Grower summary

SF 79

Evaluation of foliar sprays of acaricides for control of tarsonemid mite in strawberry

Final report 2007

Project Title:	Evaluation of foliar sprays of acaricides for control of tarsonemid mite in strawberry 2007
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Report:	Final report 2007
Previous reports:	None
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Date Project commenced:	March 2006
Expected completion date:	September 2007

Key words: tarsonemid mite, acaricides, *Phytonemus (Tarsonemus) pallidus* ssp. *fragariae*, strawberry, abamectin (Dynamec), tebufenpyrad (Masai), Sequel, Floramite, Borneo, UKA378b, Silwet

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Authentication

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

Signatures (project leaders).....

date.....

J V Cross & J D Fitzgerald, East Malling Research, Date 5 November 2007

East Malling Research is an Officially Recognised Efficacy Testing Organisation (Certification No. ORETO 0150)

Grower summary

Headline

Control of tarsonemid mite in commercial strawberry was dramatically improved by the addition of a wetter to acaricides, including Dynamec and a 'novel' compound. Admixture of these acaricides with adjuvants is not currently supported by label recommendations and it is recommended that they are not used in admixture until more testing has been done.

Background and expected deliverables

The tarsonemid mite, *Phytonemus (Tarsonemus) pallidus* ssp. *fragariae*, is a serious pest of strawberry. The previously effective insecticide endosulfan (Thiodan) is no longer available, so there is a need to find alternative acaricides to control this pest which causes stunting and distorting of leaves and buds, reducing yield and quality. An experiment was conducted to determine the efficacy of foliar sprays of 10 acaricidal treatments for curative control of tarsonemid mite adults, nymphs and eggs, and to assess their effects on natural enemies. In a previous study, in 2006, products were identified that were candidates for controlling the mite. Further aims of this trial were to investigate the incorporation of a wetter to spray applications and to determine whether higher doses of abamectin (Dynamec), that were used in the previous trial, reduce tarsonemid mite populations in strawberry.

Summary of the project and main conclusions

An experiment at East Malling Research in 2007 determined the efficacy of acaricides for controlling tarsonemid mite in polytunnel-protected everbearer strawberry plants in grow bags. Treatments evaluated included both approved acaricides (Dynamec and Masai) at recommended and non recommended rates, along with novel products. Some treatments were applied in admixture with the silicone adjuvant Silwet L-77. The full list of treatments can be found in Table 1.

Table 1 Summary of treatments included in the trial

Treatment	**Active ingredient**	**Rate/ha**
Dynamec	abamectin	500 ml
Dynamec + Silwet L-77	abamectin	500 ml
Dynamec	abamectin	750 ml
Dynamec	abamectin	1250 ml
Masai	tebufenpyrad	750 g
Masai + Silwet L-77	tebufenpyrad	750 g
UKA378b + Silwet L-77	novel	640 ml
Floramite + Silwet L-77	bifenazate	400 ml
Sequel + Silwet L-77	fenpyroximate	1000 ml
Borneo + Silwet L-77	etoxazole	500 ml
Silwet L-77	heptamethyltrisiloxane	50 ml
Untreated		

Two spray applications (1000 l/ha) were applied on 13 and 29 August 2007 to plants previously inoculated with tarsonemid mites. Numbers of tarsonemid adults, nymphs and eggs and of predatory mites were determined on 24 August and 5 September 2007, 7-9 days after each treatment application, by counting the number of each life stage on 5 young trifoliate leaves from each plot.

This trial confirmed many of the findings of the previous trial undertaken in 2006 including the importance of the use of a silicone wetter with acaricide products.

- Only the UKA378b+Silwet and Dynamec 500ml+Silwet reduced all life stages of the tarsonemid mite compared to the untreated control.

- By the second spray application these treatments had reduced total mite numbers by 97% and 98%, respectively.

- Masai and Dynamec alone did not significantly reduce the total number of all the mite life-stages.

- The approved rate of use of Dynamec in the UK is 500 ml product/ha which is substantially lower that the dose used in other EU countries, which vary between 750-1250 ml/ha. However, Dynamec without Silwet did not significantly reduce numbers of tarsonemid mites at doses of 750-1250 ml/ha in this trial.

- Masai alone gave some control of tarsonemid mite adults and eggs after the first application only. Masai+Silwet gave significant control of adults and eggs after a second application, reducing numbers by 80%.

- Borneo in admixture with Silwet was effective at controlling adult and egg stages (85% total reduction).

- The most effective control of the mite was achieved after the second application of the successful products.

- Sequel+Silwet and Floramite+Silwet were ineffective.

- Numbers of predatory mites were reduced by all the Dynamec and Masai treatments and by Borneo+Silwet. No signs of phytotoxicty to the plants were observed.

The substantially improved control achieved by admixture of a silicone wetter is believed to be due to better spray penetration in to the young folded leaves where tarsonemid mites live and breed. Strawberry leaves are waxy and covered in hairs, and many products not specifically formulated for the crop have insufficient wetting properties.

The data presented here are very encouraging for the prospect of chemical control of tarsonemid mites in commercial strawberry. It is recommended that further tests be executed to evaluate the efficacy of higher rates of Dynamec with the addition of a silicone wetter, and efficacy of the addition of other adjuvant classes to Dynamec and the novel product UK378b.

Financial benefits

Tarsonemid mite is a serious pest of strawberry and, since the withdrawal of Thiodan, the UK industry no longer has a highly effective treatment to control the pest. It currently relies on biological control and the partially effective acaricides Dynamec and Masai. Losses in the UK due to outbreaks of tarsonemid mite have not been quantified but are substantial. Though outbreaks are usually localised, complete crop loss can occur in the affected areas, and in years when such outbreaks have been widespread, substantial financial losses have resulted. Occurrence of infestation, even at low levels, in propagation crops is particularly ruinous as the whole crop may be unsaleable. More effective control will have substantial financial benefits.

Action points for growers

- Clear benefits of using Dynamec in admixture with a silicone wetter have been demonstrated both in this and the previous experiment.

- Dynamec has a specific off-label approval (SOLA) for use in strawberries. Any use of the product is at the growers risk growers should possess and read a copy of the SOLA if it is used on strawberry.

- The label states that Dynamec should not be used with adjuvants.

- To date, no problems with admixture of Dynamec with adjuvants have been reported from strawberry, but before Dynamec (or any other pesticide for which no specific compatibility recommendation is given) is used in admixture, growers should take the precaution of testing on a small number of plants before employing large scale treatment.

- Be aware that the effect of admixture of the product with an adjuvant on the occurrence of residues in harvested fruit has not been assessed.

Science Section

Evaluation of foliar sprays of acaricides for control of tarsonemid mite in strawberry

Introduction

Tarsonemid mite (*Phytonemus pallidus* spp. *fragariae* (Zimmerman)), also known as strawberry mite, is a serious pest of strawberry in the UK. Formerly, attacks were severe only during hot summers and the pest was effectively controlled by high volume post-harvest sprays of endosulfan (Thiodan). Endosulfan (Thiodan) is no-longer available and there is, as yet, no really effective replacement. Everbearer varieties, mid and late season crops and those under protection appear particularly prone to attack. The mites attack the upper surface of very young strawberry leaves, mainly along the mid-vein between the two halves of the folded leaflets. Damaged plants are stunted with small, rough and distorted leaves. Infestation is usually patchy at first but can spread rapidly especially in warm conditions. The pest should be prevented by planting clean stock and by introducing the predatory mite *Amblyseius cucumeris*, making repeated introductions until the predator has established. Increased numbers of the predators are needed to control existing infestations. The predatory mite *Amblyseius californicus* may also be used in protected crops that are sealed throughout their life. Biological control, though effective, is slow acting and does not eliminate the pest.

Previous HDC trials work showed that tebufenpyrad (Masai) (approved for control of two-spotted spider mite on strawberry) and abamectin (Dynamec) are partially effective against tarsonemid mite. Control during propagation and efficient spray cover when applying acaricide sprays are important. Dynamec has recently been granted a SOLA for protected strawberry. However, as Dynamec and Masai are only partially effective, more effective chemical treatments need to be identified. The work reported here follows a trial carried out in 2006 aimed at testing alternative acaricides to Dynamec and Masai and to determine whether an admixture of acaricides with the silicone based wetter Silwet improves control. In the 2006 trial

only Masai+Silwet and Dynamec+Silwet significantly reduced tarsonemid mite populations. Masai or Dynamec sprayed alone did not significantly reduce the mites, with Dynamec alone only reducing numbers of adults after the second spray application. However, it was noted that the rate of Dynamec used in this trial was half the maximum and much lower than the rates approved in other EU countries, which vary between 750-1250 ml/ha. In the 2006 trial Sequel, Floramite, Oberon, Kanemite, UKA378b and Envidor were ineffective at controlling tarsonemid mites.

Here we report a single replicated field experiment conducted on everbearer strawberry plants in a polytunnel in 2007 to further determine the efficacy of acaricide sprays to control tarsonemid mite in the UK. Treatments evaluated were the standard and two higher rates of abamectin (Dynamec), tebufenpyrad (Masai), Dynamec and Masai in admixture with the silicone adjuvant Silwet, and four novel acaricides (UKA378b, Floramite, Sequel, Borneo) each in admixture with Silwet. An untreated control and a wetter application alone were included as controls. The aim was to identify more effective treatments for use by growers.

Methods and Materials

A small plot replicated experiment comparing foliar sprays of the acaricidal products was carried out on tarsonemid mite infested everbearer strawberry plants (cv. Flamenco) in a polytunnel at East Malling Research (EMR) between March and September 2007.

Tarsonemid culture

Infested control plants from the previous year were kept in two glasshouses at EMR in order to culture the tarsonemid mites. Approximately 100 elite Flamenco cold-stored strawberry runner plants were planted into individual pots and placed amongst the infested plants (2 February 2007, Appendix 1) to increase the number of inoculation plants available for the trial. The mite populations took some months to build up to levels sufficient to inoculate experimental plants (4 June 2007).

Experimental design and layout

The experimental strawberry plantation consisted of 48 plots in a 22 x 6 m Spanish polythene tunnel (EMR plot code WF211) remote from other strawberry plantations. A randomised block experiment with 4 replicates of 12 treatments was used. Each

plot consisted of a standard 1m peat bag planted with 10 Flamenco everbearer strawberries on 25 April 2007. Each bag was provided with trickle fertigation. The plots were arranged in 4 rows of 12, within the polytunnel (Appendix 1). Plots were separated by 0.5 m (Appendix 1).

On 4 June 2007, tarsonemid infected plants from the glasshouse culture were moved to the polytunnel and two infested potted plants placed in the centre of each plot (peat bag). Young leaves from the strawberry plants in the polytunnel were checked for tarsonemids on 3 and 19 July and low numbers of mites were observed. A full pre-assessment was done on 13 August and sufficient numbers of tarsonemid mites were present for the treatments to be applied.

Treatments

Treatments were foliar sprays of the standard and two higher rates of abamectin (Dynamec), tebufenpyrad (Masai), Dynamec and Masai in admixture with the silicone adjuvant Silwet L-77, and four novel acaricides (UKA378b, Floramite, Sequel, Borneo) each in admixture with Silwet-L77 (Table 1). An untreated control and a Silwet L-77 application alone were included as controls. Each material was applied twice (no sprays were applied to the untreated control), at an interval of 16 days (13 and 29 August). Treatments were applied with a knapsack sprayer with a hand-lance at a volume rate of 1000 l/ha. Each plant was sprayed for 5 (second treatment) or 6 (first treatment) seconds delivering a volume of 20 ml spray per plant. The amount of spray remaining in the tank after each treatment application was measured so that the dose applied to each plot could be checked. The majority of the applications delivered a spray volume within 10% per of the target volume. However, a couple were only 25% of the required dose. Although 25% variation is below the targeted spray volume for some of the treatments, all plants on all plots were covered in spray so that runoff occurred.

Table 1. Treatments. Sprays were applied at a volume rate of 1000 l/ha.

Trt no.	Product	Parent company	Active substance and formulation	Dose rate product/ha
1	Dynamec	Syngenta	abamectin 18 g/l EC	500 ml

2	Dynamec + Silwet††	Syngenta	abamectin 18 g/l EC	500 ml
3	Dynamec	Syngenta	abamectin 18 g/l EC	750 ml
4	Dynamec	Syngenta	abamectin 18 g/l EC	1250 ml
5	Masai 1	BASF	tebufenpyrad 20% w/w WB	750 g
6	Masai 2 + Silwet††	BASF	tebufenpyrad 20% w/w WB	750 g
7	UKA378b + Silwet††		'novel'	640 ml
8	Floramite + Silwet††	Certis	bifenazate	400 ml
9	Sequel + Silwet††	Certis	fenpyroximate 51.3 g/l SC	1000 ml
10	Borneo + Silwet††	Interfarm	etoxazole 110 g/l	500 ml
11	Silwet L-77	GE Silicones	heptamethyltrisiloxane	50 ml
12	Untreated	-	-	-

Assessments

A pre-treatment assessment was made (13 August 2007) of the degree of tarsonemid mite infestation in the polytunnel. One young trifoliate leaf from each of the plots was collected and examined using a microscope and the number of tarsonemid mites and eggs recorded. A note was made of any potential predators.

The effects of the treatments were assessed between 7-9 days after each treatment application (24 August and 5 September 2007) by counting the number of mite adults, nymphs and eggs (Appendix 1) on 5 trifoliate leaves per plot (grow bag) under a binocular microscope. The upper and lower surface of each trifoliate leaf was examined. Predatory mites were also counted on the same leaves.

Plot maintenance

Daily watering was directly applied to each infested strawberry potted plant (glasshouses). Trickle irrigation was supplied to the plants in the polytunnel. Potted plants transferred to the polytunnel were watered twice a week. There was a normal overall spray programme of fungicides for mildew control. Overall sprays of pirimicarb (Aphox) were applied for aphid control. The plantation was inspected weekly to check for pests, disease and any other problems. Plants were de-flowered and de-fruited approximately every 2 months to encourage new leaf growth, which favours tarsonemid mites.

Meteorological records

Wet and dry bulb temperature, wind speed and direction were recorded before and after spraying. An ADEPT USB502 temperature and humidity logger was used to take hourly readings inside the polytunnel.

Statistical analysis

Plot total numbers of adults, nymphs and eggs were calculated and analysis of variance conducted after $\log_{10}(n+1)$ transformation to stabilise variances.

Experimental approval and crop destruction

The novel coded products were not approved for use on strawberry and an experimental approval was acquired for all non-approved products by EMR. No fruit was harvested and the experimental plants were destroyed at the end of the experiment.

Phytotoxicity

Determination of any phytotoxic effects of the treatments was not a central aim of this work. However, plots were inspected for any visual signs of phytotoxicity from the treatments on each sampling occasion.

Quality assurance

East Malling Research is an officially recognised efficacy testing organisation (Certificate no. 0206). The work was done according to GEP quality standards and according to East Malling Quality Assurance (EMQA) procedures and requirements (experiment no. GEP06/008).

Results

In the pre-treatment assessment on 13 August 2007, the frequencies of the presence of mites and eggs on the leaves were 30/48 and 28/48, respectively and the total numbers of mites and eggs on the 48 leaves was 400 and 128, respectively. The presence of eggs on the plants in the grow bags indicated that the mites had successfully transferred to the experimental plants and were reproducing.

Nine days after the first spray application, on 24 August 2007, there were few significant differences between the treatments and the untreated control (Fig. 1, Table 2). However, the number of adult mites was lower in the Masai (no wetter) treatment compared to the untreated control. Masai also reduced the number of eggs as did Dynamec 500ml+Silwet. None of the treatments reduced the numbers of tarsonemid nymphs following the first spray application (Fig. 1, Table 2).

The only predators found on the trifoliate leaves during this trial were phytoseiid mites, but there was no significant affect of any of the treatments after the first spray application (Table 2, Appendix 2).

Seven days after the second spray application (5 September 2007), the numbers of adult mites found on the leaves on the Dynamec 500ml, Dynamec 500ml+Silwet, Masai+Silwet, UKA378b+Silwet and Borneo+Silwet plots were significantly lower than untreated control plots (Fig. 2, Table 2). The numbers of nymphal mites were only reduced by sprays of Dynamec 500ml+Silwet and UKA378b+Silwet compared to the untreated control. However, egg numbers were reduced by Dynamec 500ml+Silwet, Masai+Silwet, UKA378b+Silwet, Borneo+Silwet and, also, Silwet used alone (Figure 2, Table 2). It is possible that the presence of the wetter alone on the strawberry leaves deterred the adult mites from laying eggs.

On the 7th day following the second treatment application, the number of phytoseiid mites was significantly reduced in the Dynamec 1250ml, Dynamec 750ml, Dynamec 500ml+Silwett, Masai alone and with Silwet, and Borneo+Silwett treatments (Table 2, Appendix 2).

In agreement with the 2006 trial, Dynamec+Silwet were effective at reducing populations of tarsonemid mites. Dynamec alone was not successful at reducing tarsonemid nymphal stages and eggs (this was also found in the 2006 trial). In addition, it was demonstrated that the novel product, UKA378b, and Borneo, in combination with a wetter, were more affective than in the 2006 trial. In the earlier trial these two products were not effective at controlling the mite when applied without a wetter. As with the former trial, most of the pesticides were more effective after the second spray application. Masai gave some control of mite adults and eggs on the first application, but no reduction in mites was observed after the

second treatment. However, Masai mixed with Silwet gave significant control of adults and eggs after a second application. Increasing the dose of Dynamec (to 1250 ml/ha), without the addition of a wetter, did not improve the effectiveness of the product against tarsonemid mites. Sequel and Floramite, even with the addition of a wetter, were ineffective at reducing tarsonemid populations on strawberry.

Dynamec and Masai (with and without a wetter) reduced the number of predatory mites, as did Borneo+Silwet. The novel product UKA378b+Silwet did not reduce the numbers of predators even though it was effective against all life stages of tarsonemid mite. No signs of phytotoxicty to the plants were observed throughout the trial.

Tarsonemid mites live and breed in-between the folded halves of very young strawberry leaves mainly on the top of the mid-vein. In this location, they are relatively inaccessible to sprays. This is the main reason why they are so difficult to control with acaricides, which are mostly contact acting and do not penetrate to where the mites live and reproduce. Furthermore, strawberries have a much waxier leaf surface than many other plants, especially the undersides of the leaves, and some pesticides, which have often been formulated for use on other crops, may not have sufficient surfactants for strawberry.

There is a SOLA for the use of Dynamec on strawberries and use is not directly supported on the label. Any use of the product is at the growers risk and it is important that growers are in possession of a copy of the SOLA if they use it on strawberry. The results of this trial confirm the results of the trial in 2006, that the use of a wetter increases the efficacy of some acaricides. However, the Dynamec label states that the product should not be used with a wetter, although no problems with admixture of Dynamec with a wetter have been reported from strawberry. It is recommended that Dynamec (or any other pesticide for which no specific compatibility recommendation is given) is not used in admixture with a wetter until more testing has been done.

The addition of a wetter could affect pesticide residues on fruits at harvest and PSD might require data on this if the inclusion of a wetter was made part of the label recommendations. Residues data may or may not exist on strawberry for the novel

products tested, and this needs to be determined if a recommendation for an effective treatments is developed.

Future work

The data presented here are very encouraging for the prospect of chemical control of tarsonemid mites on commercial strawberry. We recommend that a further trial is conducted in 2008, with the following objectives:

1. To test whether the higher rates of Dynamec, used in other countries, used in admixture with a silicone adjuvant, give an appreciable improvement in efficacy compared with the standard rate of Dynamec in admixture with a silicone adjuvant.

2. To investigate whether other classes of adjuvant are equivalent or superior to the silicone wetter used in this trial.

3. To further investigate the novel product UK378b alone and in admixture with a range of classes of adjuvant.

It is also recommended that further evaluation is needed on the effects of acaricides in admixture with adjuvants on fruit residues and plant toxicity.

Conclusions

- This trial confirmed many of the findings of the previous trial done in the project in 2006 including the importance of the use of a silicone wetter with acaricides products
- Only the UKA378b+Silwet and Dynamec 500ml+Silwet reduced all life stages of the tarsonemid mite compared to the untreated control.
- By the second spray application of these treatments the total mite numbers had been reduced by 97% and 98%, respectively. Masai and Dynamec alone did not significantly reduce the total of all the mite life-stages
- The approved rate of use of Dynamec in the UK is 500 ml product/ha which is substantially lower that the dose used in other EU countries, which varies between 750-1250 ml/ha. However, Dynamec without Silwet did not

significantly reduce numbers of tarsonemid mites at doses of 750-1250 ml/ha in this trial

- Masai alone gave some control of tarsonemid mite adults and eggs after the first application only. Masai+Silwet gave significant control of adults and eggs after a second application, reducing numbers by 80%
- Borneo in admixture with Silwet was effective at controlling adult and egg stages reducing numbers by 85%
- The most effective control of the mite was achieved after the second application of the successful products
- Sequel+Silwet and Floramite+Silwet were ineffective
- Numbers of predatory mites were reduced by all the Dynamec and Masai treatments and by Borneo+Silwet
- No signs of plant phytotoxicty were observed
- The substantially improved control was achieved by admixture of a silicone wetter. Strawberry leaves are known to be waxy and many products not specifically formulated for the crop have insufficient wetting properties.
- Clear benefits of using Dynamec in admixture with a silicone wetter have been demonstrated both in this and the 2006 experiment
- The use of Dynamec on strawberries has a SOLA but it is not directly supported on the label. Any use of the product is at the growers risk and it is important that growers are in possession of a copy of the SOLA if they use it on strawberry. The label states that Dynamec should not be used with adjuvants. No problems with admixture of Dynamec with adjuvants have been reported from strawberry, but before Dynamec (or any other pesticide for which no specific compatibility recommendation is given) is used in admixture, growers should take the precaution of testing on a small number of plants before large scale treatment. Also, the affect of admixture of the product with an adjuvant on the occurrence of residues in harvested fruit has not been assessed

Acknowledgements

We are grateful to Nigel Osborne and his team for the erection and maintenance of the polytunnel and husbandry of the plants. We would also like to thank Mike Easterbrook and Matthieu Chereau, EMR, who assisted with the sampling and mite counts.

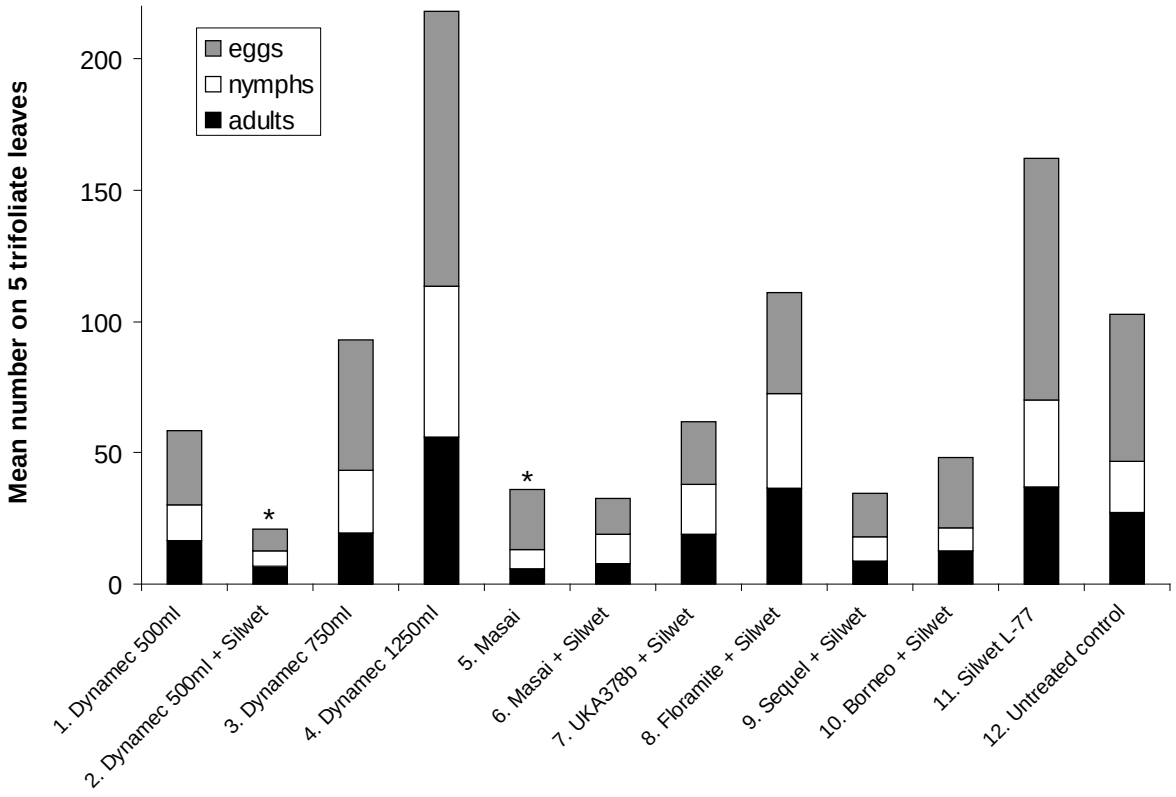


Figure 1. Mean numbers of tarsonemid mites (adults, nymphs and eggs) recorded on 5 trifoliate leaves on 24 August 2007, 9 days after the first spray application. *=significantly lower number of all tarsonemid life stages totalled than the control plots.

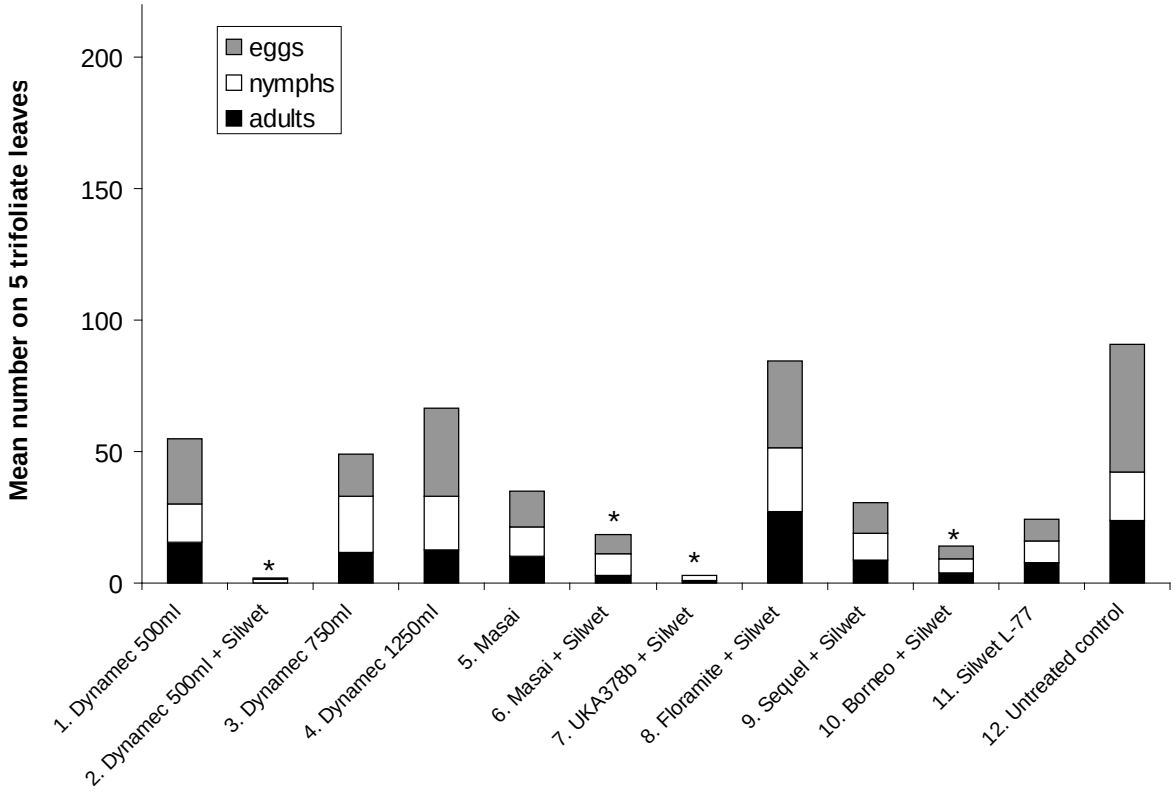
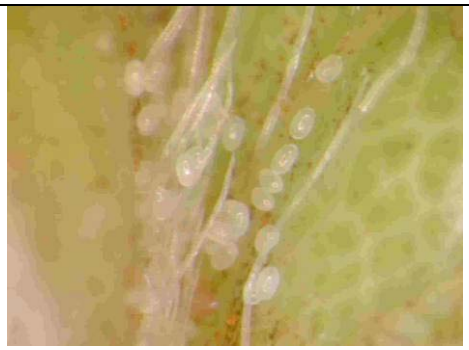


Figure 2. Mean numbers of tarsonemid mites (adults, nymphs and eggs) recorded on 5 trifoliate leaves on 5 September 2007, 7 days after the second spray application. *=significantly lower number of all tarsonemid life stages totalled than the control plots.

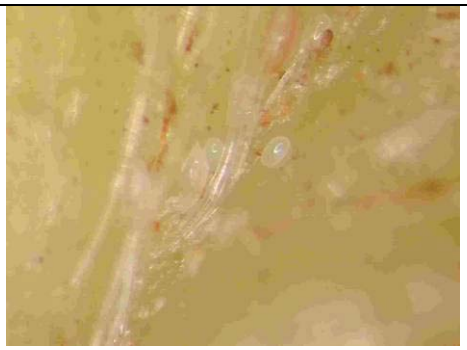
Table 2. Mean $log_{10}(n+1)$ transformed numbers of tarsonemid mite adults, nymphs, eggs and total, and predatory mites on the two assessment dates, 7-9 days post treatment applications. *= statistically lower numbers than the untreated control, ns = no significant differences.

	1st assessment (24 August 2007)					2nd assessment (5 September 2007)				
Treatment	adult	nymph	egg	total	predatory mites	adult	nymph	egg	total	predatory mites
1. Dynamec 500ml	2.77	2.51	3.27	1.73	0.28	*2.62	2.60	2.77	1.62	1.10
2. Dynamec 500ml + Silwet	1.66	1.63	*1.58	*1.10	0.35	*0.00	*0.82	*0.17	*0.39	*0.35
3. Dynamec 750ml	3.00	3.15	3.90	1.97	0.45	2.44	3.11	2.71	1.68	*0.35
4. Dynamec 1250ml	3.62	3.76	4.20	2.17	0.55	2.52	2.77	2.83	1.70	*0.35
5. Masai	*1.16	1.62	*1.91	*1.08	0.17	1.76	2.29	2.28	1.39	*0.00
6. Masai + Silwet	2.15	2.37	2.51	1.50	0.35	*0.90	1.82	*1.60	*0.99	*0.00
7. UKA378b + Silwet	2.57	2.57	2.87	1.67	0.40	*0.62	*0.79	*0.17	*0.48	0.69
8. Floramite + Silwet	3.47	3.42	3.08	2.01	1.07	3.06	2.67	3.10	1.76	0.62
9. Sequel + Silwet	2.23	1.86	2.76	1.48	0.45	1.99	2.28	2.52	1.45	0.52
10. Borneo + Silwet	2.46	2.18	2.82	1.57	0.55	*1.22	1.64	*1.62	*1.05	*0.17
11. Silwet L-77	3.59	3.19	2.76	2.16	0.62	1.90	1.89	*1.68	1.19	1.07
12. Untreated control	3.25	2.89	3.90	1.96	0.28	2.76	2.73	3.19	1.73	0.69
Fprob	0.003	0.022	0.025	0.005	ns	<0.001	0.010	<0.001	<0.001	0.01
SED (d.f. 33)	0.590	0.635	0.796	0.295		0.616	0.630	0.692	0.222	0.32
LSD (d.f. 33)	1.199	1.293	1.620	0.600		1.253	1.281	1.408	0.639	0.65

Appendix 1. Photographs from HDC strawberry trial 2007.



Tarsonemid mite eggs



Tarsonemid mite eggs and nymph

Tarsonemid mite adult

Tarsonemid damage to strawberry leaf

Polytunnel used in trial, 4 May 2007

Plants in grow bags, 4 May 2007

4 replicate blocks in tunnel, 4 May 2007

Tarsonemid culture plants, October 2006

Appendix 2. Actual mean numbers of tarsonemid mite adults, nymphs, eggs and total, and predatory mites on the two assessment dates, 7-9 days post treatment applications.

	1st assessment (24 August 2007)					2nd assessment (5 September 2007)				
Treatment	adult	nymph	egg	total	predatory mites	adult	nymph	egg	total	predatory mites
1. Dynamec 500ml	17	14	28	58.2	1	16	15	25	55.0	3
2. Dynamec 500ml + Silwet	7	6	8	21.0	1	0	2	0	1.7	1
3. Dynamec 750ml	20	24	50	93.2	1	12	22	16	49.0	1
4. Dynamec 1250ml	56	57	105	218.2	1	13	20	34	66.5	1
5. Masai	6	7	23	36.0	0	10	12	13	34.7	0
6. Masai + Silwet	8	11	14	32.7	1	3	9	7	18.2	0
7. UKA378b + Silwet	19	19	24	62.0	1	1	2	0	3.0	1
8. Floramite + Silwet	37	36	39	111.2	3	27	25	33	84.8	1
9. Sequel + Silwet	9	9	17	34.5	1	9	11	12	30.7	1
10. Borneo + Silwet	13	9	27	48.2	1	4	5	5	14.0	0
11. Silwet L-77	37	33	92	162.2	1	8	8	9	24.5	2
12. Untreated control	27	20	56	102.8	1	24	18	49	90.8	2