HORTICULTURE

Grower Summary

FV 408a

Baby-leaf Cruciferae: Improved control of *Scaptomyza flava* (extension to FV 408)

Final 2015

Disclaimer

The results and conclusions in this report may be based on an investigation conducted over one year. Therefore, care must be taken with the interpretation of the results.

Use of pesticides

Only officially approved pesticides may be used in the UK. Approvals are normally granted only in relation to individual products and for specified uses. It is an offence to use non-approved products or to use approved products in a manner that does not comply with the statutory conditions of use, except where the crop or situation is the subject of an off-label extension of use.
Before using all pesticides check the approval status and conditions of use.
Read the label before use: use pesticides safely.

Further information

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

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Project Number:	FV 408a
Project Title:	Baby-leaf Cruciferae: Improved control of Scaptomyza flava (extension to FV 408)
Project Leader:	Gemma Hough
Contractor:	ADAS
Industry Representative:	Will Archer, Independent Agronomist
Report:	Final Report 2015
Publication Date:	05/11/2015
Previous report/(s):	Interim report, November 2014
Start Date:	01 February 2013
End Date:	31 July 2015
Project Cost:	£26,461.00

GROWER SUMMARY
Headline

Potential products have been identified which may be useful for controlling *Scaptomyza* species; the AHDB Horticulture Crop Protection team are aware of the need to get the best performing products approved for leafy crops and they will continue to discuss opportunities with the manufacturers of the products.

Background

During summer 2009, leaf miners caused serious economic damage to watercress and Cruciferae grown as baby-leaf salads in central, eastern and southern England. In severe cases up to 40% of leaves were damaged. As a result, growers incurred economic losses resulting from increased pesticide applications, crop rejection and additional packhouse labour inputs. In HDC project FV 376, *Scaptomyza flava* was identified as the pest responsible for the damage.

In FV 376, crop covers were shown to be the only effective measure for the control of *S. flava* and, as in FV 376 the subsequent project, FV 408, did not identify any effective pesticides in a field trial. However, in FV 408, two experimental products and spinosad (Tracer) gave effective kill of adult *S. flava* in leaf dip laboratory tests. This project aimed to build on previous work and identify insecticides which could provide reliable control of *S. flava* on baby-leaf Cruciferae.

Summary

Culturing Scaptomyza spp.

A culture of *Scaptomyza* spp. is maintained at ADAS, Boxworth in insect-proof cages containing rocket. Due to difficulties in culturing *Scaptomyza* adults in high enough numbers needed for the experiments to have good replication, visits to a commercial crop in East Anglia were made and *Scaptomyza* spp. were collected by sweeping a net above the crop on a warm still day. As the adults were collected from the field it was impossible to confirm each adult as *S. flava* and not another other closely related rocket leaf mining species such as *Scaptomyza pallida* or a mixture of species without killing them first. Therefore the work and this report now refers to *Scaptomyza* spp and not *S. flava*.

Objective 1: Determine the survival of S. flava (now Scaptomyza spp.) adults on pesticide-treated rocket leaves under controlled laboratory conditions.

The survival of *Scaptomyza sp.* adults on pesticide-treated rocket leaves under controlled laboratory conditions was determined. A fully expanded rocket leaf was dipped into the insecticide treatment to represent spraying to run-off. The leaf was allowed to dry on a mesh tray before being placed in a ventilated container with a piece of cotton wool soaked in a 1:1 solution of honey and water as a food source for the adult flies. Two *Scaptomyza* sp. adult flies were added to each container.

The experiment consisted of 11 treatments (Table 1) with five replicate containers each (10 flies per treatment- 110 flies in total). After 24 and 48 hours the numbers of live and dead flies were recorded.

Table 1 Treatments used in Objective 1

Trt. Num	Treatment name/code	Active ingredient	Rate	Approval status on outdoor rocket
1	Untreated	-	-	-
2	HDCI 059	-	-	Not approved (approved on certain other crops in UK)
3	Hallmark	lambda-cyhalothrin	75 ml/ha in 300 litres of water per hectare	EAMU 0636/2006
4	Movento	spirotetramat	0.5 l/ha in 300 litres of water per hectare	EAMU 2410/2010
5	Tracer	spinosad	200 ml/ha in 300 litres of water per hectare	EAMU 1290/2008
6	HDCI 045	-	-	Not approved in UK
7	HDCI 046	-	-	Not approved (approved on certain other crops in UK)
8	HDCI 047	-	-	Not approved in UK
9	HDCI 062	-	-	Not approved in UK
10	HDCI 060	-	-	Not approved in UK
11	HDCI 061	-	-	Not approved in UK

After 24 hours, HDCI 060 and Tracer were the best performing products reducing the mean number of live *Scaptomyza* flies to 0 and 0.2 respectively (Figure 1). After 48 hours, Tracer, HDCI 060, HDCI 045 and HDCI 047 were the best performing products reducing the mean number of live *Scaptomyza* flies per pot to 0, 0, 0.2 and 0.4, respectively.

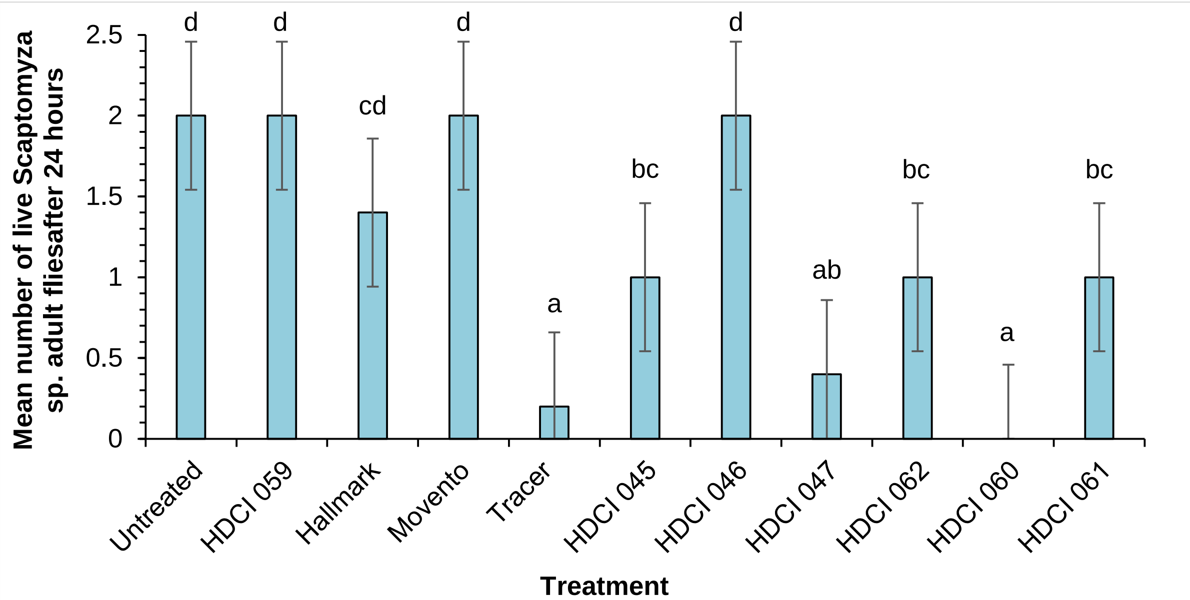

Figure 1 The mean number of live *Scaptomyza* sp. adult flies alive after 24 hours with 95% confidence limits (treatments that share the same letter are not significantly different from each other).

Objective 2: Record the survival and leaf puncturing damage of *S. flava* (now *Scaptomyza* spp.) adults on whole rocket plants following spray application under semi-field conditions.

The experiment consisted of five treatments including an untreated control. Four of the best performing products from Objective 1 were selected including Tracer, HDCI 045, HDCI 047 and HDCI 060. Each treatment had five replicate plots. Each plot consisted of an insect-proof cage containing two pots, each of which had one plug of organic rocket, untreated with insecticides (cv. Montana purchased from Delflands Nurseries in 144 plug trays). Plants were sprayed with a pot sprayer and arranged in the cages. The experiment took place in a glasshouse compartment at ADAS, Boxworth.

Four adult female *Scaptomyza* spp. were then added to each cage. Each cage had a dish containing cotton wool soaked in a 1:1 solution of honey and water as a food source for the adult flies. After 72 hours the number of live *Scaptomyza* spp. adult flies and the number of leaf punctures were recorded on every plant in each cage.

All of the treatments significantly reduced the mean number of live adults, mean number of leaf punctures per plant, mean number of leaf mines developing per plant and the mean percentage of punctured leaves per plant, compared with the untreated control. All the treatments were equally effective in all of the assessments except for the assessment of live adults where Tracer, HDCI 045 and HDCI 060 were significantly more effective in reducing the number of live females per cage compared with HDCI 047. Figure 2 shows the mean percentage of punctured leaves per plant. The untreated had a mean of 31.1% of leaves per plant with punctures (Figure 2). All the treatments performed equally well in reducing the mean percentage of leaves per plant with punctures to between 3.1 – 5.4%.

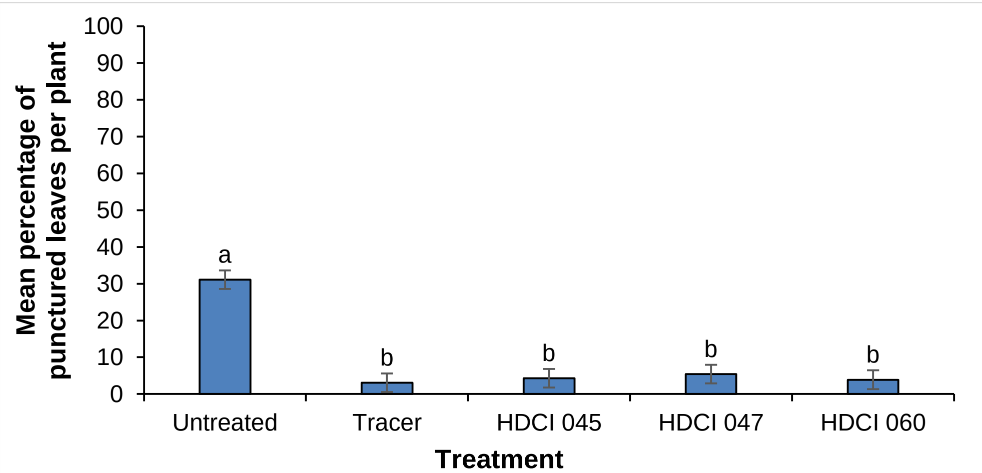

Figure 2 Mean percentage of punctured leaves per plant (treatments that share the same letter are not significantly different from each other).

Objective 3: Determine whether pesticide-treated plants are repellent to S. flava (now Scaptomyza spp.) adults under semi-field conditions.

The experiment consisted of the same four treatments as in Objective 2 compared with an untreated control. Each treatment had four replicates. Each replicate plot consisted of a large insect-proof tent cage (1.45m wide x 1.5m tall) containing eight pots; each pot contained one plug of organic, untreated rocket purchased from Delfland Nurseries. Plants were sprayed using a pot sprayer and the eight pots were arranged in a circle in each cage and the positions were alternated between treated and untreated plants (Figure 3).

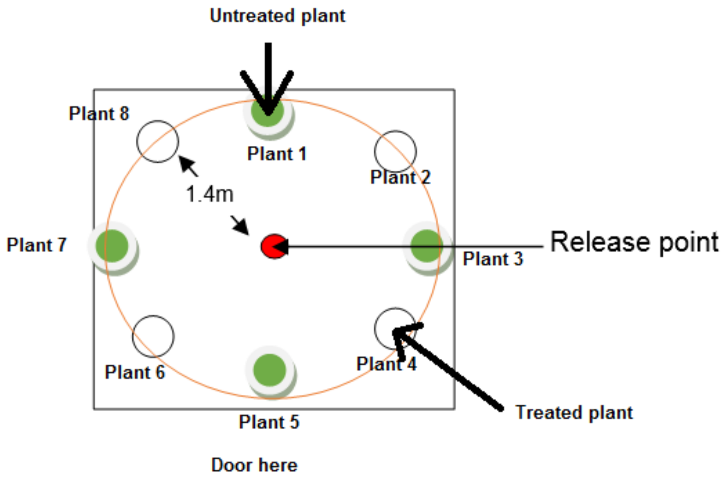

Figure 3 Layout of repellency experiment.

Eight adult female flies were released into each cage from a central position. Due to the low number of flies available, two replicates were set up on 3 July and the final two replicates were set up on 10 July. After four days, the number of total leaf punctures per plant were assessed along with the total number of leaves per plant and number of punctured leaves so that the percentage of punctured leaves per plant could be calculated.

There was no evidence to suggest that any of the pesticides had a repellent effect on *Scaptomyza* spp. The mean number of punctures per plant and the mean percentage of punctured leaves per plant on the eight treated plants were similar to the eight untreated plants for each of the treatments. However, there was a trend for the untreated plants to have more puncturing damage compared to the treated plants. This result could be due to *Scaptomyza* spp. adults subsequently dying after feeding on treated plants compared to those on the untreated plants which would continue to feed. Large variation was also observed between the replicates and increasing the number of replicates and number of flies used in this experiment would help to reduce this variation.

Objective 4: Determine the efficacy of insecticide spray applications in reducing S. flava (now Scaptomyza spp.) puncturing damage on a commercial baby-leaf cruciferous crop.

The field trial assessed the efficacy of the same four pesticides evaluated in Objective 2 and 3 with the addition of a fleeced treatment in reducing leaf puncturing damage compared with an untreated control. Each treatment had five replicate plots (30 plots in total) which measured 1.5m x 6m. There was a 1 m buffer zone between each plot in the bed.
The experiment was carried out on a wild rocket crop (cv. Ancona) at a site in Norfolk. Crop covers (Enviro mesh) were used to protect the crop from pests but the trial plots were uncovered during the trial period.

On 29 June, the trial plots were uncovered and pesticide treatments were applied by ADAS. For treatment 2, individual plots were individually fleeced using horticultural fleece (Figure 4). An initial assessment of crop damage was carried out and very low level of damage was observed i.e. less than a mean of one leaf puncture per plant.

Figure 4 Field trial on rocket crop in Norfolk

On 2 July and 6 July 2015 (days 3 and 7 after treatment, respectively), 15 plants from each plot were assessed. No phytotoxic effects of the treatments were observed on the crop. Three days after treatment all the treatments had significantly reduced the mean number of leaf punctures per plant compared to the untreated control (Figure 5). The fleece, HDCI 060 and HDCI 045 treatments were the most effective, reducing the mean number of punctures per plant to 8.3, 11.6 and 20.3 respectively, compared with the control which had a mean of 62.1 leaf punctures per plant. The least effective treatment was HDCI 047 with a mean of 39.12 leaf punctures per plant. The most effective and least effective treatments were as effective as Tracer which had a mean of 22.44 leaf punctures per plant

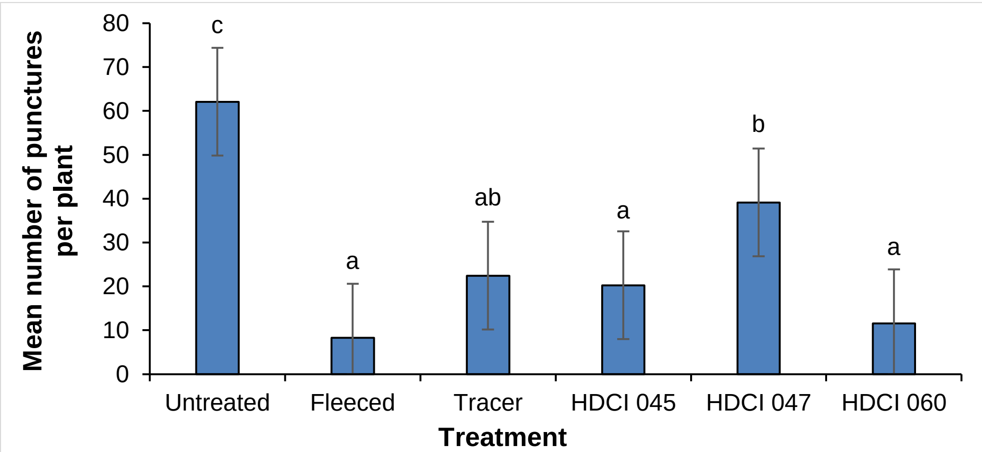

Figure 5 Mean number of punctures per plant three days after treatment including 95% confidence limits. Treatments that share the same letter are not significantly different from each other.

Three days after application all the treatments had significantly reduced the mean percentage of punctured leaves per plant compared with the untreated control. The untreated plots had a mean of 61.7% of leaves per plant being punctured. The fleece was the most effective treatment reducing the mean percentage of leaves per plant with punctures to 14.2% (Figure 6). HDCI 060 and HDCI 045 were the next best treatments with means of 25.3 and 31.6% of leaves per plant with punctures respectively.

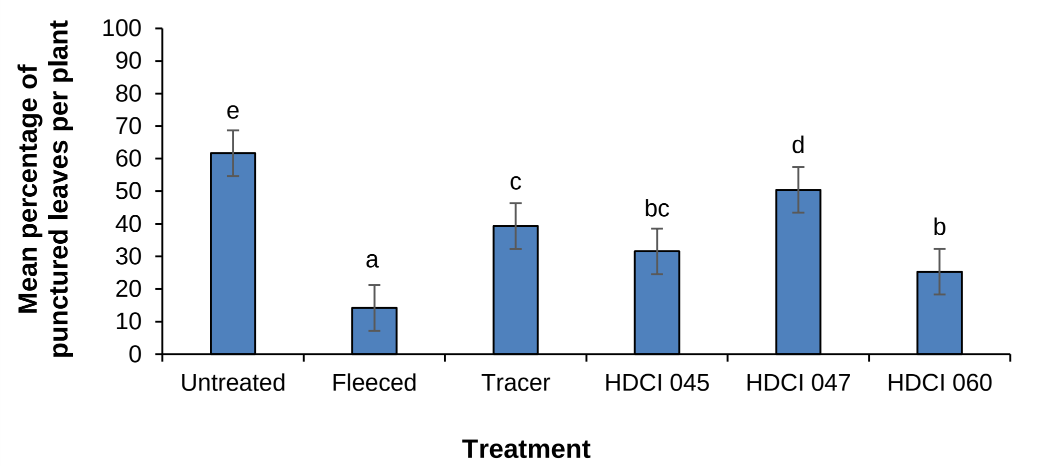

Figure 6 Mean percentage of punctured leaves per plant three days after treatment including 95% confidence limits. Treatments that share the same letter are not significantly different from each other.

Seven days after application, all the treatments were still significantly reducing the mean number of leaf punctures per plant and the mean percentage of punctured leaves per plant compared with the untreated plots. However, compared with the three day assessment the amount of puncturing damage had increased in all treatments which is likely to be due to new *Scaptomyza* spp. moving into the trial from surrounding crops. Therefore, it's likely that these pesticides only provide a temporary knock-down of this pest.

Financial Benefits

If a crop was written off, the cost to buy replacement material would be approximately £2.50/kg (£2,500/tonne). With average yields of 5,500 kg/ha crop losses of 5, 25 and 40% per hectare would cost £688, £3,438 and £5,500/ha respectively to replace. Therefore, growers will benefit from improved knowledge on the effectiveness of selected pesticides to avoid crop rejection at times of high pest pressure. The project has also identified new effective chemistry which can be considered for EAMUs.

Action Points

- Growers can use crop covers to protect plants from adult flies.
- Consider Tracer for knock-down (maximum of three applications per crop) although repeated use may lead to the development of resistance and have harmful effects on naturally-occurring parasitoids which may be reducing *Scaptomyza* spp. populations.
- Crop debris should be removed as soon as possible as *Scaptomyza flava* can lay eggs and the larvae can develop in decaying plant material.
- Monitor for *Scaptomyza* sp. populations early in the morning, as feeding and egg laying mainly occurs during the first six hours of day light.

