Blue-Green Lucerne Aphid

CHEMICAL CONTROL OF BLUE-GREEN LUCERNE APHID IN NORTHERN NORTH ISLAND.

R. EAST, R.P. POTTINGER and L.M. NEWMAN

*Soil and Field Research Organisation, Ruakura Agricultural Research
Centre, MAF, Hamilton*

Summary

In two trials each comparing 18 insecticides applied as foliar sprays at rates approximately equivalent in cost to thiometon (125 g/ha), significant reductions in blue-green lucerne aphid (*Acyrtosiphon kondoi*) numbers 13 to 20 days after treatment were given by WL 43775 (25 g/ha), cypermethrin (25 g/ha), demeton-S-methyl (125 g/ha), dicotophos (125 g/ha), pirimicarb (125 g/ha), thiometon and omethoate (150 g/ha) in both trials, and by acephate (125 g/ha) and dimethoate (200 g/ha) in one trial. Surface-broadcast applications of granular systemic insecticides required much higher application rates to achieve comparable control.

INTRODUCTION

Initial studies of chemical control of blue-green lucerne aphid (BGLA) in both the U.S.A. (Sharma *et al* 1976) and New Zealand (Kain *et al* 1976; Sharpe and MacDiarmid 1976) have shown that BGLA is readily killed by systemic and contact insecticides but rapid reinfestation of treated areas is common. The aim of this study was to compare the effectiveness of a wide range of chemicals for control of BGLA, using aphid numbers as the criterion.

METHODS

Trial 1 was laid down at Kaipaki on 28 September 1976 in lucerne (*Medicago sativa*) 5-10 cm high, to compare three insecticides each at three rates (Table 1) in order to derive a standard treatment for subsequent comparisons. Trials 2 and 3 each compared 18 insecticides (Tables 2 and 3). Trial 2 was laid down on 16 November 1976 at Hamilton Airport in lucerne 10-15 cm high. Trial 3 was laid down on 20 April 1977 at the Otakanini Research Area, near Helensville, in lucerne 10-20 cm high.

Trial 4 compared granular formulations of five systemic insecticides (Table 4), applied by surface broadcast to young regrowth lucerne 3-5 cm high at Hamilton Airport on 1 December 1976. In the 4 days after application 40 mm of rain fell and a further 85 mm on the tenth day after application.

All trials were of randomized complete block design with 5 x 1 m plots separated by a 1 m wide buffer. There were either 5 replicates (trials 2 and 3) or 6 replicates (trials 1 and 4) of each treatment. Foliar sprays were applied with a small plot precision sprayer at 200 kPa in

Proc. 30th N.Z. Weed and Pest Control Conf.

Blue-Green Lucerne Aphid

either 325 litres/ha (trials 1 and 2) or 280 litres/ha (trial 3). Granular formulations (trial 4) were applied by hand shaker. Aphid numbers were measured by bulking 10 randomly selected lucerne stems per plot, removing the aphids by agitation in drum alcohol and extraction over a Buechner funnel, and counting them under a binocular microscope.

All data were transformed to $\log_e(x + 1)$ prior to analysis. Aphid numbers presented in the tables were calculated from the raw data.

RESULTS

TABLE 1: Average numbers of aphids per stem at different times after treatment in Trial 1.

Insecticide	Rate (g/ha)	Days after treatment			
		6	17	24	49*
thiometon	500	0.0 eC	1.0 dE	3.2 fF	21.1 a
thiometon	250	0.4 deBC	1.3 dE	7.5 defDEF	11.3 b
thiometon	125	0.1 eC	1.4 dDE	4.0 efEF	14.5 b
maldison	750	0.5 cdeBC	2.1 cdBCDE	10.7 cdCDE	21.9 ab
maldison	375	0.7 cdBC	1.3 dCDE	8.0 cdeCDEF	19.4 ab
maldison	150	1.2 bcB	8.4 bB	31.4 bB	12.6 b
chlorpyrifos	250	0.3 cdeBC	2.2 cdBCDE	9.4 cdeCDE	16.3 ab
chlorpyrifos	125	1.6 bcB	5.6 bcBCD	17.7 bcBC	17.7 ab
chlorpyrifos	50	1.3 bB	10.3 bcBC	16.9 bcBCD	13.5 b
untreated		22.2 aA	114.5 aA	125.5 aA	10.4 b

* Lucerne grazed off 31 to 34 days after treatment

All treatments in trial 1 (Table 1) markedly reduced aphid numbers below those in the unsprayed plots up to 24 days after treatment ($P < 0.01$). All rates of thiometon gave greater reductions ($P < 0.05$) than maldison (150 g/ha) or chlorpyrifos (50 and 125 g/ha) at 6, 17 and 24 days after treatment. Thiometon was therefore chosen as the standard insecticide for subsequent comparisons. Since there were no significant differences in the pre-grazing counts between the three rates of thiometon tested (Table 1), the lowest rate (125 g/ha) was used as the standard. Insecticides tested in trials 2 and 3 were applied at rates approximately equivalent in cost to thiometon (125 g/ha).

The decline in aphid numbers in the controls in trials 2 and 3 was apparently in response to such factors as weather and the severely damaged state of the unsprayed lucerne in trial 2, since counts of natural enemies revealed very low numbers at all trial sites.

Blue-Green Lucerne Aphid

TABLE 2: Average numbers of aphids per stem at different times after treatment in Trial 2.

Insecticide	Rate (g/ha)	Days after treatment		
		6	17	27
WL 43775	25	7.7defgDE	1.2eD	3.1ghi
thiometon	125	4.7fgDE	2.4deCD	4.8fghi
demeton-S-methyl	125	6.8fgDE	3.0deCD	7.8efgh
pirimicarb	125	10.5efgDE	4.8cdeCD	6.8fghi
cypermethrin	25	14.6cdefgCDE	7.0cdBCD	48.0abcde
omethoate	150	3.8gE	8.1cdABC	63.2abcd
dicrotophos	125	12.6cdefCDE	9.2cdABCD	42.3cdefg
dimethoate	200	6.6defgCDE	11.8bcABC	22.5cdefg
acephate	125	17.0cdeBCD	17.2abAB	12.3defg
permethrin	25	8.2efgDE	17.9abAB	33.8abcdef
carbofuran	200	15.5cdeBCD	21.1abA	29.9abcdef
chlorpyrifos	125	8.0defgCDE	22.9abA	79.1a
mevinphos	125	25.4bcBC	23.3abA	44.4abc
fenitrothion	300	13.5cdeBCD	24.0abA	75.7ab
diazinon	300	21.9cdBCD	24.0abA	62.0abcd
maldison	500	13.8defgCDE	25.2abA	85.5a
methomyl	125	49.4abAB	29.8aA	20.6bcdefg
parathion	400	12.0cdefCDE	31.0aA	63.1abc
untreated		104.4aA	23.2abA	1.2hi

TABLE 3: Average numbers of aphids per stem at different times after treatment in Trial 3.

Insecticide	Rate (g/ha)	Days after treatment		
		13	20	27
WL 43775	25	0.3gG	0.04eE	0.0f
cypermethrin	25	0.5gG	0.2eDE	0.02ef
dimethoate	200	3.0efEF	1.2dCD	0.2cde
acephate	125	5.4deCDEF	1.3cdBCD	0.2bcde
pirimicarb	125	4.6eDEF	1.6bcdABC	0.05ef
thiometon	125	4.3deCDEF	1.7bcdABC	0.2cdef
dicrotophos	125	5.8bcdeABCDE	1.7bcdABC	0.1cdef
demeton-S-methyl	125	5.5cdeBCDE	2.0cdBCD	0.1def
omethoate	150	2.0fF	2.1cdBCD	0.1cdef
diazinon	300	10.4abcABC	2.4abcdABC	0.3cde
maldison	500	10.8abcABC	2.5abcdABC	0.1cdef
methomyl	125	13.6aA	3.4abcABC	0.3bcde
fenitrothion	300	11.9abcABC	3.6abABC	0.3abcd
oxamyl	125	8.6abcdABCD	3.6abABC	0.8abc
carbofuran	200	8.5abcdABCD	4.3abcABC	0.2cde
mevinphos	125	11.0abABC	4.6aAB	0.1cdef
parathion	400	10.1abcABCD	4.7aAB	0.7ab
chlorpyrifos	125	14.3aA	4.8aA	0.9a
untreated		11.4aAB	3.2aAB	0.3abcde

Blue-Green Lucerne Aphid

TABLE 4: Average numbers of aphids per stem at different times after treatment with granular insecticides (Trial 4)

Insecticides	Rate (kg/ha)	Days after treatment					
		7	14	22	29	35	47
disulfoton	1.0	1.3bcAB	2.4abABC	8.1abAB	21.6abA	4.4aA	0.6a
disulfoton	4.0	1.0bcB	0.4dE	3.6deCD	4.8dC	1.2bA	0.3a
terbufos	1.0	0.3bcB	1.2cdCDE	6.3bcABC	11.5bcAB	3.8abA	0.6a
terbufos	4.0	0.2cB	0.4dE	1.7eD	8.0cdBC	2.7abA	0.5a
phorate	1.0	2.7bcAB	3.3aAB	7.3abcAB	30.5aA	3.5aA	0.6a
phorate	4.0	1.2bcAB	1.6bcBCD	3.9cdBCD	11.7bcAB	4.0aA	0.4a
carbofuran	1.0	2.0bcAB	2.3abABC	9.5abAB	21.2abA	4.1aA	0.7a
carbofuran	4.0	1.4bAB	1.3bcCDE	8.4abAB	15.2abAB	2.1abA	0.2a
oxamyl	1.0	1.5bcAB	3.3aAB	9.9abAB	25.4abA	6.5aA	0.3a
oxamyl	4.0	0.6bcB	1.8bcABC	10.0abAB	23.6abA	2.8abA	0.5a
untreated		5.4aA	5.2aA	16.9aA	27.7abA	3.2aA	0.4a

Blue-Green Lucerne Aphid

DISCUSSION

Tables 1, 2 and 3 show that it is possible to control BGLA with considerably lower rates of insecticides than reported elsewhere (e.g. Sharma *et al* 1976). While almost all of the chemicals gave good initial knockdown of BGLA, WL 43775, cypermethrin, thiometon, demeton-S-methyl, pirimicarb, omethoate and dicrotophos in both trials 2 and 3, plus acephate and dimethoate in trial 3 reduced aphid numbers below those in the unsprayed controls for a longer period than the other insecticides tested. This longer period of protection is likely to reduce significantly the frequency of spraying required to control BGLA when chemical control is repeatedly followed by a rapid build-up of aphid populations.

The markedly greater superiority of WL 43775 and cypermethrin to other treatments in trial 3 than in trial 2 may reflect the low solubility of these pyrethroids in water. Both trials were laid down in dry conditions, but 38mm of rain fell in the first 7 days after treatment in trial 3, compared to 7mm of rain in the same period in trial 2.

While it was possible to control BGLA in established lucerne with granular applications of systemic insecticides (Table 4), presumably through root uptake and translocation of the insecticides to the foliage, this method appeared to require much higher application rates than foliar sprays to achieve comparable control.

ACKNOWLEDGEMENTS

R. Stone, J. Parr and A.M. Parr for technical assistance.

REFERENCES

- Kain, W.M., Esson, M.J., Holland, T.V. and Atkinson, D.S., 1976. Preliminary studies of chemical control of blue-green lucerne aphid. *Proc. 29th N.Z. Weed and Pest Control Conf.*: 23-27.
- Sharma, R.D., Stern, V.M. and Hagemann, R.W., 1975. Blue alfalfa aphid: a new pest in the Imperial Valley. *California Agriculture* (April 1976): 14-15.
- Sharpe, C.J. and MacDiarmid, B.N., 1976. Control of brassica aphid and blue-green lucerne aphid with chlorpyrifos. *Proc. 29th N.Z. Weed and Pest Control Conf.*: 189-192.