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Project leader:	Jude Bennison, ADAS
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The results and conclusions in this report are based on a series of experiments conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with 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 the report represents a true and accurate record of the results obtained.

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GROWER SUMMARY

Headline

- A modified tractor-mounted suction machine designed for removing horse droppings from paddocks removed up to 70% of leafhoppers from field crops of mint and thyme in a single pass.

- The machine also removed up to 85% of non-target invertebrates, including other pest species, ‘incidental’ species and some beneficial insects such as bees and parasitic wasps. Impact on beneficial insects could be reduced by avoiding using the machine in flowering crops.

- Repeated use of the suction machine on a crop of mint did not reduce leafhopper damage, probably due to rapid re-invasion of treated plots.

- It may be possible to increase the efficacy of the machine by some simple modifications to reduce escape of target pests during the suction operation.

Background and expected deliverables

A machine designed in the US for the removal of horse droppings from paddocks by suction has been modified and used commercially by one UK grower to remove pests, particularly leafhoppers, from field-grown herbs. However, the beneficial effects of this ‘suction machine’ have not been quantified.

The expected deliverables of this project were to examine the efficiency of the machine in removing pests from herb crops and to establish what, if any, reduction in damage followed use of the machine.

Summary of the project and main conclusions

Removal of leafhoppers and other insects from thyme and mint crops

- In the first experiment on flowering thyme, numbers of leafhoppers in treated plots were 70% lower than in untreated plots immediately after passage of the suction machine.
- Numbers of non-target invertebrates were 75% lower in treated thyme plots. These included other pest species (aphids), 'incidental' species (crane flies, various small flies and springtails), and beneficial species (bumblebees and honey bees). The thyme was flowering when the suction machine was used and this will have attracted many of these insects e.g. bees to the crop. Avoiding using the suction machine on a flowering crop is likely to reduce the impact on beneficial species.
- In the second experiment on mint, numbers of leafhoppers in treated plots were 66% lower than in untreated plots.
- Numbers of non-target invertebrates were 85% lower in treated mint plots. These were mainly miscellaneous fly species, but also included pollen beetles and parasitic wasps.
- In both experiments, it was evident that the passage of the suction machine over the crops, even in non-operating mode, had a 'flushing' effect on both leafhoppers and non-target invertebrates, which was consistent if not in all cases statistically significant. There is an important implication in this, because the efficacy of the machine is compromised if it merely diverts pests onto neighbouring rows of crop rather than removing and destroying them. The design of the suction machine is such that it is mounted on the rear of a tractor, where it is driven by the tractor's power take-off (PTO). This means that the tractor passes over the crop before the inlets of the suction machine and this seems to be why the invertebrates are 'flushed'.

Reduction in leafhopper damage on mint

In a further experiment on mint, suction treatment at weekly intervals for four weeks did not reduce the level of leafhopper damage compared with that in adjacent, untreated plots. The percentage of damaged leaves increased from a mean of 3.7% before the first treatment was applied to 11.6% at the end of the experiment when the crop was harvested. There were no differences between treated and untreated plots. This was disappointing, because the first two experiments had shown that the suction machine could reduce the presence of leafhoppers by 66-70% immediately after treatment, so a similar reduction in damage might have been expected. This lack of damage-reducing effect may have been due to several factors:

1. Leafhopper adults are highly mobile and the presence of untreated plots among the treated ones (necessary for experimental design) may have acted as reservoirs from which re-invasion of treated plots could rapidly occur.
2. The ‘flushing’ effect of the passage of the machine may have resulted in significant numbers of leafhoppers redistributing themselves between plots after treatment, rather than being eliminated altogether from the experimental area.
3. More frequent use of the machine might produce better results, as the 30%-plus leafhopper adults that remained after treatment may have been sufficient to cause the damage.
4. Some or all of the damage may have been caused by leafhopper nymphs, which are more difficult than adults to dislodge from foliage. However, very few nymphs were recovered from the leaf samples so this seems unlikely.
5. The summer of 2008 was cool and wet, leading to lower leafhopper populations on the herb crops than experienced in previous years. The suction machine may have led to reductions in leafhopper damage if numbers of the pest had been higher.

Potential modifications to the suction machine

Although the suction machine is powerful, produces a strong air-stream and destroys many invertebrates, it is evident that there are potential modifications that could be made that would improve its efficiency:

1. Mounting the machine on the front of its carrying tractor would be likely to reduce its flushing effect, since any invertebrates would then be disturbed by the inlets to the machine rather than by the front axle of the tractor and would therefore be more liable to be trapped than to escape.
2. If all or part of the exhaust air from the machine could be diverted into air-jets that were directed at foliage just in front of the inlets, this might have an additional dislodging effect that would increase the ‘catch’.
3. The addition of large side plates that projected from just in front of the tractor wheels, alongside the suction machine to well in front of the machine’s inlets, and extended from just above ground level to perhaps a metre in height or

more, might reduce the number of leafhoppers that could escape sideways, again increasing the potential 'catch' of the machine.

Future work

Although these experiments did not demonstrate a positive benefit from the use of the machine in terms of reduction in leafhopper damage, there seems to be enough potential in it to justify some mechanical modifications to the machine followed by further experimental assessment.

Financial benefits

At present, the financial benefits of using the suction machine to control leafhoppers in herbs have not been demonstrated. The project showed that the machine removed a significant proportion of leafhopper adults from herb crops but no reduction in pest damage was given.

Action points for growers

- Adoption of this machine in its present state of development cannot be recommended.
- There is sufficient promise in the technique of suction-removal of pests to justify mechanical development of the machine followed by further experimental assessment of its benefits.

SCIENCE SECTION

Introduction

Leafhoppers are major pests of both field-grown and protected herbs for the fresh market. Retailers do not accept damaged produce and so growers need to control the pests. Although many use contact-acting pyrethroid insecticide sprays these often give only poor control. A better method, preferably using non-chemical control strategies, would enable growers to meet retail demands for good-quality produce grown with minimal pesticide inputs.

Since the early 1990's researchers and growers in California, Israel and Canada have used air jet/suction machines to remove insect pests from crops such as strawberry, celery, potato, tomato and melon (Boiteau *et al.*, 1992, Pickel *et al.*, 1994, Weintraub *et al.*, 1996). The most successful of these machines use an air-jet to dislodge insects coupled with a strong 'suction' airstream to remove them from the crop and destroy them.

In 2007 a UK grower began to use a modified suction machine in an attempt to remove leafhoppers from herb crops mechanically during the growing season. The machine was reported to be capable of removing leafhoppers without damaging the crops, so it presented an attractive proposition for growers. However, the machine was originally designed to be used for the removal of horse manure from grazing paddocks and its efficacy in removing leafhoppers and reducing damage to herb crops had not been established before it was put into use.

This project aimed to quantify the efficacy of the modified suction machine in removing leafhoppers and reducing crop damage in field-grown herbs.

Materials and methods

Objective 1: Identify the optimum airflow, tractor speed and machine operational height for the efficient removal of leafhoppers from two selected herb crops, mint and thyme

The suction machine that was used for the experimental work was a modified horse-paddock cleaning machine that was imported from the USA. This simple machine consisted of two centrifugal fans, each connected by a large-diameter pipe and hood to a rectangular inlet that was held parallel to the ground and could be raised or lowered to the preferred height above the pasture/crop by the operator. The inlets measured approx 800mm x 200mm so that, side-by-side, they spanned the standard 1.6m bed-width that the grower used for his herb crops. The machine was mounted on the rear of a tractor and the fans were driven by the tractor's power take-off (PTO) shaft. In use, each fan produced a strong air-draught that entered via the rectangular inlet, passed up the pipe, through the vanes of the fan and exited via an outlet at approximately 2m above ground level. When the machine was used as a paddock cleaner the entrained debris passing through the fans would be directed into a trailer attached to the tractor. When it was used for insect removal the trailer was dispensed with and instead plastic baffles were installed over the machine's outlets. It was envisaged that any insects that were dislodged from the crop, entrained in the airflow and survived passage through the centrifugal fan would be killed mechanically by impact with the baffles. Essentially, the machine was similar to a very large and powerful version of a domestic 'vacuum cleaner' and worked in the same way, by entraining loose materials in a fast air-stream.

It was originally intended to measure the speed of the inlet air-stream that the machine generated. However, it quickly became clear that no single value could be attached to this. The airspeed varied depending upon where the measurements (with a hand-held anemometer) were taken relative to the rim of the inlet, and was also influenced by the distance of the inlets from the ground (which effectively influenced the area of the intake orifice) and the presence or absence of plant material close to the inlet. Local airspeeds in excess of 40m/sec were however recorded. These were sufficient to produce strong agitation of any plant material that the inlets passed over but did not uproot or damage healthy plants.

The speed of the fans and therefore the power of the airflow was defined by the operating speed of the tractor's PTO. This was not adjustable, so the speed of the fans could not be varied. The work-rate of the suction machine could therefore only be influenced by making variations in the forward speed of the tractor. Removal of leafhoppers when operating the machine using both the slowest and fastest possible driving speeds were tested on both thyme and mint in experiments conducted under Objective 2.

Objective 2: Quantify the reduction in leafhopper numbers in crops of mint and thyme

Two experiments were conducted on field-grown herbs at the National Herb Centre, where culinary herbs are produced to be sold fresh through supermarkets.

Experiment on thyme, 19 June 2008

The aim of this experiment was to quantify the efficacy of using the suction machine to remove leafhoppers from thyme (*Thymus vulgaris*).

Treatments and experimental design

Treatments were as follows:

1. Untreated – no machine used
2. Machine in non-operating mode, slow tractor speed
3. Machine in operating mode, slowest possible tractor speed (0.67 m/sec)
4. Machine in operating mode, fastest possible tractor speed (1.0 m/sec)

No. of replicates: 5

No. of plots: 20

Plot size: 15m x 1.6m

Layout: randomised block design

Herbs are grown at the National Herb Centre in beds approximately 1.6m wide, separated from adjacent beds by wheelings approximately 50 cm wide. The area of thyme available for the experiment consisted of seven of these beds, each approximately 75m long. For experimental purposes, the two outer beds were used as buffer zones between the experimental beds of thyme and the adjacent herbs. Each of the central five beds of thyme were used to house four experimental plots. Each plot was 15m long and the plots were separated from each other within the bed by a buffer zone of 5m.

Assessments

The crop was in flower at the time of the trial and small areas were being harvested at random and at irregular intervals. Because the machine destroys any invertebrates that it collects it was not possible to measure its effect by sampling the material that had passed through it and was ejected. Instead, its effects were assessed by the indirect method of sampling the insects present in untreated plots and comparing this with the insects that remained in treated plots.

The insects present immediately after treatment of each plot were sampled using a sweep net. Twenty sweeps were completed for each plot, with the net always being handled in the same way by the same operator. The rim of the net was forced through the top of the crop during sweeping in an attempt to dislodge any non-mobile insects present there. At the completion of each sample the contents of the sweep-net were everted into a plastic bag, which was then sealed, transported back to the laboratory and placed in a freezer to await examination of the contents. The invertebrates present in each bag were identified, counted and recorded by an experienced entomologist.

Samples of thyme shoots (20 per plot) were taken from each plot immediately after treatment to check for the presence of leafhopper nymphs on the leaf material.

Statistical analysis

Data were analysed using Analysis of Variance.

Experiment on mint, 27 July 2008

The aim of this experiment was to quantify the efficacy of the suction machine in removing leafhoppers from spearmint (= garden mint, *Mentha spicata*), which has a different crop architecture from the thyme used in the first experiment.

Treatments and experimental design

Treatments were as follows:

1. Untreated – no machine used
2. Machine in non-operating mode, fast tractor speed
3. Machine in operating mode, fast tractor speed

No. of replicates: 7

No. of plots: 21

Plot size: 10m x 1.6m

Layout: randomized block design

The treatments used were similar to those used in the experiment on thyme, except that the slow-speed pass with the machine in operating mode was eliminated. The first experiment had shown this treatment to be of no advantage when compared to the high-speed pass, and the latter would be preferred by growers as it gives a higher work-rate than the slower speed pass.

The experiment was done on seven beds of mint, each being approximately 120m long. As in the thyme experiment, the outer two beds 1 and 7 were used as untreated buffer zones between the experimental area and the adjacent crops, whilst beds 3 and 5 were used as untreated buffers between the treated beds (numbers 2, 4 and 6). Individual plots were 10m long, separated from adjacent plots within the bed by a buffer of 4m.

At the time of the experiment the mint was re-growing after having been harvested on an earlier date and consisted of a matted base of old stems with a vigorous re-growth bearing about seven leaves per stem.

Assessments

As in the thyme experiment, the insects present immediately after the treatments were carried out were sampled using a sweep-net, and the catches from each plot were identified, counted and recorded by an experienced entomologist.

Statistical analysis

Data were analysed using Analysis of Variance.

Objective 3: Quantify the reduction in leafhopper damage to mint at harvest

One further experiment was done on mint to quantify the effect of regular removal of leafhoppers using the suction machine on the level of leafhopper damage present in the crop at harvest.

Treatments and experimental design

Treatments were as follows:

1. Machine in non-operating mode, fast tractor speed
2. Machine in operating mode, fast tractor speed

Dates of treatment:

1. 25 July 2008
2. 28 July 2008
3. 5 August 2008
4. 13 August 2008

Dates of sampling and assessment:

5. 25th July 2008 (Pre-treatment)
6. 20th August 2008 (Post-treatment)

No. of replicates: 14

No. of plots: 28

Plot size: 25m x 1.6m

Layout: randomised block design

The trial was conducted in an area comprising seven adjacent beds of spearmint, each 100m long. Each bed was divided into four plots, each of 25m, in two blocks of two plots each. Thus there were a total 14 blocks of two plots, i.e. one plot for each of the two treatments used.

Application of treatments and assessments

- The plots were marked out on 25 July, shortly after a round of commercial harvesting had been completed, and samples of 20 shoots were taken at random from each plot. These were put into labelled plastic bags for subsequent assessment in the laboratory.
- The first round of treatments was then applied to the experimental site. The suction machine in operating mode was passed over one of each pair of plots. The machine also passed over the second of each pair of plots, but this time not operating, as a form of control treatment. It was not practical to include a true control treatment in this trial, i.e. the machine not being passed over the plot, because the machine could only be driven the whole length of the beds. Diversion around these control plots would have caused unacceptable crop damage.
- Three further rounds of treatment were then applied to the plots, at intervals. This was done by the farm staff of the National Herb Centre. On each subsequent occasion the individual plots were treated they received the same treatment as they had on the first occasion.
- Just before the mint was due to be harvested, further samples of 20 shoots were taken from each plot and taken back to the laboratory for damage assessment.
- In the laboratory, each shoot was examined and the number of leaves on each was recorded. The number of these leaves showing evidence of damage by leafhoppers, leaf miners, caterpillars and other pests was also recorded. This was done on each of the two sampling occasions.

Statistical analysis

Data were analysed using Analysis of Variance.

Results and Discussion

Objective 2: Quantify the reduction in leafhopper numbers in crops of mint and thyme

Experiment on thyme: leafhopper numbers and species

Almost 550 insects were caught in the sweep net during the sampling undertaken in this experiment, of which 214 were leafhoppers. The leafhoppers comprised 212 'green leafhoppers', *Empoasca decipiens*, a species commonly found on thyme, and two 'potato leafhoppers', *Eupteryx aurata*, a species more commonly associated with mint. It is probable that the latter specimens had strayed into the thyme from an adjacent crop of mint.

There was a mean of 18.2 adult leafhoppers per untreated plot in this trial (Table 1). Running the suction machine through the plots significantly reduced mean numbers of leafhoppers to 5.4 leafhoppers per plot ($P<0.05$), a reduction of just over 70%. Over the range of speeds available, the speed of travel of the machine through the treated plots did not seem to influence its effectiveness, the same reduction in numbers occurring whether the machine travelled at the upper or lower end of the available range. There was some indication that merely passing the non-operating machine through the plots might also have had the effect of slightly reducing the remaining leafhopper population, although this was not statistically significant at the 95% confidence level.

Table 1. Mean numbers of leafhoppers per thyme plot after treatment with the suction machine at slow or fast speed. ***** significantly lower than in untreated control, $P<0.05$

Treatment	Mean number of leafhoppers per plot
1. Untreated	18.2
2. Machine non-operating, slow speed	13.8
3. Machine operating, slow speed	5.4*****
4. Machine operating, fast speed	5.4*****

Experiment on thyme: numbers and species of non-target insects

Of the 550 insects caught in the sweep net during this experiment, 214 were leafhoppers and 228 were miscellaneous small flies. The remaining 108 insects were aphids, crane flies, springtails, bumblebees, honey bees and small numbers of other insects. It is likely that many of these were attracted to the pollen and nectar sources in the thyme, which was in flower. Avoiding using the machine in flowering herbs is likely to reduce the impact on beneficial species such as bees.

Running the suction machine through the experimental plots significantly reduced ($P<0.05$) the mean numbers of non-target insects per plot from 54.8 in untreated plots to 13.4 and 14.4 per plot at fast and slow speeds respectively (Table 2), i.e. by just under 75%. There was no discernible difference in reduction of non-target insects when using the different rates of travel of the machine. Passing the machine through the plots in non-operating mode also significantly reduced the number of insects present, by over 50% (Table 2). This confirmed that even when switched off the passage of the machine caused a reduction in the number of insects remaining in the plots, i.e. a 'flushing effect'.

Table 2. Mean numbers of non-target insects per thyme plot after treatment with the suction machine at slow or fast speed. ***** significantly lower than in untreated control, $P<0.05$

Treatment	**Mean number of non-target insects per plot**
1. Untreated	54.8
2. Machine non-operating, slow speed	26.8*****
3. Machine operating, slow speed	14.4*****
4. Machine operating, fast speed	13.4*****

Experiment on mint: leafhopper numbers and species

The total catch of insects in the sweep-net during this experiment reached 720 individuals. However, only 59 of these were leafhoppers, including 27 'potato leafhoppers', *Eupteryx aurata*, the species usually associated with mint. The remaining leafhoppers included five 'green leafhoppers', *Empoasca decipiens* (the species predominating on the thyme), 20 *Delphacodes* sp. (a grass-feeding species) and seven *Macrosteles sexnotatus*, a species found on grasses and clovers. It is probable that the latter two species were associated with grass weeds present in the mint crop.

The mean number of leafhoppers present in the mint was much lower than in the thyme (Table 3), and only just under half of them were likely to have been pests of mint. Nevertheless, the suction machine did produce a significant reduction ($P<0.05$) in the number of leafhoppers present, from 4.71 to 1.57 per plant, a decrease of approximately 66% (Table 3). As in the thyme experiment, the machine may have had a 'flushing effect', even when passed over the crop whilst not operating, though this was not confirmed statistically.

Table 3. Mean numbers of leafhoppers per mint plot after treatment with the suction machine in operational or non-operational mode at fast speed. ***** significantly lower than in untreated control, $P<0.05$

Treatment	Mean numbers of leafhoppers per plant
1. Untreated	4.71
2. Machine non-operating, fast speed	2.14
3. Machine operating, fast speed	1.57*

Experiment on mint: numbers and species of non-target insects

Of the 720 insects caught in the sweep net during the experiment, 59 were leafhoppers and of the remaining, non-target insects, the three most numerous insect groups were miscellaneous flies (466), parasitic wasps (98) and pollen beetles (40).

The passage of the suction machine in operating mode over the plots resulted in a significant reduction ($P<0.05$) in numbers of non-target insects, of the order of 85% (Table 4). In non-operating mode a significant reduction was also recorded, this time of 62%, again confirming the 'flushing effect' of the machine.

Table 4. Mean numbers of non-target insects per mint plot after treatment with the suction machine at slow or fast speed. ***** significantly lower than in untreated control, $P<0.05$.

Treatment	Mean number of non-target insects per plot
1. Untreated	62.4
2. Machine non-operating, fast speed	23.7*
3. Machine operating, fast speed	9.4*

Objective 3: Quantify the reduction in leafhopper damage to mint at harvest

The mean number of leaves present per shoot at the time of the pre-treatment assessment on 25 July was 7.6. With 20 shoots being sampled per plot, the total number of leaves examined for leafhopper feeding damage (a distinctive pale speckling of the leaf) at this assessment was 4,231. Any leaf showing even slight symptoms of leafhopper speckling was counted as damaged, because supermarkets, which are important customers for fresh herbs, have a very low (or zero) tolerance of this.

By the time of the post-treatment assessment on 20 August, 27 days after the pre-treatment assessment and a day before the crop was due to be picked, the mean number of leaves per shoot had risen to 9.6, an increase of two leaves per shoot since the pre-treatment count. During the post-treatment assessments 5,383 leaves were examined for pest damage.

At the pre-treatment assessment on 25 July there was an overall mean of 3.7% of leaves with damage symptoms and after four weekly applications of the machine (with or without suction) there was a mean of 11.6% damaged leaves (Table 5). Using the machine with suction did not reduce the percentage of damaged leaves compared with using it without suction. The host grower considered that leafhopper numbers on the field-grown herbs during 2008 were much lower than usual, possibly due to the cool, wet summer, and he did not use the suction machine on his crops except for on the experimental plots in this project. It is possible that in a warmer season, with larger leafhopper populations, the suction machine would have reduced leafhopper damage.

Table 5. Percentage mint leaves with leafhopper damage after four repeated applications of the suction machine at weekly intervals, with or without suction

Treatment	Mean % damaged leaves (range) pre-treatment	Mean % damaged leaves (range) post-treatment
Without suction	3.6 (0-13.3)	11.4 (3.5-22.5)
With suction	3.8 (0.7-6.5)	11.7 (3.5-23.6)
Mean	3.7	11.6

Conclusions

- The suction machine is clearly capable of reducing the numbers of insect pests present in crops. It removed between 66% (mint) and 70% (thyme) of leafhoppers from herb crops in a single pass.
- The machine produces a sufficiently powerful airstream to entrain a wide range of species. In addition to leafhoppers, it also removed 85% (mint) 75% (thyme) of non-target invertebrates. Some of these were potential pest or contaminant species e.g. aphids and pollen beetles, many were 'incidental' species e.g. miscellaneous flies and springtails, but some were beneficial species e.g. bumblebees, honey bees and parasitic wasps. As the thyme crop was flowering when the suction machine was used, it is likely that some of the beneficial species including bees, were attracted to the flowers as a source of pollen and nectar. Avoiding using the machine in flowering crops is likely to reduce the numbers of beneficial species being removed.
- Passing the tractor-mounted suction machine in non-operating mode over the crop clearly has a flushing effect on mobile invertebrates, as it resulted in lower sweep-net catches immediately afterwards.
- The flushing effect of the tractor carrying the suction machine could be considered a drawback of the design. Insects that are flushed from the crop can infest neighbouring beds or re-invade treated beds, and so continue to damage the crop.
- The suction machine would be likely to cause a higher mortality of target insects if it was mounted on the front of the carrying tractor rather than the rear. Any insects flushed would then be more likely to be caught up in the machine rather than escaping.
- The Israeli machine that is used for removing capsid bugs and other insects incorporates air-jets to dislodge insects as well as the suction device to collect and kill them. It also incorporates side-screens alongside the suction inlet area to prevent insects escaping sideways as the machine approaches and thus to increase the efficiency of the machine. Both of these modifications could be made to the machine used in this project.
- The results suggested that removing approximately 65-70% of leafhoppers from a crop four times in a 27-day period was insufficient to have any impact on the mean 11.6% leaves damaged by leafhoppers at harvest. However, 2008 was

cool and wet and leafhopper populations and damage levels in the herb crops were lower than experienced previously on the farm. It is possible that in a warmer season, with larger leafhopper populations, the suction machine would have had a significant impact on leafhopper damage.

- As only a relatively small area of herbs were available for the repeated suction experiment, it was not possible to have treated and untreated plots widely spaced in the experiment design. Thus leafhoppers could have re-invaded treated plots from adjacent untreated plots after the suction procedure, and the flushing effect would have exacerbated this problem. In commercial practice, the whole area of a herb crop would be subjected to suction treatment rather than leaving 50% of it untreated. This would minimise the area left as a reservoir of leafhoppers and might increase the effectiveness of the treatment.
- It is possible that the machine is less efficient at removing leafhopper nymphs from plants than it is at removing adults, leaving the nymphs behind to cause damage. However, no leafhopper nymphs were found on the 9000+ leaf samples that were examined in this experiment, which makes this explanation unlikely.
- Treating the whole area of a crop in a single pass (rather than leaving untreated reservoirs as in Trial 3) might improve the efficiency of the treatment, as might applying the treatment to the crop at shorter intervals.

Technology transfer

Jude Bennison presented some of the project results at the BHTA Technical Meeting at the National Herb Centre on 17 March 2009.

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