
FINAL REPORT

To:
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The identification of winter aphids in protected lettuce

March 2007

Commercial – In Confidence

The results and conclusions in this report are based on an investigation conducted over winter of one year. The conditions under which the experiment was carried out and the results obtained have been reported with detail and accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results especially if they are used as the basis for commercial product recommendations.

Authentication

I declare that this work was done under my supervision according to the procedures described herein and that this report represents a true and accurate record of the results obtained.

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Grower Summary

Headline

- A survey of protected lettuce growers in the 2006/07 winter season established that the following five species of aphids were occurring on winter crops: Peach potato aphid (*Myzus persicae*), Potato aphid (*Macrosiphum euphorbiae*), Glasshouse and potato aphid (*Aulacorthum solani*), Bulb potato aphid (*Rhopalosiphoninus latysiphon*), Currant-lettuce aphid (*Nasonovia ribisnigri*)
- Four of the species are commonly recorded on protected lettuce; bulb potato aphid is uncommon.
- Of those growers who reported aphid infestations 60% had crops infested with currant lettuce aphid.

Background and expected deliverables

At a recent meeting of the protected Lettuce Technology Group (28/11/06) the increased occurrence of aphids in autumn/winter crops was identified as a major problem. The recent milder autumns have allowed aphid populations to continue growing later in the year than previously observed within winter lettuce crops. This allows substantial pest levels to be established before the crop harvest. The restrictions in the use of aphicides at this time of year, (e.g. Calypso 1st Nov.-31st March, Chess-1st Nov-1st March), means that there are currently a limited range of effective solutions for controlling the growth of a pest population.

A short term project was subsequently agreed to establish which species of aphids were the problem in winter crops. There are four foliar aphid species on protected lettuce; peach-potato aphid (*Myzus persicae*), potato aphid (*Macrosiphum euphorbiae*), glasshouse and potato aphid (*Aulacorthum solani*) and currant-lettuce aphid (*Nasonovia ribisnigri*) (identified in HDC project: PC 194) (see figure 1 below). Some observations from growers suggest that peach-potato aphid (*M. persicae*) is possibly the most commonly occurring aphid in winter lettuce. However in order to develop a control programme for this changing pest problem it was important to initially identify the aphid species involved.

Figure 1: Foliar species of protected lettuce aphids



Myzus persicae



Nasonovia ribisnigri



Macrosiphum euphorbiae



Aulacorthum solani

Objectives

1. To organise a survey of protected lettuce growers.
2. Identify which species of aphids were causing problems in winter crops of protected lettuce.

Project Summary and Conclusions

- Small plastic containers with corresponding information were sent to 38 protected lettuce growers in January 2007.
- 28 growers responded to the aphid enquiry.
- Of the 28 responses, 10 growers had aphid problems and 18 growers reported no problem with aphids at the time, although two growers had had problems in late September 2006.
- Of the 10 growers with aphids, six were identified as having currant-lettuce aphid (*N. ribisnigri*).
- Other species of aphid recorded were, peach potato aphid (*M. persicae*), potato aphid (*M. euphorbiae*), glasshouse and potato aphid (*A. solani*) and unusually bulb-potato aphid (*R. latysiphon*).
- There was no correlation between the presence of overwintering aphids and the level of frost protection or heating in the crop.
- The results suggest that the increased problem with overwintering aphids is possibly related to higher levels of infestation with *N. ribisnigri*.
- Whereas low numbers of the other aphid species occurring in winter crops can sometimes be removed by trimming the outer leaves at harvest, *N. ribisnigri* is potentially more of a problem as it is mostly found in the heart of the lettuce.
- An effective pesticide programme with good resistance management needs to be developed to control this potentially serious situation.

Previous suggestions of Integrated Pest Management (IPM) within protected lettuce have required the use of screened vents and doors to prevent migration of aphids, butterflies and moths into the lettuce crop. However winter crops are less vulnerable to this type of invasion as generally insect populations are less active in the winter. There is the potential therefore of developing an IPM programme without the need for expensive screens and so following the results of this project further work can be recommended to investigate:

- The development of an IPM programme for the winter lettuce as an alternative to a pesticide-only programme.
- The potential role of *Nasonovia* resistant lettuce varieties as a factor within an IPM programme.
- The potential of the parasitoids *Aphidius hieraciorum*/*Praon volucre* to integrate with resistant lettuce varieties for improved control of currant-lettuce aphid under the low temperatures and short day lengths of a winter crop.
- The use of other parasitoids for the control of the other aphid species.

Financial Benefits for Growers

The UK glasshouse lettuce industry is currently worth around £20m per year at wholesale level and £30m at retail level. Growers are reporting that due to warmer autumns and springs aphids are increasingly becoming a 'year round' pest on protected lettuce.

The identification and control of aphids on protected lettuce crops in winter will increase the competitiveness of the UK protected lettuce industry by producing products that

satisfy standards sought by consumers and reflected by major food retailers. This will enable them to retain, and perhaps increase, their current share of the UK market.

This project has identified the species of aphids that are a problem over the winter period for protected lettuce growers and established that the currant-lettuce aphid is the most troublesome species.

Action points for growers

This project focuses on a survey of aphid species found on protected lettuce during the winter in response to an emergency request from the protected lettuce industry. With possible changes in the winter climate growers will have to decide on a pest control strategy for the control of the four species identified including the development of pesticide and IPM programmes

SCIENCE SECTION

Introduction

At a meeting of the protected Lettuce Technology Group (28/11/06) increased occurrence of aphids in autumn/winter crops was identified as a major problem. The recent milder autumns have allowed aphid populations to continue developing later in the year than previously observed within the winter lettuce crop. This allowed substantial pest levels to be established before the crop harvest.

The restrictions in the use of aphicides over winter, (e.g. Calypso 1st November - 31st March, Chess 1st November - 1st March) means there are currently limited methods for controlling aphids during this period.

Four foliar aphid species are found commonly occurring on protected lettuce; peach-potato aphid (*Myzus persicae*), potato aphid (*Macrosiphum euphorbiae*), glasshouse and potato aphid (*Aulacorthum solani*) and currant-lettuce aphid (*Nasonovia ribisnigri*) (identified in HDC PC194). The following project aims to identify the species of aphids that are currently establishing in winter lettuce crops in increasing numbers.

Methods

During December 2006 to January 2007 three small containers were posted to 38 members of the protected Lettuce Technology Group. Growers were asked to collect any aphids observed in the winter crops and send them to STC Research Foundation (STCRF), in the pre-paid addressed envelopes. Aphids were identified to the species level by the Entomology Department at STCRF.

Results

- A total of 28 growers responded to the survey (74% response).
- Of the 28, 10 growers reported aphid problems and 18 reported that they had no problem with aphids, although of these 18 growers, two growers reported having problems late September 2006, before the survey had commenced.
- Of the 10 growers reporting aphid infestations, six growers were found to have crops with *N. ribisnigri* (see Table 1).
- The presence of overwintering aphids did not appear to be connected to the presence of frost protection or heating in the lettuce crop (see Table 2 for information).

Table 1: Identification of aphids in protected winter lettuce

Species of aphid	Number of Growers with aphids
Peach-potato (<i>M. persicae</i>)	1
Potato (<i>M. euphorbiae</i>)	1
Glasshouse and potato (<i>A. solani</i>)	1
Bulb-potato (<i>R. latysiphon</i>)	1
Currant –lettuce (<i>N. ribisnigri</i>)	6

Table 2: Survey details

	Aphids present (*)/absent (-)	Species	F=frost protection H= heated 10°C
1	*	<i>Nasonovia ribisnigri</i> (currant-lettuce aphid)	F
2	–		F
3	–		F
4	–		F
5	–		
6	–		
7	–		
8	–		
9	–		
10	–		
11	–		
12	–		
13	*	<i>Aulacorthum solani</i>	F

		(glasshouse –potato aphid)	
14	*	<i>N. ribisnigri</i>	H
15	–		
16	*	<i>N. ribisnigri</i>	H
17	*	<i>N. ribisnigri</i>	
18	–		
19	*	<i>N. ribisnigri</i>	F
20	*	<i>N. ribisnigri</i>	F
21	–		
22	–		
23	–		
24	–		
25	–		
26	*	<i>Macrosiphum euphorbiae</i> (potato aphid)	
27	*	<i>Rhopalosiphoninus</i> <i>latysiphon</i> (bulb potato aphid)	F
28	*	<i>Myzus persicae</i> (peach-potato aphid)	

Discussion and Recommendations

The results in Tables 1 and 2 shows that all the foliar aphid species previously identified as occurring on protected lettuce were present in winter protected crops. However the results suggest that the increased incidence in overwintering aphids, as observed by growers, is possibly due to an increasing occurrence of *N. ribisnigri* (*currant-lettuce aphid*). This shift in the aphid populations is not related to a change in grower practice, i.e. heating of the glasshouses, but is probably as a result of warmer autumns.

N. ribisnigri can be more problematic than other species as the aphid predominates in the heart of the lettuce, whereas low numbers of the other species can sometimes be removed by trimming the outer leaves at harvest. Therefore it is important to develop

pest control programmes that will be effective at reducing the numbers of aphids and specifically at reducing *N. ribisnigri*.

The presence of bulb potato aphid is unusual as this pest has not been recorded previously in lettuce crops. It is difficult to explain the finding and this may be just a 'one off' occurrence.

For all aphid species there is a problem in the use of contact insecticides to actually hit the aphids and the selection of insecticide programmes must take this into consideration.

The project makes the following recommendations:

- An insecticide programme with good resistance management needs to be developed.
- As an alternative to an insecticide only programme, there is also the possibility of developing an IPM programme for the winter crops.
- The use of *Nasonovia* resistant lettuce varieties as part of an IPM programme should be investigated.
- An IPM programme could also establish the potential of the parasitoids *Aphidius hieraciorum* and *Praon volucre* to integrate with *Nasonovia* resistant lettuce varieties. The parasitoids would need to operate successfully at the shorter day lengths and cooler temperatures.
- The parasitoids would provide an additional control to combine with resistant lettuce and this further removal of *N. ribisnigri* adults within a crop would help reduce the pressure for *N. ribisnigri* to overcome resistance mechanisms within the lettuce varieties.
- A successful IPM programme for the winter crops is more likely to be taken up by growers as there would be no need for expensive screening of vents and doors at this time of year.