Grower Summary

SF 012 (GSK229b)

Effects of herbicides on weed control and fruit quality in blackcurrant

Final 2012

Project Number:	SF 012 (GSK230)
Project Title:	Timing of HDCI 058 application for the control of blackcurrant gall mite 2012
Project Leader:	Professor Jerry Cross East Malling Research Kent ME19 6BJ Tel: 01732 843833 Fax: 01732 849067
Contractor/(s):	East Malling Research
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Start Date:	1 April 2012
End Date:	31 March 2014

AUTHENTICATION

I declare that 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.

Signed……..

J. V. Cross

Dated……

East Malling Research is an officially recognised efficacy testing organisation (Certification No. ORETO 321)

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Horticultural Development Company, Stoneleigh Park, Kenilworth, Warwickshire, CV8 2TL
Telephone : 0247 669 2051 Email:hdc@hdc.org.uk

GROWER SUMMARY

Headline

- Single applications of HDCI 058 on 1 June and 3 July reduced galls on blackcurrant caused by blackcurrant gall mite by 65% and 74%, respectively. Later applications did not.

Background and expected deliverables

The overall objective of this trial was to evaluate the efficacy of single foliar sprays of the unapproved coded product HDCI 058 at different timings post blossom through the season for control of blackcurrant gall mite (*Cecidophyopsis ribis*). Previous work has clearly shown that early season sprays of sulphur at the late dormant growth stage and at first grape emergence give good (*c.* 80%), though not complete, control of gall mite. Additional later sprays are needed to improve control, but sulphur, when applied at the full dose, has proved phytotoxic to some varieties of blackcurrants, especially if applied in hot weather. HDCI 058 can only be used post-blossom on blackcurrants, because the risks it poses to bees if applied earlier have not been assessed on the crop. If HDCI 058 proved effective or partially effective as a post, it could be applied post-blossom as a supplement to early season applications of sulphur, significantly improving the overall efficacy of gall mite control.

Summary of the project and main conclusions

A replicated field experiment was conducted on a growers holding in Kent in 2012 to compare the efficacy of different timings of foliar sprays of HDCI 058 for control of blackcurrant gall mite, *Cecidophyopsis ribis*. Treatments tested were 5 different timings of single foliar applications of HDCI 058 on 1 June, 3 July, 10 August, 5 September and 10 October, in comparison with an untreated control. No early season sprays of sulphur or other sprays against blackcurrant gall mite were applied. The effects of the treatments were assessed by counting the number of galls which formed on 30 bushes per plot during the season relative to the numbers present before the first sprays were applied at the onset of the experiment. The numbers of gall mites within a sub-sample of collected galls was also counted.

Applications of HDCI 058 on 1 June and 3 July caused 65% and 74% reductions in the seasonal increase in the numbers of galls caused by blackcurrant gall mite compared to the untreated control, respectively. For these treatments gall numbers increased c. two-fold over the season compared to seven-fold for the untreated control and other treatments. The later applications of HDCI 058 did not reduce the seasonal rate of gall increase. August applications of the product reduced the numbers of mites within galls but not the number of galls. No visual phytotoxicity symptoms on the blackcurrant bushes were observed.

Financial benefits

Losses to the UK blackcurrant industry due to blackcurrant gall mite and reversion virus disease have not been quantified. Failure to control blackcurrant gall mite can lead to loss of blackcurrant plantations and the pest is routinely treated in all plantations. The costs of the programme of work done over the life of the project which developed the recommendations for control of gall mite are very small compared to the potential losses due to this pest.

Action points for growers

None at this time.

SCIENCE SECTION

Introduction

The overall objective of this trial was to evaluate the efficacy of single foliar sprays of the unapproved coded product HDCI 058 applied at different times through the season for control of blackcurrant gall mite (*Cecidophyopsis ribis*) and produce grower recommendations for gall mite control. Previous work has clearly shown that early season sprays of sulphur at the late dormant growth stage and at first grape emergence give good, though not complete, control of gall mite. Additional later sprays are needed to improve control, but sulphur, when applied at the full dose, has proved phytotoxic to some varieties of blackcurrants. The aim of this experiment was to evaluate the efficacy of various timings of HDCI 058 as a supplement to early season applications of sulphur.

Methods and materials

Site

A blackcurrant plantation at Cottenden Farm, Ticehurst, Kent (NGR TQ 678 284) was used for the trial by kind permission of Tom Maynard, Windmill Hill, Ticehurst, E Sussex TN5 7HQ (Fig. 1). 'Cottenden 3' was planted in 2005. It was ~ 2 ha and consisted of ~40 rows of Ben Tirran on a spacing of 3 m x 0.5 m. The rows ran north to south and the most easterly 11 rows of the plantation were used for the trial.

Treatments

Treatments were single foliar sprays of HDCI 058 applied at approximately monthly intervals through the season starting on 1 June (Table 1). HDCI 058 was applied at a dose rate of product of 750 ml/ha and a concentration of 1.5 ml of product/l. The product was not approved for use on blackcurrant.

Table 1. Treatments applied to the blackcurrant bushes in the trial

Trt No.	Product	Date of spray (2012)	Growth stage
1	HDCI 058	1 Jun	Early green fruit
2	"	+ 4 wks (3 July)	Late green fruit
3	"	+4 wks (10 Aug)	Pre-harvest
4	"	+4 wks (5 Sep)	Post-harvest
5	"	+4 wks (10 Oct)	Post-harvest
6	Untreated control	-	-

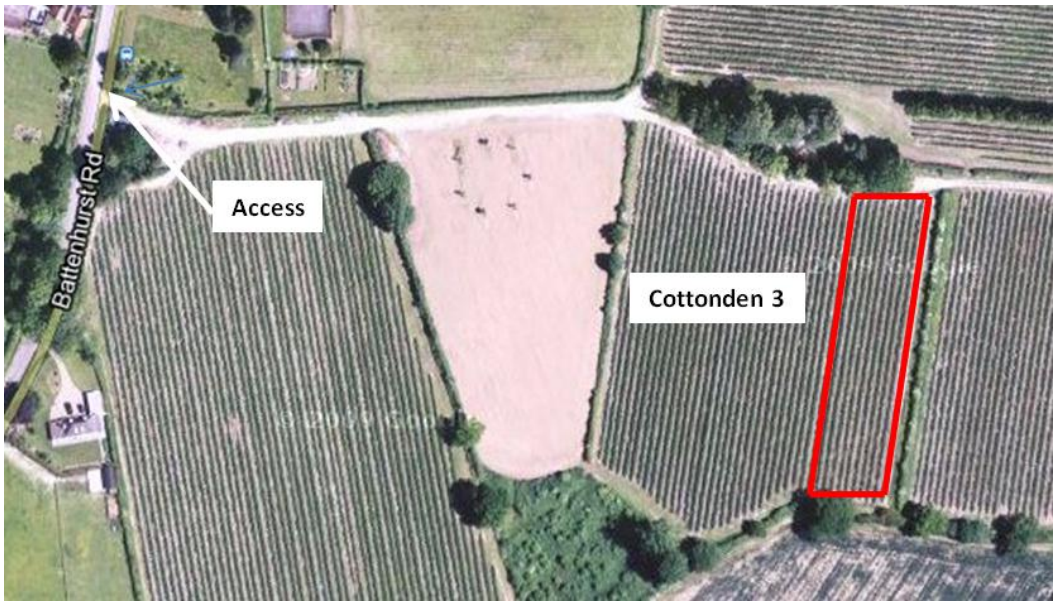

Figure 1. Location of 'Cottonden 3' cv. Ben Tirran blackcurrant plantation. The red box indicates the location of the trial

Spray application

Sprays were applied with a Birchmeier B245 motorised Knapsack mist blower in a spray volume of 500 l/ha. The growth stage of the crop at each application was recorded. The accuracy of each application was calculated as a percentage of the actual volume applied divided by the target volume (Table 2).

Table 2. Accuracy of spray application estimated from the amount of sprayate remaining in the spray tank after spray application

	Spray round and date	Treatment No:	Accuracy	Growth stage
1.	01 Jun	1	98%	Early green fruit
2.	03 Jul	2	99%	Late green fruit
3.	10 Aug	3	100%	Fruit set
4.	05 Sep	4	94%	Post-harvest
5.	10 Oct	5	93%	Post-harvest

Experimental design and layout

Alternate rows were used for the trial with a spray drift guard row between them. Each target row was divided into six approximately equal sections of 40 bushes. All 40 bushes were sprayed but only the central 30 bushes were assessed. The five bushes at the terminal ends of the rows acted as spray guards between adjacent plots.

Meteorological records

Wet and dry bulb air temperatures were measured with a whirling psychrometer, and wind speed with a hand held cup anemometer at 2 m height before and after spraying (Table 3). Two Lascar usb-500 data loggers were deployed in a Stevenson screen at the periphery of the plantation to record half hourly temperature and relative humidity for the duration of the trial (Appendix 1).

Table 3. Weather conditions at the time of spray application

Date	Time	Air temperature			Wind	
		°C dry	°C wet	% rh	speed (Kmh)	Wind direction
1 Jun	10:30	19	16	74	0	N/A
3 Jul	12:06	19	18	91	4	SW
10 Aug	12:00	25	20	63	0	N/A
5 Sep	15:31	21	16	53	0	N/A
10 Oct	15:15	14	13	90	9	E

N/A = Not applicable

Maintenance sprays applied overall to the trial site

No early season sprays of sulphur or other sprays against blackcurrant gall mite were applied. The experimental site received the grower's normal sprays of other pesticides against insect pests, diseases and weeds.

Assessments

Pre and post season gall counts: Counts of the numbers of galls on each of the 30 target bushes were done before the trial commenced on 28 May 2012. End of experiment gall counts were done after leaf fall on 15 November 2012.

Numbers of mites within galls: The numbers of mites surviving in galls were assessed. 10 fresh galls from each plot were brought back to the laboratory for dissection. The galls were then categorised based on the numbers of live mites within each gall:

0 = no mites
1-3 = mites per gall
4-10 = mites per gall
11-30 = mites per gall
31-100 = mites per gall
101-300 = mites per gall
301-1,000 = mites per gall

Aphids: The number and species of aphids and aphid colonies was to be counted, however, by 10 July 2013 after five preliminary assessments to look for aphids, no aphid populations of any species had developed. Therefore, aphid assessments were discontinued and are not reported here.

Phytotoxicity: When spraying and assessments were conducted the bushes were inspected for visual symptoms of phytotoxicity.

Statistical analysis

Number of galls: ANOVA with covariance adjustment for the pre-season gall counts was done on the end of season gall counts after $\log_e$ transformation to stabilise.

Results

Effects of treatments on end of season gall counts

The analysis of variance of the $\log_e$ transformed rate of change of population (post- season divided by pre-season) showed significant treatment effects (P = 0.006) for the early treatments (June and July) (Table 4). Applications of HDCI 058 applied at these timings reduced the seasonal increase in numbers of blackcurrant mite galls by 65% and 74% compared to the untreated control, respectively. Later application timings did not reduce the seasonal rate of increase of gall numbers significantly.

Table 4. Mean numbers of galls recorded at each assessment at the final assessment. *= significantly different from the control

Treatment			Mean no. galls/plot (n=30)		Mean no. galls/plot/plant Plant(n=30)		Rate of gall no. increase
Trt	Product	Date	28-May	15-Nov	28-May	15-Nov	
1	HDCI 058	1 Jun	119.6	304.0	4.49	11.69	*2.56
2	HDCI 058	3 Jul	134.6	317.2	5.06	11.92	*1.92
3	HDCI 058	10 Aug	71.8	558.4	2.66	21.15	6.49
4	HDCI 058	5 Sep	119.8	623.2	4.50	24.34	5.31
5	HDCI 058	10 Oct	97.8	670.6	3.47	24.13	7.54
6	Untreated		115.4	749.0	4.01	26.19	7.39
Fprob							0.006
SED (33 df)							1.48
LSD (P=0.05)							2.26

Number of mites in each gall: An ANOVA was conducted comparing the numbers of mites within galls in comparison to the untreated control (Table 5).

Effects of treatments on end of season mite numbers within the galls: The July, September and October treatments had no effect on the numbers of mites within the gall. All the galls which received these treatments contained 301-1,000 mites, as did the galls from the untreated control plots. The 3 July treatment had three galls out of 50 which contained no mites. The August treatment partially reduced numbers of mites in 55% of the 51 galls assessed; two had 11-30 mites, 13 had 31-100 mites and 13 galls had 101-300 mites.

Table 5. Total numbers of mites per gall in seven categories recorded in November from 10 galls per plot 50 galls per treatment

			Numbers of mites within a gall						
Trt	Product	Date	0	1-3	4-10	11-30	31-100	101-300	301-1,000
1	HDCI 058	1 Jun	0	0	0	0	0	0	50
2	HDCI 058	3 Jul	3	0	0	0	0	0	47
3	HDCI 058	10 Aug	0	0	0	2	13	13	23*
4	HDCI 058	5 Sep	0	0	0	0	0	0	50
5	HDCI 058	10 Oct	0	0	0	0	0	0	50
6	Untreated		0	0	0	0	0	0	50
Fprob									<0.001
SED (33 df)									4.58
LSD (P=0.05)									10.15

*= significantly different from the control

Discussion

These results indicate that 1 June and 3 July foliar applications of HDCI 058 gave partial control of gall mite galls. These treatments did prevent an increase in numbers of galls formed over the season. Indeed gall numbers still increased, though the rate of increase was significantly reduced to c. two-fold compared to seven-fold for the untreated control and the other treatments. Later HDCI 058 treatments had no effect on the numbers of galls formed compared to the untreated control.

It appears the 1 June and 3 July sprays were applied early enough in the season to kill the mites before they caused galling, either by killing the mites whilst they were still migrating or when they were feeding in the un-galled buds or at the very early stages of gall formation. It may be that at the early stage of gall formation there was adequate translocation of the active substance into the buds and young galls but that at later stages translocation was inadequate to kill all the mites within a gall, resulting in only partial control in August and little control later. The August treatment was thus not early enough to prevent galling, but it appeared to have detrimental effects on the numbers mites within the galls.

Conclusions

- A 1 June or 3 July application of HDCI 058 significantly reduced seasonal the rate of increase in numbers of galls caused by blackcurrant gall mite by 65% and 74%, respectively
- Later applications (post July) were not effective at reducing the rate of increase in number of galls
- The August application partially reduced the numbers mites within 55% of galls, later applications did not
- No visual phytotoxicity symptoms to the blackcurrant bushes were observed in this trial
- Further work is needed to investigate the use of post blossom HDCI 058 sprays to supplement early season sulphur applications for gall mite control

Future work

Further investigations should include earlier post-blossom applications of HDCI 058 (in April, May) to determine if efficacy can be improved by targeting of one or two sprays earlier in the gall mite migration and as a supplement to early season applications of sulphur.

Efforts need to be made to obtain an EAMU for this compound for use on blackcurrants, as it is an effective control for several pests of blackcurrant, including gall mite, aphids and leaf midge. The maximum number of sprays is likely to be limited to two per season and best timing of applications to control all these pests needs to be investigated. Care must be taken to avoid routine applications to reduce the possibility of resistance emerging. HDCI 058 would be a useful component of an Integrated Pest and Disease Management programme for the crop.

Acknowledgements

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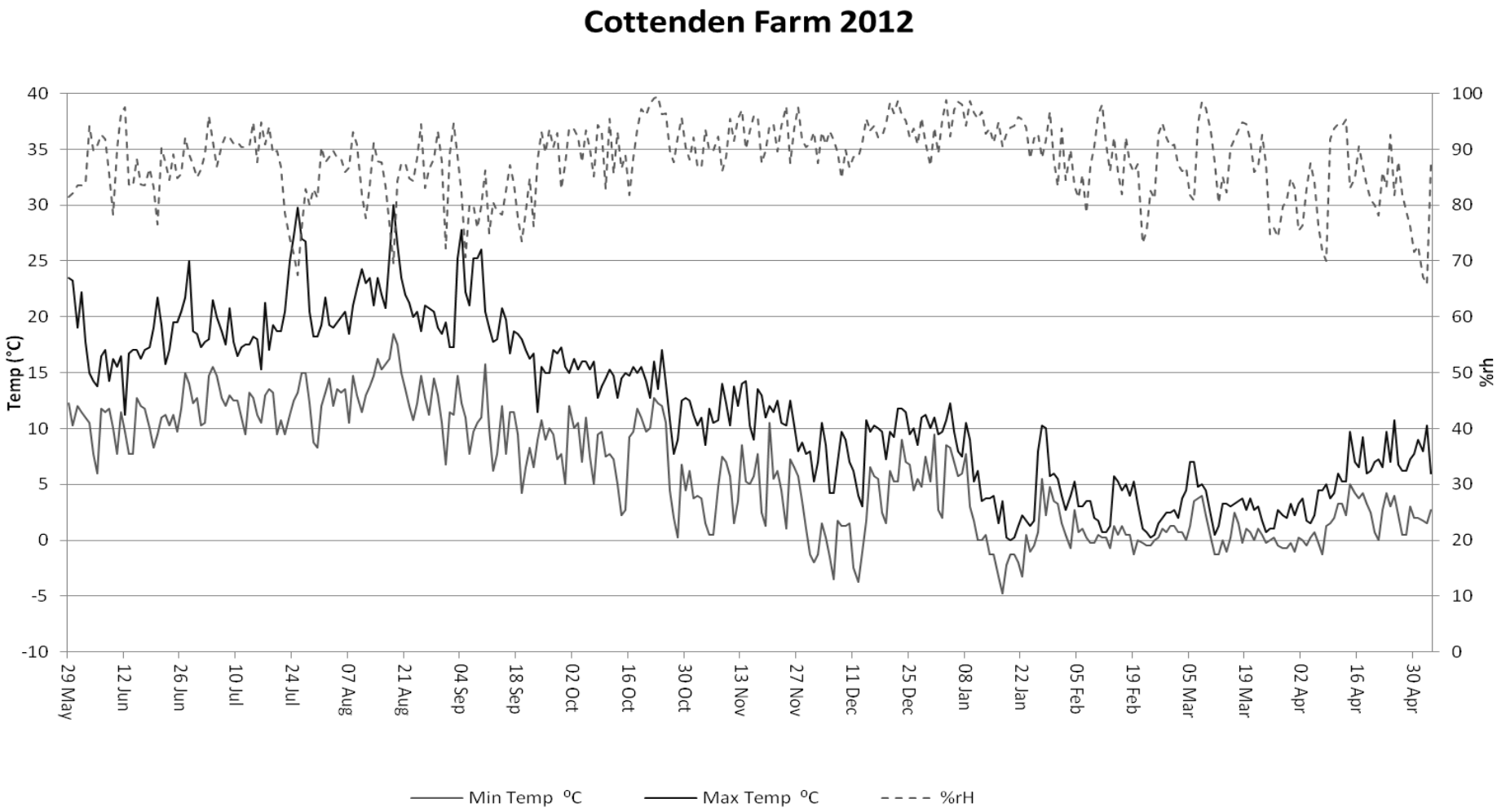

Appendix 1. Maximum and minimum air temperature (ºC) and relative humidity (%rh) for Cottenden Farm for the duration of the trial