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HRI East Malling Contract Manager	Mr Ian Hardie Horticulture Research International East Malling West Malling Kent ME19 6BJ Telephone: 01732 843833 Fax: 01732 849067
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Principal Scientists: A L Harris (Entomologist) (author of report)
J V Cross (Entomologist)

Authentication

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

..... A L Harris
Signature

Date.....

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Summary

In 2001, a replicated field experiment was done at HRI-East Malling, Kent, UK to evaluate the efficacy of seven pesticide products for control of the blackcurrant gall mite *Cecidophyopsis ribis* on the blackcurrant variety Ben Tirran in comparison with Headland Sulphur and Meothrin standards. Three sprays of each product: D2341 (100 ml hl^{-1}), Elvaron Multi (tolyfluanid 50.5% WG, 340 g hl^{-1}), Calypso (thiacloprid 480 gl^{-1}, 37.5 ml hl^{-1}), SZI 121 (50 ml hl^{-1}), Bayer UK 872 (60 ml hl^{-1}), Talstar (bifenthrin 100 gl^{-1} EC, 40 ml hl^{-1}), lambda-cyhalothrin (Hallmark 100 gl^{-1}, 50 ml ha^{-1}), Meothrin (fenpropathrin 100 gl^{-1} EC, 200 ml hl^{-1}) and Headland Sulphur (sulphur 800 g/l SC, at two concentrations 625 and 1250 ml hl^{-1}) were applied at a volume rate of 1000 l ha^{-1} to gall infested bushes with a hand-lance. The sprays were applied at the standard timings for gall mite control, timed according to the flowering times of the standard variety Ben Lomond (just before first flower (growth stage E2-F1), at the end of flowering (growth stage 11) and 10-14 days later). The dates of application were 27 April, 21 May and 5 June. The growth stages of Ben Tirran were 3 leaves unfurled (growth stage C3), first flower open (growth stage F1), 50% fruit set (growth stage 12) respectively. The HRI temperature based forecasting model predicted that gall mite migration started on 2 April and that 5% migration occurred on 18 April. Emergence monitoring confirmed that these forecast dates were accurate.

Compared to the untreated control, none of the products tested significantly reduced the numbers of galls that developed. Only the industry standards of sulphur applied at the full rate (10 kg of active ingredient per hectare) or at the half rate (5 kg of active ingredient per hectare) and Meothrin successfully controlled gall mite populations. These standard treatments reduced the number of galls that had formed at the end of the season by 78%, 69 % and 58% respectively compared to the untreated control. No phytotoxic effects of any of the treatments were observed.

Objective

To evaluate the efficacy of programmes of three foliar sprays of eight insecticidal/acaricidal products (D2341, Elvaron Multi, Calypso, SZI 121, Bayer UK 872, Talstar, Hallmark), applied at standard spray timings, for control of existing infestations of blackcurrant gall mite, *Cecidophyopsis ribis,* in comparison with Headland Sulphur full and half rate and Meothrin standards.

Methods and Materials.

A single replicated small plot experiment was conducted at HRI-East Malling in 2001.

Site

The experiment was done in a 4 year old experimental blackcurrant plantation at HRI-East Malling, Kent, UK (Table 1) in 2001. The plantation consisted of 9 rows of 12 bushes of the variety Ben Tirran, a widely grown commercial blackcurrant variety which is highly susceptible to gall mite. The plantation was heavily infested with viable galls (big buds) before the start of the experiment.

Table 1. Experimental plantation.

Plantation	No. KF264
Variety	Ben Tirran
Plant spacing	1.5 m between bushes in a row, 3m between rows.
Planting date	13th May 1998
OS Reference	MR 713568, OS Sheet 188, Series 1:50 000

Treatments

Eleven treatments were compared (Table 2). These were 5 novel compounds, lambda-cyhalothrin (Hallmark) and bifenthrin (Talstar), which are known to have acaricidal properties, plus sulphur (at half and full rate) and fenpropathrin (Meothrin) as positive controls in comparison with a double replicated untreated control.

Table 2. Treatments.

Treat	Active ingredient	Product	Dose product (l /ha)	Conc (ml/l)	No. sprays
A	D2341	D2341	1.0	1	3
B	tolyfluanid 50.5% WG	Elvaron Multi	3.4 kg	3.4g	3
C	thiacloprid 480 g/l	Calypso	0.375	0.375	3
D	SZI 121	SZI 121	0.5	0.5	3
E	Bayer UK 872	Bayer UK 872	0.6	0.6	3
F	bifenthrin 100 g/l EC	Talstar	0.4	0.4	3
G	lambda-cyhalothrin 100 g/l	Hallmark	0.05	0.05	3
H	fenpropathrin 100 g/l EC	Meothrin	2	2	3
I	sulphur 800 g/l SC - ½ rate	Headland Sulphur	6.25	6.25	3
J	sulphur 800 g/l SC	Headland Sulphur	12.5	12.5	3
K	untreated (double replicated)	-	-	-	-

Spray Application

Sprays were applied at a volume rate of 1000 l ha^{-1} using a Cooper Pegler CP 2000 knapsack sprayer fitted with a hand lance and a single Albuz ATR brown hollow cone nozzle. The sprayer was calibrated before spraying by measuring the spray liquid flow rate, 443 ml min^{-1}. For treatment application, each bush was sprayed for 61 seconds, the time required to achieve the required volume rate a duration of 61 seconds to achieve an application volume of 450 ml per bush (i.e. a spray volume rate of 1000 l ha^{-1} as the bush density was 2222 bushes per ha). This method of spraying ensured near complete spray cover. During spray application, each bush was surrounded by an anti-drift shield to prevent drift on to neighbouring bushes

Applications were made on three occasions. The timings of the sprays were governed by the growth stage of the variety Ben Lomond. The first spray was applied on the 27 of April 2001, just before first open flower of Ben Lomond (Growth stage E2-F1). The second was applied at the end of flowering on the 21 of May 2001 (Growth stage 11). The final spray was applied 10-14 days later on the 5 of June. These are the standard timings used for by the UK blackcurrant industry. The growth stages of the Ben Tirran on which the experiment was done are shown in Table 3

The HRI gall mite migration forecasting model (Cross & Ridout, 2001) predicted that, based on daily maximum and minimum air temperatures recorded by the Met Office Meteorological station at HRI-East Malling, first emergence and 5% emergence of the gall mite occurred on 2 April and 18 April 2001 respectively. Monitoring the emergence using sticky caps (Cross & Ridout, 2001) indicated that these forecast dates were accurate. The sprays thus coincided well with the main period of emergence of the mite.

Table 3 Growth stages

Variety	Date of spray application and growth stage		
	27 April	21 May	5 June
Ben Lomond	1st flower open	End of flowering	14 days later
Ben Tirran	3 leaves unfolded	1st flower open	50% fruit set

The accuracy of application of each spray application for each treatment was calculated (volume applied as % required volume). The air temperature, relative humidity (determined using a whirling psychrometer) and wind-speed (2m above ground level) were measured before and after application of the treatments.

Experimental design

A randomised complete block design with nine replicates was used. There were nine blocks each containing twelve plots. Each plot consisted of a single bush. The untreated control was double replicated.

Assessments

The number of galls present in the dormant periods before and after treatment were assessed. The pre-treatment number of galls per bush was assessed before bud burst on the 28 and 29 of November 2000. The post treatment number of galls was assessed after leaf drop on the 4-6 December 2001. For each assessment the number of blackcurrant gall mite galls was counted on each plot. Phytotoxicity observations were made on the 16 June, 30 July and 19 September. None of the treatments exhibited any signs of phytotoxicty.

Statistical analysis

There were strong block and positional effects in the trial. A regression analysis of the data was done on the square root transformed post spray count data which took into

account the pre-spray count, block and positional effects providing means and estimated standard errors for each treatment.

Results

None of the seven products tested (A-G) significantly reduced the number of galls that developed (Table 3). Only the positive controls of Headland Sulphur (at half or full rates) and Meothrin significantly reduced the number of galls per bush compared to the untreated controls. Mean values for Calypso, Bayer UK 872 and Meothrin did not differ significantly. Calypso and Bayer UK 872 did not differ from the control, though Meothrin had significantly less galls than the control.

Table 4. Results

Treatment		Mean no. of galls per bush on 4-6 December 2001 (6 months after treatment)		
		Mean number	Mean square root number† √n	se
A	D2341	393	18.55 cd	1.58
B	Elvaron Multi	345	19.48 d	1.48
C	Calypso	306	16.93 bcd	1.49
D	SZI 121	393	18.62 cd	1.44
E	Bayer UK 872	250	16.24 bcd	1.46
F	Talstar	391	17.86 cd	1.48
G	Hallmark	435	18.89 cd	1.47
H	Meothrin	190	13.06 ab	1.52
I	Headland Sulphur – ½ rate	137	10.90 a	1.42
J	Headland Sulphur – full rate	97	10.13 a	1.64
K	Untreated control	449	18.91 cd	1.10

† Statistically corrected for positional effects and pre-treatment count. Means followed by the same letter do not differ statistically ($P \leq 0.05$). The discriminating letters have been determined using the least significant difference.

Conclusions

- Only the full rate sulphur, the half rate sulphur and the Meothrin treatments significantly reduced end of season numbers of galls per bush compared to the untreated control. The sulphur treatments had the smallest number of galls but not significantly less than Meothrin. They appeared the most effective treatments. The Meothrin treatment was significantly better than the other treatments except Calypso and Bayer UK872.

- D2341, Elvaron Multi, Calypso, SZI 121, Bayer UK872, Talstar and Hallmark did not significantly reduce numbers of gall mite galls compared to the untreated control and thus appeared ineffective.

- The loss of fenpropathrin (Meothrin) due to the EU pesticides review is threatening as none of the other treatments available for use on blackcurrants is efficacious except sulphur. This points to the need to explore the use of sulphur on blackcurrants more thoroughly including quantifying possible phytotoxic effects of applications in the middle of gall mite migration (before, during and after flowering). The use of reduced doses of sulphur, multiple sprays and the effects of formulations and adjuvants. It also highlights the importance of new gall mite and reversion-resistant varieties.

- A continued programme of screening of novel active ingredients for gall mite control is needed. It would also be worthwhile to assemble all the results of previous gall mite trials (generated in the UK and elsewhere) into a single database and to review existing information.

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Archiving

The experimental file containing the experimental protocol, correspondence, diary, site plans, experimental approval, treatment records, COSHH assessments, statistical analysis and report copies will be held in the GEP archive in the Entomology and Plant Pathology Department, HRI East Malling for at least 10 years. File No. GEP 01/006.

References

Cross, J V & Ridout, M S. 2001. Emergence of the blackcurrant gall mite (*Cecidophyopsis ribis*) from galls in spring. *Journal of Horticultural Science and Biotechnology* **76**, 311-319.