



Grower Summary

FV 406a

Brassicas: Improving control of
whitefly

Annual 2015

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Project title: Brassicas: Improving control of whitefly

Project number: FV 406a

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Report: Annual

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Location of project: Warwick Crop Centre
University of Greenwich
Elsoms Seeds

Industry Representative: Andy Blair

Date project commenced: 1 March 2014

**Date project completed
(or expected completion date):** 28 February 2016

GROWER SUMMARY

Headline

Field trials using a range of approaches to manage cabbage whitefly are beginning to indicate some of the components of an effective treatment programme.

Background

Whitefly (*Aleyrodes proletella*) is becoming increasingly difficult to control on kale and Brussels sprout in particular. It is not clear why this is the case, although outbreaks appear to be more severe in hot, dry years (2003, 2006 and 2010). Research on the basic biology and ecology of cabbage whitefly was undertaken in the late 1930s and provides useful background information. Recent research in the UK has focused on insecticidal control (data obtained in other HDC projects targeted at control of aphids on brassica crops) and a PhD project at the University of Greenwich (Simon Springate – supervised by Professor John Colvin) investigated the increasing importance of cabbage whitefly as a pest, and potential methods for its control. Populations of whitefly were tested for resistance to certain insecticides and it was shown that certain whitefly populations are resistant to pyrethroid insecticides. The potential for native predators, in particular a species of ladybird and parasitic wasps (*Encarsia* spp.), to control whitefly was also investigated. The HDC has recently been developing a portfolio of work addressing whitefly control on brassica crops and to date this has involved three projects: FV 399 - to evaluate insecticide spray programmes and application strategies that might improve control of brassica whitefly; FV 406 – to field test the impact of releasing parasitoid wasps (*Encarsia tricolor*) and explore the impact of early insecticide applications; CP 091 - an HDC Studentship at Warwick Crop Centre (Spencer Collins) on the biology of cabbage whitefly.

The overall aim of the current project is to improve understanding of the biology and ecology of cabbage whitefly to help growers minimise the development of whitefly infestations and control unacceptable infestations effectively. It focuses particularly on the assessment of novel methods of control and on the timing of the most promising of these together with existing treatments. The specific objectives of the project are described in the Summary. Objectives 1, 3 and 4 were undertaken at Warwick Crop Centre and Objective 2 was undertaken by staff of the Natural Resources Institute (University of Greenwich), Syngenta Bioline, Allium & Brassica Agronomy Ltd. and Elsoms Seeds.

Summary

Objective 1: Trial 1 - Investigate additional treatments for whitefly control.

The aim of this replicated plot trial was to determine the relative efficacy of treatments for whitefly control. The crop was kale (cv. Reflex) and this was sown on 23 April and transplanted on 13 May. There was an untreated control, one sowing-time treatment (Sanokote – Gaucho (imidacloprid)) and the other treatments (Movento (spirotetramat), HDCI 075, HDCI 076, HDCI 073 (coded insecticides), HDCI 074 (coded bio-insecticide)) were applied as foliar sprays to an established infestation of whitefly. Treatments (4 replicates) were applied on: 20 August (all treatments), 27 August (HDCI 074 only), 3 September (HDCI 074 only) and 12 September (all treatments). Comparative assessments of the Sanokote (imidacloprid) treatment and the untreated control were made on 2 occasions (7 August, 19 August) and all plots were assessed on 22 October, 40 days after the last spray was applied (Figure 1). The size of the whitefly infestation increased throughout the trial. Lower numbers of egg circles, leaves infested with larvae and adults (score) were found on the plants treated with Sanokote throughout the trial but these differences were statistically significant on the first assessment date (7 August) only. When all treatments were compared on 22 October, there were statistically-significant differences between treatments for all three life stages. Compared with the untreated control, the numbers of egg circles, larvae and adults were reduced by Movento, HDCI 075 and HDCI 073, whilst HDCI 074 reduced the numbers of larvae.

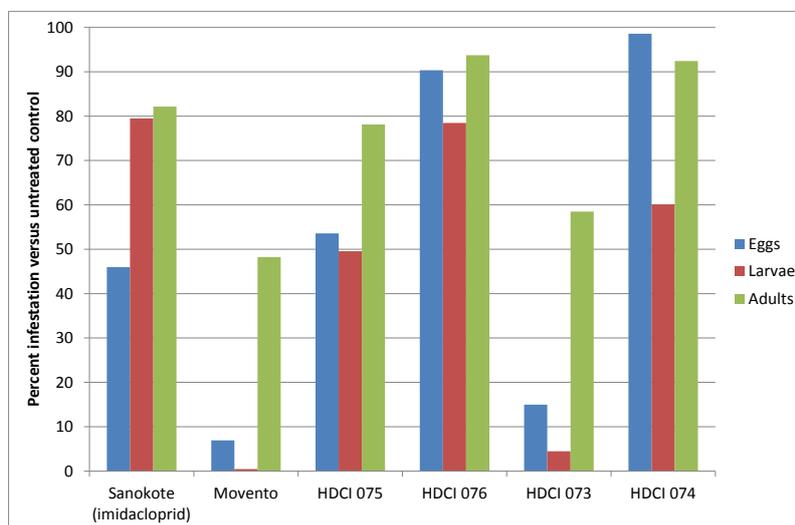


Figure 1. Trial 1 – percentage infestation on treated plots versus untreated control. Assessment made on 22 October and the last sprays in the programme were applied on 12 September (40 days after last spray).

Objective 2: Trial 2 - Investigate the efficacy of parasitoid release and crop covers, alone and in combination, in suppressing whitefly infestations.

The aim was to field test the impact of parasitoid releases on whitefly infestations on kale and to explore the effect of early netting covers. A production system for the parasitoid wasp *Encarsia tricolor* was established at Syngenta Bioline to provide insects for field release. An experimental field trial was carried out in 2014 on 22 x 13 plant kale plots in Lincolnshire. Each treatment was applied to 4 plots (Table 1). In two treatments, netting (0.77mm mesh) was applied soon after planting and removed 4 weeks later. Following the collapse of the parasitoid production, an alternative strategy of late season Movento application was applied to the relevant plots, to contribute to other project objectives. Three demonstration plots (9 x 9 plants) were treated with simplified insecticide programs for comparison (Table 1). An AZO knapsack sprayer powered by compressed air with VP02F conventional nozzles was used for spray application.

Table 1 Experimental treatments applied in the field trial

Trial	Demonstration
A. Untreated	1. Untreated
B. Late Movento	2. Movento / Biscaya
C. Net only (4 weeks)	3. Movento / -
D. Net / Movento	4. HDCI 073 / -

Whitefly numbers on the trial site were lower than in previous years. Short-term netting covers significantly disrupted whitefly infestation (C and D). Late Movento applications in September also reduced whitefly levels and contamination in October and November, with an additive effect to those plots previously covered by netting (D), making this the most successful treatment in terms of adult whitefly numbers and leaves contaminated with larvae (Figure 2). In the unreplicated demonstration plots, only those treatments including Movento led to significant reductions. While HDCI 073 was highly effective on small plants in FV 406, application to larger plants in the demonstration plot was ineffective, suggesting a need for good coverage when using this product.

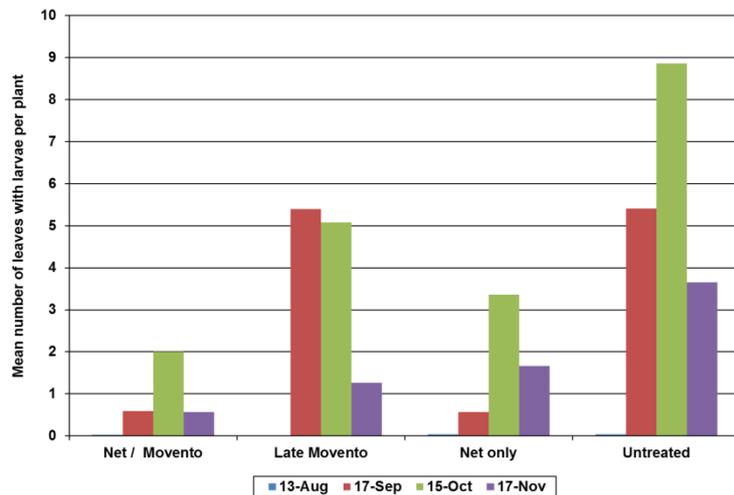


Figure 2 Number of leaves with larvae per plant (treatments ranked by level of control on 17 November).

Objective 3 Trial 3 - Investigate the most effective overall treatment strategy for whitefly control

This objective was addressed with a field trial on field plots of kale (cv. Reflex). The seed was sown on 23 April and the plants were transplanted on 21 May. A natural infestation was allowed to develop. For each of four insecticide treatments, a single spray of Movento was applied soon after the start of either the first, second, third or fourth generations of the field population of whitefly at Wellesbourne, as indicated by the monitoring on other plots undertaken by Spencer Collins as part of project CP 091. The sprays were applied on 9 June, 17 July, 20 August or 12 September. There was also an untreated control.

The plots were assessed on 30 July, 5 and 26 September. Overall, a single spray applied either on 17 July or 20 August appeared to reduce the infestation more effectively than sprays on 9 June or 12 September (Figure 3). The plots sprayed on 17 July had lower numbers of egg circles than the untreated control on all three assessment dates, lower numbers of larvae on the first two assessment dates and lower numbers of adults on the last two assessment dates ($p < 0.05$). The plots sprayed on 20 August had lower numbers of larvae and adults on the last assessment date ($p < 0.005$).

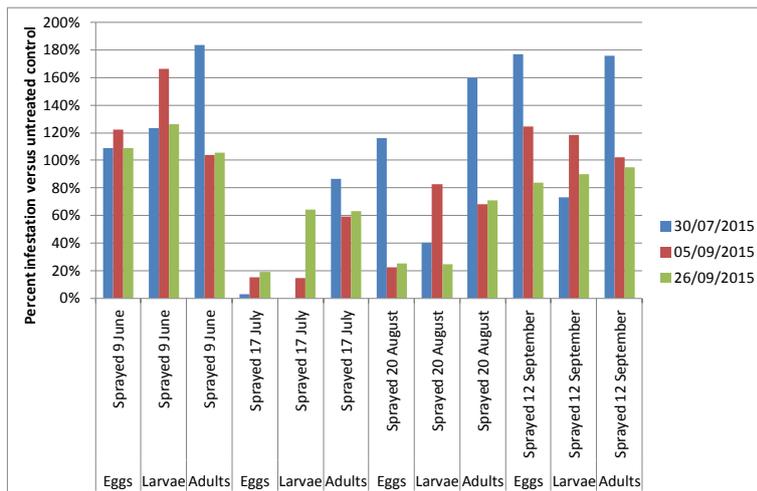


Figure 3 Trial 3 – percent infestation versus the untreated control.

Objective 4: Trial 4 - Investigate the most effective way to use Movento and other effective insecticides in terms of the interval between treatments.

The aim of this trial was to investigate the persistence of three treatments and an untreated control (4 replicates). The treatments were Movento, Sanokote (imidacloprid) and HDCI 075. The plants (cv. Reflex) were sown on 23 April and transplanted on 21 May and sprayed on 20 August. Assessments were made on 7 and 19 August (Sanokote (imidacloprid) and untreated control only) and on 17 September and 23 October. There were always more whitefly in the untreated control plots than in those treated with Sanokote, but the differences were statistically-significant on 19 August only. On 17 September, both spray treatments had reduced the number of whitefly egg circles, larvae and adults compared with the untreated control. By 23 October there were no differences between treatments in the numbers of adults, but larval numbers were reduced by all four treatments and Movento appeared to be having a continued effect on egg numbers.

Discussion

The field trials confirmed the efficacy of Movento (spirotetramat) and HDCI 073 as foliar sprays for whitefly control and indicated that Sanokote seed treatment with imidacloprid (Gaucho) suppressed the development of whitefly infestations, particularly early in the season. HDCI 075 also showed statistically-significant levels of control with a reasonable amount of persistence. Overall, compared with the untreated control, reductions in numbers of egg circles and larvae were ‘greater’ than reductions in numbers of adults, which probably reflects the mobility of the adults to a certain extent, as they may move from plot to plot very readily.

The failure to produce and subsequently test the parasitoids in the field was a substantial disappointment and prevented the primary function of the trial in Objective 2 from being achieved. Despite this, useful data were still extracted from the trial in relation to insecticides and crop covers since the potential value of short-term netting for exclusion of adult whiteflies was shown, with the effects persisting to the end of the trial. However, a heavier infesting pest pressure would be required to test other eventualities. Also data from studentship CP 091 may indicate whether such short-term covers would be effective in other cases or if whitefly immigration is less predictable.

Treatment timing was investigated particularly in Trials 2 and 3. The application of crop covers in Trial 2 between 7 July and 6 August led to a considerable reduction in the size of the subsequent infestation which persisted until the final assessment on 17 November (Figure 2). Similarly, the applications of Movento on either 17 July or 20 August in Trial 3 were the most effective treatments at the final assessment on 26 September (Figure 3), whereas the spray applied very early (9 June) and the late spray (12 September) had no, or much less, impact. Thus there is evidence that the treatment programme should begin in mid-summer, even though the size of the infestation may not be large by then and the crop may still be some time away from harvest.

Financial Benefits

In recent years the cabbage whitefly has caused considerable reductions to the quality and marketable yield of Brussels sprout and kale crops in particular. As control options are currently limited, additional options and information on how to use current control options more effectively will be very valuable to the industry.

Action Points

- Short term netting covers following planting can disrupt whitefly colonisation and population growth without impacts on growth. Movento application late in the growing season gives equivalent control and additive benefits in association with covers.
- Growers should try to use the considerable efficacy and relative persistence of Movento to best effect in their spray programmes.
- Sanokote seed treatment with imidacloprid (Gaucho) can suppress the development of whitefly infestations, particularly early in the season.