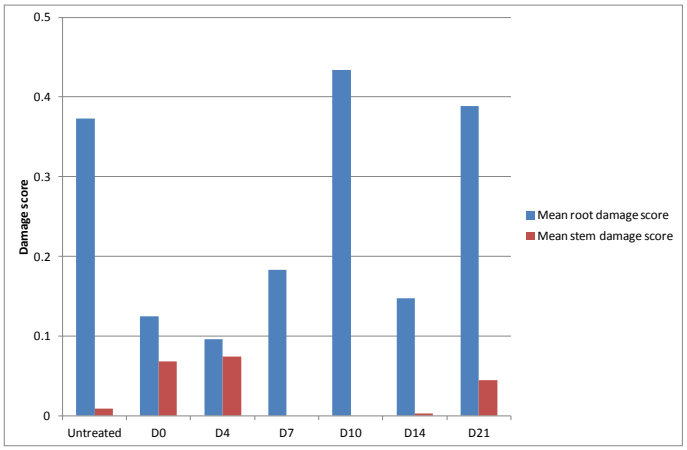

Figure B. Damage scores in roots and stems in Trial 2b.

Objective 3 Identify and summarise the key problems associated with use of crop

covers to control cabbage root fly on swede crops. Determine whether changes in practice would improve control without compromising yield and quality.

Trial 3a

Laboratory tests were undertaken to determine whether cabbage root fly eggs can be laid through, or on, fine-mesh netting covering brassica plants and whether these eggs will hatch and the larvae will reach the soil and feed on the roots, leading to root damage. Different gauges of mesh were evaluated (1.3, 0.8, 0.6 and 0.3mm). Pots containing radish plants were covered with netting of a specific grade and placed in cages containing female flies. The eggs/larvae were then allowed to develop. There was a relationship between mesh size and numbers of larvae/pupae recovered with numbers decreasing with decreasing mesh size, although the pattern varied between trials (Figure C).

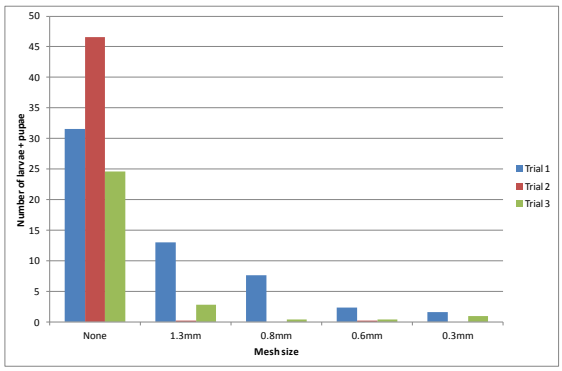

Figure C. The mean numbers of larvae + pupae recovered in Trial 3a.

Trial 3b

A field trial was undertaken at Wellesbourne to support the findings of the laboratory results. An area was sown with swede seed (cv Magres) on 30 July 2015. The trial was marked out into plots (1 bed x 2.5m) on 2 August. The treatments are summarised in Table B.

Table B Treatments applied in Trial 3b

Code	2 August	14 September
1	Cover with 1.3mm mesh	Release flies under nets directly on to plants (20 male + 20 female)
2	Cover with 1.3mm mesh	Cover with second mesh (0.8mm) and release flies between nets (20 male + 20 female)
3	Cover with 0.8mm mesh	Cover with second mesh (0.8mm) and release flies between nets (20 male + 20 female)
4	Cover with 0.6mm mesh	Cover with second mesh (0.8mm) and release flies between nets (20 male + 20 female)
5	Cover with 0.3mm mesh	Cover with second mesh (0.8mm) and release flies between nets (20 male + 20 female)
6	Cover with 1.3mm mesh	Uncovered to expose to natural population

The trial was harvested on 8 December and analysis of the data showed statistically significant effects. All of the roots from plots uncovered from 14 September, and 40% of roots in the plots where flies were released under the net covers, were damaged. The roots from plots covered with mesh suffered from 3-12% damage depending on mesh size; the level of damage increased as the mesh size increased. The overall yield was greatest from the plots uncovered from 14 September. There was no difference in overall yield between the four covered treatments.

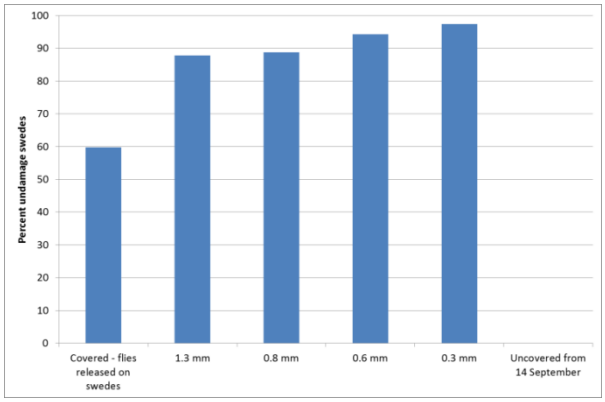

Figure D. The percentage of roots undamaged by cabbage root fly larvae in Trial 3b

The maximum mesh size which is likely to reduce/eliminate the problem appears to be 0.6mm which is less than half the width of the standard 1.3mm cabbage root fly net and may cut out unacceptably large amounts of light for good growth of swede crops.

Financial Benefits

All brassica crops are treated prophylactically to control cabbage root fly. In the absence of effective control measures crop losses might be 10% or even higher. The value of Home Production Marketed in 2014 was approximately £200 million (Defra Horticulture Statistics 2014). Thus a 10% loss in yield would equate to £20 million.

Action Points

1. Growers and their propagators need to consider how they might best achieve a uniform distribution of pesticide at the recommended dose when drench treatments are applied to modules. This may be more critical if Dursban WG is withdrawn.
2. If growers need to apply post-planting treatments then there is an indication that these should be applied within a week of transplanting and sooner if possible.
3. Monitoring egg-laying can help to focus post-planting treatments.
4. It is possible for cabbage root flies to lay eggs on or through mesh netting covers which will go on to develop into damaging larvae; more damage occurred on plants covered by larger mesh sizes.