Grower Summary

FV 435

Evaluating aphid control strategies on lettuce

Final 2014

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HDC
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel – 0247 669 2051

HDC is a division of the Agriculture and Horticulture Development Board.

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Project Leader:	Gemma Hough, ADAS
Contractor:	ADAS UK Ltd University of Warwick
Industry Representative:	Emma Garrod, G's Growers
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GROWERS SUMMARY

Headline

The insecticide loading on Iceberg lettuce seed could be reduced to 80g/ha for Gaucho (imidacloprid) or 60g/ha for Cruiser (thiamethoxam); these lower insecticide loadings provide the same level of control as standard treated seed or dummy pills.

Background

Currently in the UK, lettuce root aphid is effectively controlled with the neonicotinoid seed treatments imidacloprid (Gaucho) and thiamethoxam (Cruiser), which also provide control of foliar feeding aphids for many weeks after transplanting. However, depending on the lettuce variety and its planting density, the seed loading is adjusted so that the maximum total dose of neonicotinoids per hectare per year is not exceeded. This has shown that varieties such as Little Gem, which are planted at higher densities using lower seed loadings (e.g. Gaucho at 80 g/ha), are still protected from aphids. Therefore, growers could reduce their pesticide usage and associated costs if they could lower the seed loading of other varieties planted at lower densities such as Iceberg (Gaucho at 120 g/ha is commonly used) without increasing the risk of aphid infestation, particularly lettuce root aphid. In addition, seed treatments can be associated with phytotoxicity problems but methods to reduce these negative effects, e.g. dummy pills, are not widely used due to concerns about residues, which have not been tested.

Prior to the use of neonicotinoids, lettuce root aphid was a significant problem, particularly near areas with poplar wind breaks when control measures were not used, due to the pest overwintering on poplar. However, since the use of neonicotinoid seed treatments lettuce root aphid has been controlled effectively and no further research has been conducted to identify alternative insecticide treatments with different modes of action which could be used instead of seed treatments. Information about alternative treatments would allow growers to diversify their aphid control strategies. Furthermore, due to the current restrictions on the use of certain neonicotinoids on crops attractive to bees, identifying alternative treatments would be useful for growers should further restrictions be imposed on the use of neonicotinoid seed treatments on lettuce.

The aim of this project was to determine and compare the persistence and efficacy of seed treatments currently used, seed treatments with lower loadings of pesticide, dummy pills, spirotetramat (Movento) and other ‘novel’ systemic insecticides for the control of lettuce root aphid and a foliar feeding aphid, the currant-lettuce aphid.

Summary

Objective 1 and 2: Establish and maintain a lettuce root aphid culture

The lettuce root aphid, *Pemphigus bursarius* overwinters as an egg on poplar trees (Lombardy and Black poplar). In the spring, the eggs hatch and the nymphs feed on the petioles which, in response to aphid feeding, develop a gall which encloses the aphids. A method of collecting lettuce root aphid galls (Figure 1a) and enclosing them in an insect proof cage containing lettuce led to the establishment of a lettuce root aphid culture at ADAS Boxworth (Figure 1b). Additionally, winged lettuce root aphids were observed emerging from the galls which were collected at Warwick Crop Centre, Wellesbourne from 2 June onwards. Warwick Crop Centre also provided transplants infested with lettuce root aphids for the ADAS culture.

a)  b) 

Figure 1 a) lettuce root aphid gall b) Lettuce root aphid infestation

Objective 3: Determine the efficacy and persistence of seed treatments using reduced rates of insecticide and evaluate alternative methods for control of lettuce root aphid and currant-lettuce aphid on Iceberg lettuce grown in pots in a polytunnel.

Materials and methods

The trial consisted of 11 treatments (Table 1) and was carried out in a polytunnel at ADAS Boxworth. Each treatment had eight replicates and each replicate was a lettuce plant in a 3 Litre pot. The efficacy and persistence of each treatment was evaluated by challenging plants with aphids at different growth stages (at transplanting, two weeks after transplanting and four weeks after transplanting). The lettuce variety was Iceberg cv. Excalibur. Treated and untreated seed was provided by Shamrock Seeds and dummy pills were supplied by Syngenta, UK. Movento spray treatments were applied using a knapsack sprayer fitted with 02F110 nozzles in 200 l/ha (lower water volume used than the 300-600 L/ha recommended

on label). Treatment 10 was applied by soaking seed overnight in a solution at 5°C (refrigerator). Treatment 11 was applied in 0.5 ml solution using a 1 ml transfer pipette.

Table 1 Treatments used in the pot trial at ADAS Boxworth, their active ingredients, application methods and application rate.

Trt. num	Product name	Active Ingredient	Application method	Rate
1	Untreated			
2	Cruiser	thiamethoxam	Seed treatment	80 g/ha (Standard rate)
3	Cruiser	thiamethoxam	Seed treatment	60 g/ha (Lower rate)
4	Gaucho	imidacloprid	Seed treatment	120 g/ha (Standard rate)
5	Gaucho	imidacloprid	Seed treatment	80 g/ha (Lower rate)
6	Cruiser	thiamethoxam	Dummy pill	80 g/ha
7	Gaucho	imidacloprid	Dummy pill	120 g/ha
8	Movento	spirotetramat	Foliar spray	1 application at transplanting (product applied at 0.5 L/ha, applied prior to infesting with aphids)
9	Movento	spirotetramat	Foliar spray	2 applications (product applied at 0.5 L/ha) one applied at transplanting, one applied 2 weeks after first (applied prior to infesting with aphids)
10	HDCI 063	-	Transplant drench pre-planting	15ml/1000 plants
11	HDCI 064	-	Seed treatment	4µM solution

On 21 July, 24 lettuce transplants for seed treatments T1, T2, T3, T4, T5, T6, T7 and T11 were potted up into 3 Litre pots. The seed treatments were assessed in a separate trial to the foliar treatments and drench treatments due to poor and variable germination of the lettuce seedlings (attributed to the seeds falling too deeply in the blocks).

At transplanting on the 21st of July eight of the 24 plants from each treatment were infested with eight lettuce root aphids and eight currant-lettuce aphids. The numbers of aphids were then assessed two weeks later, on the 6th of August.

Two weeks after transplanting eight of the remaining 16 plants were infested with eight lettuce root aphids and four currant-lettuce aphids (5-6 August) and assessed two weeks later, on the 20th and 21st of August. The remaining eight plants were infested with eight lettuce root aphids and four currant-lettuce aphids four weeks after transplanting (21-22 August) and were assessed two weeks later (4-5 September).

Currant-lettuce aphids were placed onto the foliage and eight lettuce root aphids were placed on the roots (either to the underside of the peat block before it was transplanted or to the roots at the side of the pot at later infestations). Each plant was then covered in a pot topper cage and arranged in a randomised design in the polytunnel.

When the plants were assessed, the foliage was sampled destructively and the numbers of wingless currant-lettuce aphids were recorded. To assess the number of lettuce root aphids per plant, any substrate containing aphids and their waxy deposits was placed in water so the aphids would float and could be counted.

On 23 July, further lettuce seed was sown to complete the foliar spray treatments and drench treatments trial (T1, T8, T9 and T10) (Table 1). Germination was uniform and on 14 August plants were potted up into 3 Litre pots. Plants for treatments 8 and 9 were sprayed with Movento at transplanting (0.5 l/ha, water volume 200 l/ha). Treatment 9 was sprayed a second time with Movento two weeks after transplanting. The method described above for the seed treatments was used to test their efficacy and persistence. Eight clean plants were infested with aphids on 14-15 August (at transplanting), 29 August (two weeks after transplanting) and 11 September (four weeks after transplanting) and assessed on 28-29 August, 11 and 26 September respectively.

Objective 4: Determine the efficacy and persistence of seed treatments using reduced rates of insecticide and evaluate alternative methods for control of lettuce root aphid and currant-lettuce aphid on Iceberg lettuce in the field

Materials and methods

Lettuce root aphid: Three sequential sowings of lettuce cv Excalibur were made at Warwick Crop Centre on 20 May, 27 May and 3 June to provide plants for three sequential plantings (to maximise the chances of catching the lettuce root aphid migration and determine the impact of aphid arrival at different stages of crop development). The trial consisted of 11 treatments (Table 1 but with 2 x 4 replicates of the untreated control) and each replicate consisted of 20 plants transplanted on each of three dates (60 plants/plot in total). The plots were 4.9 m x one bed (1.83 m each) in size. The transplanting dates were: 10 June, 18 June and 24 June. Plants were transplanted at a spacing of 35 cm within rows and 35 cm

between rows. Treatments were applied as described previously except all spray treatments were applied in 300 l/ha. The sprays were applied on 10 June (T8 and T9) and 24 June (T9), 18 June (T8 and T9) and 1 July (T9) and 24 June (T8 and T9) and 8 July (T9) for the first, second and third plantings respectively. The plots from the three plantings were assessed for infestation by lettuce root aphid on 25 July, 5 August and 12 August respectively by digging up 10 plants per plot and scoring the roots for the number of aphids.

Currant lettuce aphid: Seeds of lettuce cv Excalibur were sown on 22 August and a single planting was made on 17 September. The trial consisted of 11 treatments x four replicates (but with 2 x 4 replicates of the untreated control) (Table 1) and each replicate consisted of 14 plants in a single row. The plants were transplanted at a spacing of 35 cm within rows and 50 cm between rows and plots were 4.55 m x one row (1.83 m each) in size.

Laboratory-reared currant-lettuce aphids were confined on five plants per replicate in clip-cages (five aphids/plant) on two occasions (two weeks after transplanting and three weeks later). The plants were infested on 30 September and 20 October. The plots were protected from wind and rainfall by covering them with fleece. The numbers of aphids remaining in the clip cages were recorded on 7 October and 27 October. The first Movento spray was applied on 23 September (6 days after planting) and the second application was made on 10 October (23 days after planting).

Results

Currant-lettuce aphid

- Both the field trial and the pot trial showed that all the seed treatments (except HDCI 064) reduced the number of currant-lettuce aphids compared to the control. The pot trial showed that the seed treatments provided control of the aphids until the last assessment day (four weeks after transplanting). In contrast, the field trial showed that that these treatments were no longer effective 5 weeks from transplanting.
- Control of currant-lettuce aphid was similar between the standard and lower seed loading rates for Cruiser and Gaucho on Iceberg. Dummy pills were also just as effective as the standard seed treatments.
- The pot trial showed that after the second application of Movento there was a significant reduction in the number of currant-lettuce aphids compared to the control. The treatment was still effective two weeks after application. The lack of control observed in the pot trial after one application is possibly due to the timing of the application which was made on the day of transplanting when the plants were not growing actively. However, no aphid control was observed in the field trial after either

one or two applications when the first sprays were applied six days after transplanting (one week before the aphids were placed on the plants). The difference between the pot and field experiments in efficacy following the second application of Movento could be due to the differences in the concentration used (pot trial - 0.5 l/ha in 200 l of water per hectare (lower water volume used than label recommendation); field trial - 0.5 l/ha in 300 l of water per hectare).

- No statistically significant effect of the novel transplant drench treatment was observed against currant-lettuce aphid in the pot trial but there was a significant effect in the field trial.

Lettuce root aphid

- In the pot trial, only Gaucho reduced the number of lettuce root aphids at transplanting. Two and four weeks after transplanting no differences between treatments were observed, due to the variation between replicates, but some replicates had very high establishment of aphids. Results from the field trial showed that the seed treatments had a statistically significant effect in reducing the number of aphids per plant compared to the control. It is hypothesised that the seed treatments control lettuce root aphids during their short foliar-feeding stage rather than controlling infestations developing on the roots which would explain the differences in control observed between the pot trial and field trial.
- In the pot trial, the efficacy of Movento and the transplant drench against lettuce root aphid was not determined due to poor establishment of the aphids. Results from the field trial suggested that Movento and the novel transplant drench had efficacy against lettuce root aphids. In both the pot and field trial, Movento sprays were applied on the day of transplanting.
- All the samples sent for residue testing were found to be below the EU maximum residue limits.

Financial Benefits

This study suggests growers could reduce costs by reducing the seed treatment loading (Gaucho 80g/ha, Cruiser 60g/ha) for Iceberg and achieve the same level of control as using standard rates (Gaucho 120g/ha, Cruiser 80g/ha).

Action Points

- Time application of Movento carefully for optimum efficacy.
- Consider reduced seed treatment loading rates on Iceberg.
- Consider insecticide resistance management, as reduced dose rates may be linked to an increased risk of insects developing resistance.
- Since this project began, changes in regulation have cast some doubt over the future use of dummy pills as they may now require approval as a plant protection product. Keep in touch with HDC for further information regarding approvals of dummy pills and seed treatments.