CONTROL OF BRASSICA APHID AND BLUE-GREEN LUCERNE APHID WITH CHLORPYRIFOS

C. J. SHARPE and B. N. MacDIARMID

Ivon-Watkins-Dow Ltd, Dunedin and New Plymouth.

Summary

In four trials (two aerial) on brassica aphid (*Brevicoryne brassicae*) and four on the blue-green lucerne aphid (*Acyrthosiphon kondoi*), chlorpyrifos at 0.125 and 0.188 kg/ha gave 95-100% control. The speed of kill and final level of control was similar to that achieved with demeton-S-methyl or diazinon. Lucerne (*Medicago sativa*) yields were doubled as a result of lucerne aphid control in one trial. Both aphid species were found reinvading plots 2-3 weeks after treatment when conditions for continuous breeding and dispersal were suitable.

INTRODUCTION

In February 1975 a moderate outbreak of brassica aphid (*Brevicoryne brassicae*) in field brassicas presented an opportunity to obtain trial data and field assessment on the efficacy of the broad spectrum insecticide chlorpyrifos as an aphicide. These studies were extended to lucerne (*Medicago sativa*) during summer 1976 when an outbreak of the recently introduced blue-green lucerne aphid (*Acyrthosiphon kondoi*) occurred.

METHOD

Four brassica aphid trials were laid during February 1975 on stands of 20-40 cm high bulbous swedes and 1m high kale growing in South Otago. Two were six replicate, small plot (4 x 5m) trials using a precision sprayer applying 75 litres/ha of spray mixture. The other two were single replicate aerial trials (2 ha/treatment) using a fixed wing aircraft applying 77 litres/ha. Small untreated areas were retained in the latter trials.

Of the four lucerne aphid trials reported, two were laid down on 11 February 1976 in Waverley and the other two on 24 March in Hastings. The trials were two replicate with large plots (5-6m x 20m) and 2m wide untreated margins, laid with a hand-held or wheel-mounted spray boom applying 220 litres/ha through 8003 fan nozzles at 200 kPa. At each location, one trial was laid on 40-60cm high lucerne and one on lucerne 2-4cm high.

Assessment of populations of both aphid species were made before and regularly after treatment. Brassica aphids were assessed by selecting young leaves (10 per plot, 50 in aerial trials) which showed obvious evidence of infestation viz. chlorosis and cupping, dead or live aphids and frass. In the lucerne aphid trials, 10 shoots per plot were selected at random and the top half of each shoot assessed for live aphids using the logarithmic-type scale below. The effect of the insecticides on lady-bird populations in lucerne was also noted.

One lucerne trial at Waverley was harvested by cutting five random 0.15m^2 quadrats per plot and from each adjacent untreated strip.

Rating	Brassica aphid	Lucerne aphid
0	0	0
1	1-5	0-3
2	6-50	4-10
3	51-250	11-20
4	251-500	21-50
5	500	50

RESULTS AND DISCUSSION

Brassica aphid

The brassica aphid control achieved in the small scale trials are summarised in Table 1. Pre-treatment counts are shown under "untreated-0 days." Chlorpyrifos at 0.125 and 0.188 kg/ha gave excellent control, equivalent to standard rates of demeton-S-methyl, such that 11 days after treatment 95% of the previously infested leaves were aphid-free. This compared with only 3% in the untreated plots. The aphicidal activity of chlorpyrifos was confirmed in the aerial application to large areas (Table 2).

TABLE 1: PERCENT LEVEL OF BRASSICA APHID INFESTATION IN SMALL SCALE TRIALS

			Infestation Rating					
Treatment	kg/ha	DAT†	0	1	2	3	4	5
chlorpyrifos	0.125	4	88	10	2			
		11	95	5				
		22	28	47	25			
chlorpyrifos	0.188	4	95	5				
		11	95	5				
		22	34	49	17			
demeton-S-methyl*	0.250	4	79	13	4	2	0	2
	and	11	95	5				
	0.315	22	30	47	23			
untreated		0	5	8	13	19	24	31
		4	4	8	20	16	13	39
		11	3	6	12	13	19	47
		22	2	7	26	15	11	39

* — Mean of both rates, each in one trial
DAT† — Days after treatment

TABLE 2: PERCENT LEVEL OF BRASSICA APHID INFESTATION IN AERIAL TRIALS

			Infestation Rating					
Treatment	kg/ha	DAT	0	1	2	3	4	5
chlorpyrifos	0.125	4	95	5				
		11	100					
		19	100					
		26	25	47	26	2		
untreated		0	5	8	15	24	11	37
		4			10	13	26	51
		26	5	4	10	10	14	57

Neither insecticide prevented aphid reinfestation which was evident in all trials 22-26 days after treatment. However, reinfestation levels did not reach those occurring in the untreated areas, the onset of cold wet weather dramatically reducing populations thereby preventing further damage.

Lucerne Aphid

The blue-green lucerne aphid also proved particularly susceptible to chlorpyrifos as a summary of the trials in Table 3 shows. Diazinon 0.5 kg/ha (and demeton-S-methyl 0.175 kg/ha in two trials) was also very effective, but maldison gave poor results. There was some indication that the higher rate of chlorpyrifos was required for tall lucerne stands.

TABLE 3, PERCENT LEVEL OF LUCERNE APHID INFESTATION IN WAVERLEY AND HASTINGS TRIALS

			Infestation rating					
Treatment	kg/ha	DAT	0	1	2	3	4	5
chlorpyrifos	0.125	2	98	1	1			
		6	98	2				
		13	20	40	20	20		
chlorpyrifos	0.188	2	100					
		6	100					
		13	40	35	15	10		
diazinon	0.500	2	100					
		6	100					
		13	30	45	10	15		
maldison	0.350	2	0	10	20	30	40	
		6	20	30	40	10		
untreated		0	7	10	30	30	20	3
		6	13	20	33	27	7	
		13	0	30	20	30	20	

Reinfestation by winged adults from outside the plots was evident 13 days after treatment, but observations made where whole paddocks were treated, suggest that protection could extend up to 21 days.

Both Hastings trials contained larval populations of the predator ladybird *Coccinella leorina* as high as 500/m² and in one trial on young 'Saranac' lucerne they were probably responsible for eliminating the lucerne aphid in the untreated areas. All effective aphicides also killed the ladybird larvae.

The yields from one lucerne trial, which was sprayed 1 week after baling (2 weeks from last cut) and resprayed overall 2 weeks later with chlorpyrifos 0.15 kg/ha, are shown 5 weeks after baling in Table 4. The yields had doubled in the treated areas during this period, representing a 20 bale/ha increase.

TABLE 4: EFFECT OF LUCERNE APHID CONTROL ON LUCERNE YIELDS

Treatment	kg/ha	% increase
chlorpyrifos	0.125	94
chlorpyrifos	0.250	91
diazinon	0.500	104
untreated ± SE		1300 ± 164 kg DM/ha
CV %		19

The results presented show that chlorpyrifos is very effective at low rates for controlling aphids on fast-growing, leafy crops such as brassicas and lucerne.

ACKNOWLEDGEMENTS

During the lucerne aphid outbreak, the authors were most grateful to Messrs D. Robertson, Waverley; J. Esson, DSIR Auckland, and W. Kain, MAF, Palmerston North; for assistance.