

Grower Summary

FV 414

Optimising carrot fly control
using pyrethroids and Coragen®

Final 2014

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Contractor/(s):	University of Warwick
Industry Representative:	Mr Ian Hall, Tompsett Burgess Growers Limited
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Further information

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GROWER SUMMARY

Headline

A single spray of Coragen® can persist for at least 6 weeks but is insufficient, on its own, to provide more than about a 25% reduction in damage. Two sprays of Coragen® timed 1 week before carrot fly emergence and 3 weeks after, or at 0 and 2 weeks after emergence, offered similar levels of damage reduction to a full pyrethroid programme. Timing of Coragen® applications may not be as critical as Hallmark applications but they should be applied at the start of a programme to get maximum benefit from these treatments.

Background

An authorisation for the use of `Coragen®` on carrots was approved following an application submitted to the UK regulators by the HDC. The EAMU (0615/2012) was emailed to growers on 24 April 2012. This new EAMU (formerly SOLA), permits the use of 'Coragen®' (active ingredient DuPontT Rynaxypyr® chlorantraniliprole) as an insecticide for controlling carrot fly on carrot.

For nearly 20 years, carrot fly (*Psila rosae*), has been controlled effectively using pyrethroid insecticides, applied either as seed treatments or foliar sprays (lambda-cyhalothrin, deltamethrin, tefluthrin seed treatments). Whilst there is no evidence that populations of carrot fly have become resistant to pyrethroids, the addition of this new active offers industry another tool to control this pest and could reduce the risk of resistance developing through reliance on just one group of insecticides.

In HDC-funded trials (FV 312 and FV 375) looking at the control of carrot fly, Rosemary Collier and Andrew Jukes of Warwick Crop Centre demonstrated that programmes containing Coragen® provided levels of control that were at least as effective as, and sometimes better than, the standard insecticide programme used in the trials. As this is a new active for carrot growers, a summary document was produced in May 2012 to summarise the results from HDC projects FV 312 and FV 375 and this was sent to growers.

However, Coragen® is more expensive than foliar sprays of pyrethroids and so it is important to work out where Coragen® would fit best in a spray programme for carrot fly control. In the projects FV 312 and FV 375, Coragen® was used in the same way as a pyrethroid insecticide might be used in terms of timing and the intervals between treatments. However,

there are indications that it may be possible to 'optimise' its use and this requires a better understanding of the activity and persistence of individual Coragen® treatments and therefore of the likely role of Coragen® in a full spray programme.

Summary

Four trials were conducted. Two field trials investigated the persistence and timing of Coragen® sprays. In the laboratory, two trials were conducted to look at mortality of carrot fly adults and larvae after Coragen® sprays.

Field trials

Both trials were conducted in a field adjacent to the field where a population of carrot fly (*Psila rosae*) is maintained. Carrot seed (cv Nairobi) was drilled on 4 June 2013 and the carrots were harvested on 12 November. The roots were classified into categories according to the extent of carrot fly damage. The damage categories were 0%, <5%, 5-10%, 10-25%, 25-50% and >50% of the surface area affected by carrot fly. These equate to damage scores of 0, 1, 2, 3, 4 and 5 respectively. The total weight of roots in each plot and the mean root weight were also recorded.

Persistence trial

After drilling, the whole trial was covered with horticultural fleece to exclude adult carrot flies. The trial contained 4 replicates of 5 treatments (4 spray treatments and an untreated control). On each spray occasion, Coragen® was applied at 175 ml product/ha in 300 l/ha water using a Knapsack sprayer. Single sprays were applied 6, 4, 2 and 0 weeks before exposure to carrot flies. The fleece was removed for spray applications then replaced immediately. After the final spray application the fleece was not replaced and the trial was left open to carrot fly invasion. Although not statistically-significant there was a clear reduction in damage as a result of all of the treatments compared to the untreated control, but there were no consistent differences between spray treatments, suggesting that Coragen® applied 6 weeks before exposure to flies was as effective as the Coragen® applied immediately before exposure to flies (Figure A).

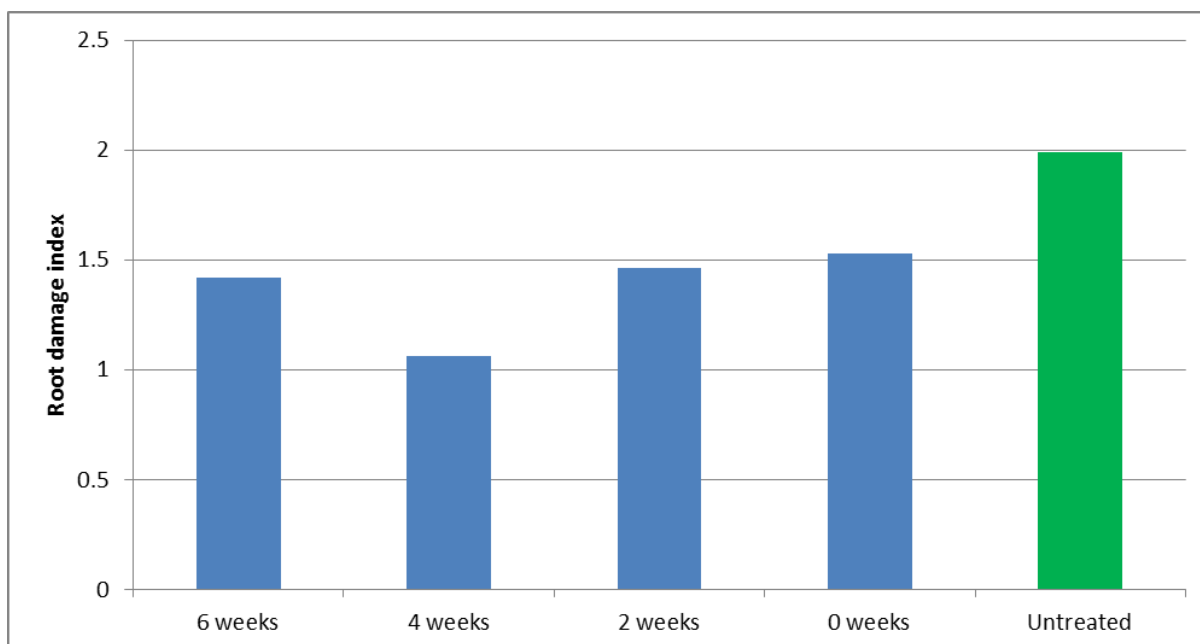


Figure A The mean Root Damage Index of carrot roots – persistence trial

Timing trial

The trial contained 4 replicates of 5 treatments (4 spray programmes and an untreated control). Spray timing was determined using the HDC carrot fly forecast. Week zero was taken as the forecasted date for 10% emergence of second generation carrot fly. The treatments included a full pyrethroid programme, a single spray of Coragen® and two two-spray Coragen® programmes (0 + 2 weeks and -1 + 3 weeks). All Coragen® sprays were applied at 175 ml product/ha and all sprays were applied in 300 l/ha water using a Knapsack sprayer. The analysis of root damage was statistically significant and there was a clear reduction in damage in all of the treatments compared to the untreated control. Coragen® (applied at -1 and 3 weeks), Coragen® (applied at 0 and 2 weeks) and the full pyrethroid programme had significantly less damage than the untreated control and the single spray of Coragen® but there were no statistically significant differences between either 2 spray Coragen® treatment and the full pyrethroid programme (Figure B).

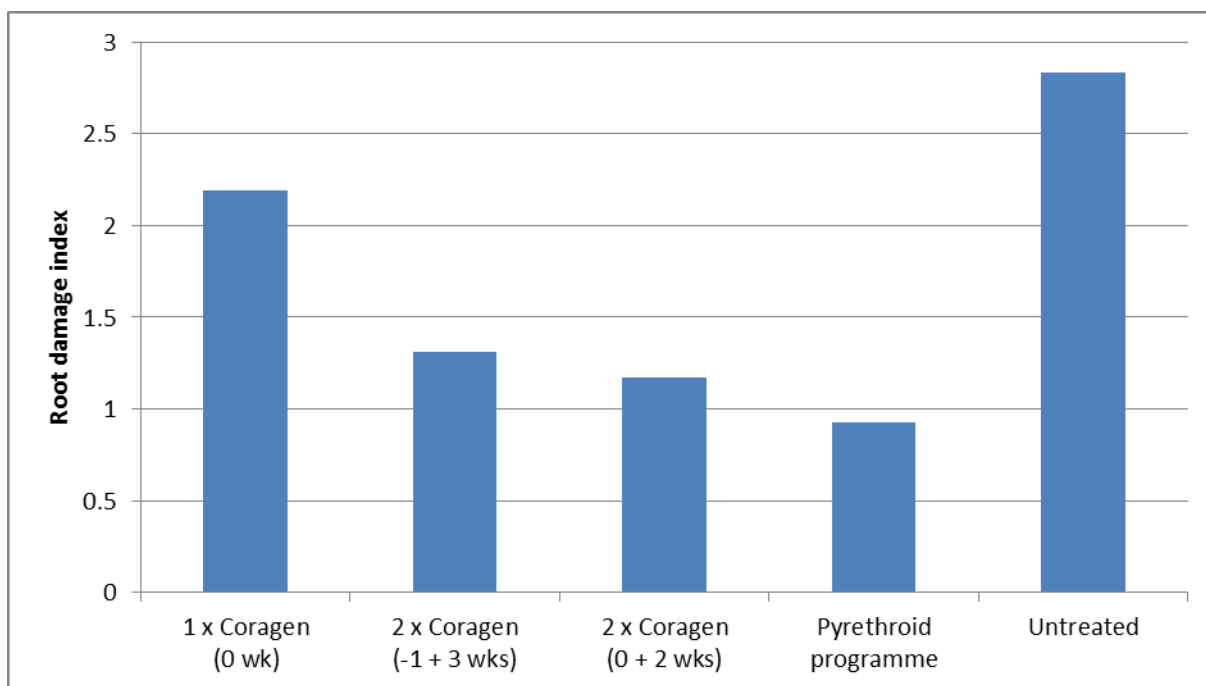


Figure B The mean Root Damage Index of carrot roots – timing trial.

Laboratory trials

Mortality of adult carrot flies exposed to Coragen® spray residues

Field grown carrots were transplanted into 11 cm square pots (2 roots/pot) in M2 compost during January 2014 when the previous years' summer foliage had died-back. The plants were kept at 15°C until approximately 50 mm of foliage had regrown. On three occasions five pots were taken outside and Coragen® was applied at 175 ml product/ha in 300 l/ha water using a Knapsack sprayer. The pots were transferred into insect cages (1 pot/cage) containing fresh water and sugar solution. Five untreated pots were placed in similarly prepared cages. Twenty laboratory-reared carrot fly were placed in each cage. Carrot fly mortality was assessed up to 7 days after spraying. Whilst Coragen® sprays increased adult mortality compared with untreated controls in some instances, the level of mortality was relatively low and results were variable.

Mortality of carrot fly larvae exposed to Coragen® spray residues

Carrot seeds (cv Nairobi) were sown in F2S compost and maintained at 18°C until they had two true leaves. Fifty seedlings were transplanted into 7 cm square pots (1 plant/pot) containing sterile loam soil. The seedlings were allowed to grow to about 50 mm before treatments were applied. Before application of treatments the pots were inoculated with 5 carrot fly eggs obtained from a laboratory-reared culture. The treatments were targeted at either the foliage or the soil. To exclude treatments from the foliage, the plants were covered with 50 ml centrifuge tubes (supported on small sticks) and to exclude treatments from the soil, the soil surface was covered with tissue paper. The pots were taken outside and treatments were applied in 300 l/ha water using a Knapsack sprayer. Ten pots were treated with each treatment and the trial was done on two occasions. The treatments were either Coragen® at 175 ml/ha or Hallmark at 150 ml/ha. After spraying, the tubes and paper were removed and the pots were returned to the Insect Rearing Unit where they were maintained at 15°C. Damage to the carrot roots and larval survival (number of pupae) were assessed and treatment differences for root damage were almost statistically significant ($p=0.06$). The treatment where Coragen® was applied to the soil appeared to be the most effective.

Financial Benefits

Even a small amount of carrot fly damage can reduce the quality and value of a carrot crop. Whilst there is no evidence that populations of carrot fly have become resistant to pyrethroids, the addition of a new active with a different mode of action offers the industry another tool to control this pest and could reduce the risk of resistance developing through reliance on just one group of insecticides. However, Coragen® is more expensive than pyrethroid insecticides. This project confirms the efficacy of Coragen® and shows that there is potential to reduce the total number of spray treatments applied to the crop.

Action Points

- A single spray of Coragen® can persist for at least 6 weeks but is insufficient, on its own, to provide more than about a 25% reduction in damage.
- Two sprays of Coragen® timed 1 week before carrot fly emergence and 3 weeks after, or at 0 and 2 weeks after emergence, offered similar levels of damage reduction to a full pyrethroid programme.
- Timing of Coragen® applications may not be as critical as Hallmark applications but they should be applied at the start of a programme to get maximum benefit from these treatments.
- In terms of insecticide resistance management, it is best practice to alternate treatments with different modes of action.