



Agriculture & Horticulture
DEVELOPMENT BOARD



Grower Summary

PE 012

The effect of Jasmonic Acid
(JA) seed treatment on aphid
control in lettuce and herb crops

Final 2013

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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 HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

HDC
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel – 0247 669 2051

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

Project Number: PE 012

Project Title: The effect of Jasmonic Acid (JA) seed treatment on aphid control in lettuce and herb crops

Project Leader: Dr Pat Croft

Contractor: Stockbridge Technology Centre Research Foundation (STCRF)

Industry Representative: Geoffrey Smith – Mapleton Growers Ltd
Claire Donkin – C Donkin Ltd

Report: Final Report 2013

Publication Date: January 2014

Previous report/(s): N/A

Start Date: 01 June 2012

End Date: 31 December 2013

Project Cost: £36,980.00

Headline

Treating seed with Jasmonic acid at 4x the Label Expected Rate resulted in reduced populations of the peach potato aphid on basil, parsley and lettuce which were grown under protection. This same dose rate also reduced populations of the glasshouse potato aphid in protected lettuce.

Background

Aphids present an on-going problem for many horticultural crops including leafy salads and herbs. Although various methods of control, including conventional insecticides (increasingly limited), biocides and biological control agents are available, there continues to be periods or seasons when aphids still are a problem.

Myzus persicae (peach-potato aphid) is a commonly occurring aphid pest for many growers across different sectors. It can be controlled using parasitoids, e.g. *Aphidius colemani* and the predatory midge *Aphidoletes aphidimyza*. However the use of chemical products, either to act as a knockdown treatment for high aphid populations or against other species of pest, can be a costly disruption to IPM programmes. *M. persicae* can also become a problem if it develops resistance to chemical products, such as pyrethroids.

When under attack from pests and pathogens, plants are able to initiate a range of defence responses. These responses are regulated by chemical pathways within the plant. However, despite the plants defence systems, crops still experience pest and disease problems. Previous unpublished research by Lancaster University and STCRF (see pages 6 and 7 in the full report) established that treating seed with Jasmonic Acid (JA) enhanced the plant's defence system against a range of pests resulting in suppressed growth in pest populations. These results suggested the potential for JA to be used as a seed treatment for the prevention of rapid aphid build-up in crops. However the experiments which were conducted then were small-scale and they were done over a short period of time in non-commercial growing conditions.

The aim of this project was to investigate the effect of using Jasmonic acid as a seed treatment on aphid population build-up throughout the life of the crop in protected herbs and protected lettuce. Crops were grown under the normal commercial practice. .

It is possible that a reduction in the growth of aphid populations through the JA treatment could provide a useful contribution to the control of aphids in conjunction with biocontrol

agents. Reducing aphid numbers by a significant percentage could assist parasitoids etc. in maintaining a lower level of the pest and further reducing the need for chemical intervention.

Summary

A series of trials were undertaken at STCRF between June 2012 and October 2013, to determine if JA seed treatment could reduce aphid populations on a selection of short term crops. Two glasshouse herb crops were examined: basil and curly leaved parsley. Glasshouse lettuce crops were also examined, looking at flat and curly leaved varieties in propagation and in the production house. JA was applied to seeds at four rates: 0.2x, 1x, 2x and 4x LER (Label Expected Rate). In addition there were two controls; seed that went through the commercial process without the application of JA (untreated check), and completely untreated seed (untreated control).

The results below list the responses of the aphid populations to the different rates of JA on basil and curly parsley and; flat and curly leaf lettuce.

Basil

Three trials were undertaken with weekly introductions of aphids. *M. persicae* was either artificially introduced or natural populations were allowed to establish during the 28 days of crop growth. Plants grown from JA treated seed had reduced population growth of aphids compared to the control plants. The response of the aphid populations to different rates of JA varied, however the high rate (4LER) consistently resulted in the greatest reduction of aphids throughout the trials.

- **21 - day experiment** (aphids were introduced onto plants after 7 days and assessed 21 days later) - plants from 4x and 2x the LER had significantly lower numbers of aphids than the controls.
- **14 day experiment** (aphids introduced 14 days after day 1 with the final assessment being done 14 days after the aphid introduction): All treatments, except 0.2x LER resulted in significantly lower numbers of aphids compared to the controls.
- **7 day experiment** (aphids introduced to plants after 21 days and assessed 7 days later): All treatments, except 2x LER, recorded significantly lower numbers of aphids than the controls.

Curly parsley

In a single trial, small numbers of *M. persicae* were introduced on to curly parsley plants. In addition, a large natural infestation of the pest occurred. The results showed that at the final assessment 4x LER had significantly lower numbers of aphids compared to the controls. However, the large natural infestation of aphid that occurred during the trial did result in aphids being recorded throughout the trial period (Fig. 1).

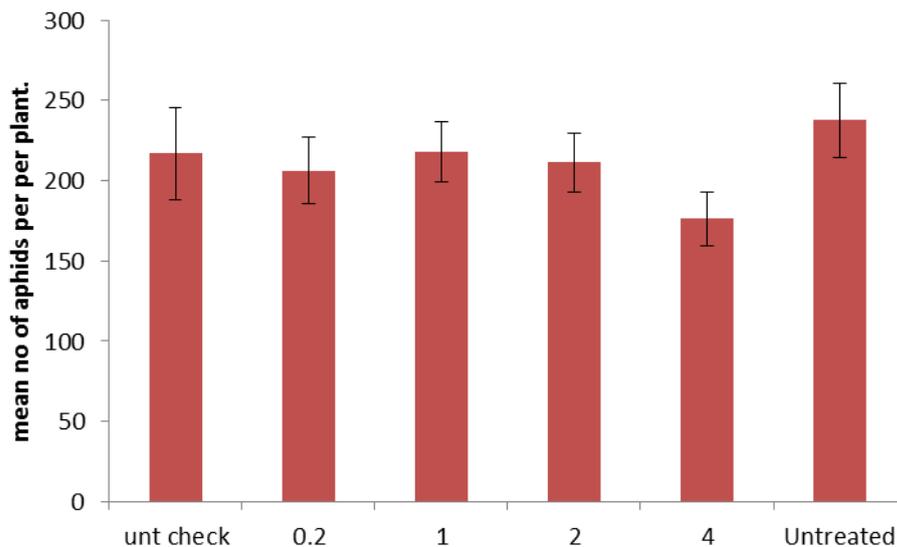


Fig. 1. The mean numbers of *M. persicae* recorded after 21 days with different seed treatments (0.2x, 1x, 2x and 4x LER) plus two controls.

Hawthorn parsley aphid (Dysaphis apiifolia) on curly parsley

In a single trial, the effect of the high rate JA treatment (4x LER) on Hawthorn-parsley aphid was compared to the untreated check and the untreated control. The results suggested that 4x LER could reduce the population growth of Hawthorn –parsley aphid by 35% compared to the untreated control although this result was not statistically significant.

Protected Lettuce

1. Lettuce - flat leaf

In propagation

Lettuce seedlings grown from seed treated with JA showed reduced populations of *M. persicae*. The 2x and 4x LER treatments resulted in aphid numbers which were significantly lower than those in the untreated lettuce plants at the point of planting (Fig. 2). However,

additional control measures would be needed to reduce aphid numbers to levels that are commercially acceptable.

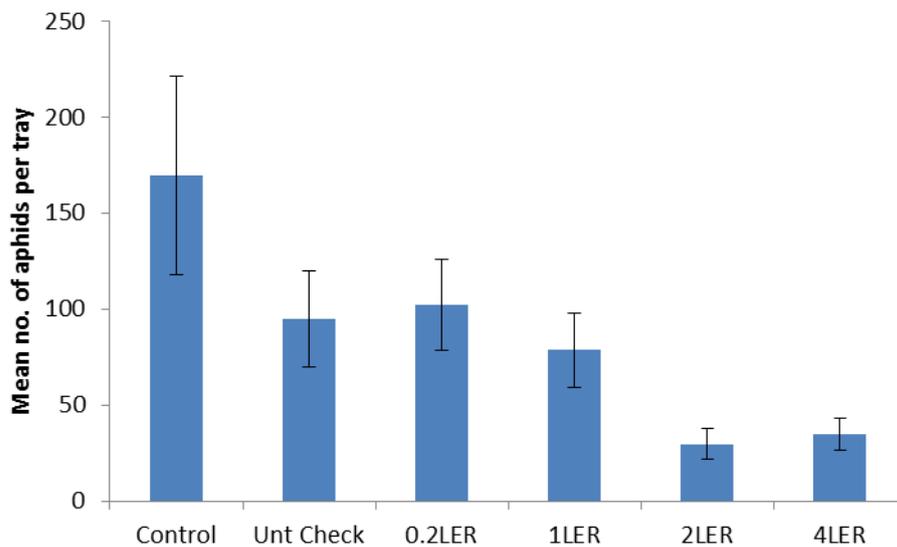


Fig.2. The mean numbers of aphids (*M. persicae*) per propagation tray at final assessment (August 2012)

Glasshouse Crop

A natural infestation of *Aulacorthum solani* (Glasshouse peach aphid) occurred in the trial and was used to assess the efficacy of the JA treatments. For the final assessment at harvest, the numbers of aphids recorded on plants treated with 2x and 4x LER were significantly ($p < 0.05$) lower than numbers recorded on the control plants (Fig. 3).

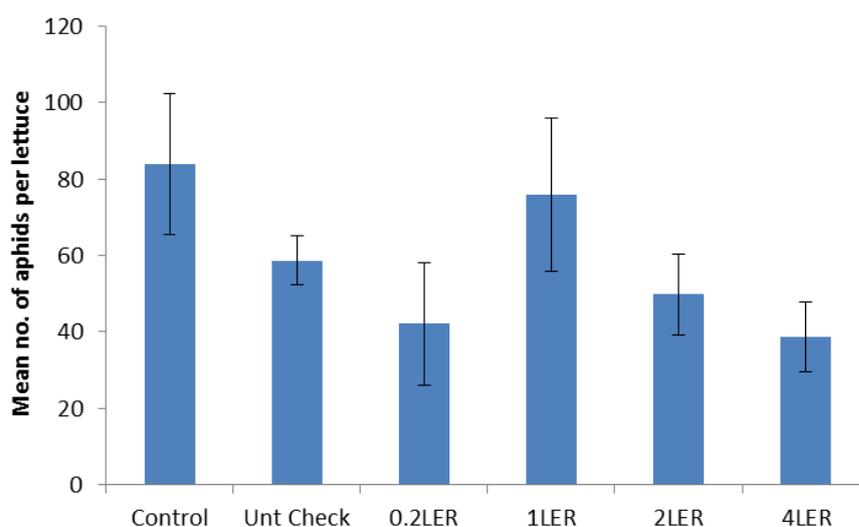


Fig.3. The mean numbers of *A. solani* at harvest, (Aug 2012).

Lettuce – curly

A further trial was conducted in the glasshouse using a curly lettuce variety (cv Fairplay) which was artificially infested with *M. persicae*.

Numbers of aphids at harvest were very variable, ranging from 0 to 28 per plant. Plants treated with 4x LER had the lowest number of aphids: there were 30% fewer aphids than in the untreated controls. Though results were not statistically significant, they followed the trend established in previous trials.

Germination and phytotoxicity

The percentage seed germination for each treatment and crop were recorded at the start of each trial. JA seed treatment did not affect the germination of any of the crops and there was no recorded phytotoxicity effects observed following treatment application.

Financial benefits

The results demonstrate the potential of using JA seed treatment as an additional tool in the armoury for the control of aphids in IPM programmes to protected herb and possibly lettuce crops.

*** Details of future work will be given in the tender which will be advertised on the HDC website soon.**