



Agriculture & Horticulture  
DEVELOPMENT BOARD



# Grower Summary

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## CP 091

Biology of the cabbage whitefly,  
*Aleyrodes proletella*.

Annual 2013

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

**Project Number:** CP 091

**Project Title:** Biology of the cabbage whitefly, *Aleyrodes proletella*.

**Project Leader:** Dr Rosemary Collier

**Contractor:** University of Warwick

**Industry Representative:** Andy Blair, Emmetts UK

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**Project Cost:** £67,650

## Headline

Monitoring techniques for cabbage whitefly have been developed and initial information has been obtained on the establishment and development of whitefly infestations on kale and Brussels sprout crops.

## Background

The cabbage whitefly (*Aleyrodes proletella*) has become an increasing problem for the Brassica industry in recent years, especially on Brussels sprout and kale. The reason for this is unknown, but it is believed to be due to a combination of climate change, removal of certain active ingredients from use and later harvest times of crops. Little research has focused on this species as, historically, it has been regarded as a minor pest. Knowledge about the biology of the cabbage whitefly is limited and most of what is currently understood about its ecology has been inferred from minimal anecdotal evidence.

The overall aim of this project is to understand population trends of cabbage whitefly in the most vulnerable crops, Brussels sprout and kale. This includes understanding the key times of population/generation increase and colonisation of a new crop. This information can then be used to inform the development of an integrated control strategy using insecticides and other tools, which might include biological control agents and methods of cultural or physical control.

## Summary

### ***Experiment 1.1. Developing an effective method for trapping active adult cabbage whitefly in the field***

Blue and yellow sticky traps were tested for effectiveness at catching adult whitefly at ground level and a height of 1m. Yellow traps at ground level caught significantly more adults than the other test treatments. The preference for yellow traps was much less pronounced at 1m, with blue traps catching similar numbers. These results suggest that yellow traps at ground level should be used to monitor adult whitefly. However, blue traps might be used to monitor migration. Further research will be aimed at improving the trapping method and confirming whether blue traps can be used to monitor migration.

### ***Experiment 1.2 Survey of wild host plants for the presence of whitefly in an uncultivated field***

A field that had been removed from cultivation since 2008 was surveyed for wild hosts of cabbage whitefly. The survey focused on wild hosts described in Mound & Hasley (1978).

Forty random quadrats of 0.5m<sup>2</sup> were surveyed within the field (~1ha) for the wild hosts and presence of cabbage whitefly. The only wild hosts found were *Sonchus* (Sow-thistle), *Taraxacum* (Dandelion) and *Euphorbia spp.* (Spurge). *Sonchus* was most abundant at a mean density of 1.84 m<sup>-2</sup> (average of 0.46 found within an experimental quadrat of 0.5m<sup>2</sup>). No whitefly were found in this survey. However, spot checks of sow-thistle on the Wellesbourne campus in February 2013 showed that whitefly were present on their wild hosts in the locality. Further studies will focus on other habitats that have high densities of wild hosts, such as disturbed land, investigating their potential for harbouring populations of cabbage whitefly.

### ***Experiment 1.3 Survey of a commercial oil seed rape crop for the presence of whitefly***

A commercial oil seed rape (OSR) field (~10ha) was surveyed on three occasions (April, June, July 2013) for the presence of whitefly. A total of forty 0.5m<sup>2</sup> quadrat surveys were taken in a 40m x 40m grid pattern throughout the field. All leaves of all OSR plants were searched for whitefly. No whitefly were found in April or June. In July, a total of 4 adult whitefly were found from all quadrats, all of which were within 40m of the field margins. Extrapolation indicated that the whole crop might be supporting 40,000 whitefly. However, this may be an overestimate if whiteflies are more abundant on plants close to field margins. As no whitefly were found in April it seems unlikely that this field acted as an overwintering site for whitefly (although a very low population, not detected by the sampling approach, may have been present). This may have been due to a high level of damage to the plants by pigeons, causing considerable disturbance and defoliation. Although juvenile stages of whitefly were found in July, nymphs found at this time are likely to be of little importance for kale crops as the OSR was harvested shortly after the sampling date and this would have killed all juvenile stages.

### ***Experiment 1.4. Egg laying rate and duration of egg laying on three different Brassica oleracea crops: Brussels sprout, kale and cauliflower***

Newly emerged adult females were confined to the foliage of one of three *Brassica* crops, Brussels sprout (cv. Revenge) kale (cv. Reflex) or cauliflower (cv. Skywalker) and the numbers of eggs laid were recorded until death. The experiment was conducted in controlled conditions at 20°C, with 16hrs light and 8hrs dark. Eggs were counted and destroyed every 2 days, taking care not to disturb the females. On average the duration of egg laying was 33 days, 89 eggs being laid in total. There was no significant difference in the mean number of eggs laid in a 2-day period for the three crops/cultivars tested. Results show the potential for overlapping of generations of cabbage whitefly as the duration of the egg-laying period at

20°C exceeded the duration of the period of development from egg to adult. The first eggs laid by a female are likely to have emerged as adults before she has finished laying her final batches of eggs. Variation in the pattern of egg laying by females kept on Brussels sprout plants was high, showing that more replication is needed.

### ***Experiment 1.5 Monitoring of whitefly on overwintering Brussels sprout plants***

A small plot of overwintering Brussels sprout plants was sampled for whitefly over the winter 2012-13. Initial studies showed a distinct vertical pattern in the distribution of the different life stages within a plant, indicating that sampling approaches need to incorporate this vertical distribution. The plot was attacked by wild herbivores in December, greatly reducing the number of overwintering whitefly. The plants were then covered with netting to prevent further damage. The remaining population was surveyed monthly until March when fortnightly samples were taken. The first eggs appeared on plants in February but egg numbers did not increase during the very cold period at the beginning of March, suggesting a cessation of egg laying due to low temperatures. Air temperatures may have fallen below the lower thermal threshold for egg laying. It is also not clear whether the eggs laid in early February were still viable and were responsible for the appearance of nymphs in May. Egg numbers continued to rise for three months. The number of adults decreased during May but it could not be determined whether this was due to death or dispersal from the plants. The reduction of pupae along with the reduction of adults suggests that new adults were not emerging from overwintered pupae. The first generation appeared on overwintering Brussels on 28<sup>th</sup> June. This date is very similar to the dates found by Al-Houty (1979). Previous research has shown that pupae can survive sub-zero temperatures (Butler, 1938b) but thermal thresholds for survival have not been determined. Future studies should investigate this further along with thermal thresholds for egg laying and egg development/survival.

**Experiment 1.6 Monitoring of whitefly on a newly-planted vulnerable field crops (Brussels sprout and kale) throughout the growing season**



**Figure 1.** Study plot of Brussels sprout and kale covered in netting to prevent damage by pigeons.

Plots of Brussels sprout and kale were planted to investigate natural colonisation and population increase of the cabbage whitefly over a whole season. Plots consisted of 24 plants (3 x 8, 50cm spacing) of both Kale (cv. Reflex) and Brussels sprout (cv. Revenge). Five replicated plots were planted in different locations on the Wellesbourne site. Plants were raised in glasshouse conditions for 7 weeks prior to planting out in the field. Plots were covered in netting to prevent damage by pigeons. To determine the date of first colonisation to within a week, all the leaves of all the plants of all plots were surveyed weekly for a month after planting. The first colonisation occurred in the last week of May. Soon after this, eggs were laid and the population rose rapidly through June and July reaching over 200 eggs per plant in August. Crop colonisation occurred earlier than described previously in the literature and it was believed that the adults emerging from the first eggs laid in the year were responsible for first colonisation of crops (Butler, 1938a). However, in the present study, although colonisation of the new plots occurred in late May, the first emergent adult of the first generation was not observed on overwintering Brussels sprouts until late July. So it is highly likely that the first coloniser was an overwintering female. This investigation is still ongoing, populations will be monitored until early 2014. Further analysis will be conducted on data collected from this experiment such as, differences in the size and structure of

populations on kale and Brussels sprouts, and whether the size of the initial infestation has any bearing on either the rate of population growth or the final pest load.

### **Financial Benefits**

Contamination of fresh produce by pest insects and associated damage can lead to rejections by retailers. Improved control of whitefly will have considerable financial benefits for growers through an improvement in crop quality.

### **Action Points**

There are no action points for growers at this early stage in the project.