EVALUATION OF ALTERNATIVE INSECTICIDES FOR LUCERNE FLEA ON PASTURE

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Summary

Two materials, phosmet and omethoate, were compared with maldison, the standard recommendation for control of lucerne flea (*Sminthurus viridus*), in New Zealand. Each chemical was evaluated at three rates. The results revealed increasing effectiveness with increasing rate for phosmet and omethoate but not for maldison. Both phosmet (200 g/ha) and omethoate (75 and 150 g/ha) gave better control than maldison (75 - 300 g/ha). At these rates, maldison was effective for 2 - 3 weeks, phosmet for at least 3 weeks and omethoate for at least 4 weeks. Omethoate was generally superior to phosmet, 15 or more days after treatment.

INTRODUCTION

Lucerne flea is an annual pest of pastures in the Ruawaro and Te Kauwhata districts of the Waikato. It damages legumes, particularly white clover (*Trifolium repens*), in late spring/early summer, when infestations peak. Numbers decline over summer with the onset of hotter, drier conditions, increasing again in autumn but not to damaging levels.

Lucerne flea originates from Europe and has been widely distributed around the world, probably as resistant eggs in soil or on plant material (Dumbleton 1939). It is a major pest of subterranean clover (*T. subterraneum*) and lucerne (*Medicago sativa*) in Australia (Evans 1937; Macfarlane 1966), and has been the subject of comprehensive study (Davidson 1934; Wallace 1967, 1968; Wallace and Mahon 1971). In severely infested pastures grasses are attacked, although legumes are preferred (Cottier 1956).

Dumbleton (1939) studied the distribution of lucerne flea in New Zealand, finding it widely established in Hawkes Bay, Manawatu, South Canterbury and Otago, with an isolated infestation at Pokeno (near Te Kauwhata), where serious damage was recorded in a hay crop. On the basis of Davidson's study, Dumbleton concluded that lucerne flea would not become a major problem in New Zealand, a prediction subsequently proven correct (Cottier 1956).

A bdellid mite predator *Bdellodes lapidaria*, a European species known to occur in New Zealand, has proven to be an effective natural enemy of lucerne flea in Australia (Wallace 1967; Wallace and Walters 1974). Its importance in natural regulation of lucerne flea is not known in New Zealand.

Generally, control of this pest in southern hemisphere pastures has relied on the use of insecticides (Dumbleton 1939; Cottier 1956; MacQuillan 1975), with or without grazing management to remove rank vegetation which tends to favour lucerne flea (MacFarlane 1966). Only

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one chemical, maldison EC, applied at 0.075 - 0.2 kg/ha, is registered for control of this pest in New Zealand. Occasionally, repeat sprayings are required every 2 - 3 weeks and Waikato farmers often experience population resurgences once the insecticide programme is terminated. A possible reason for this is elimination of *B. lapidaria*. For these reasons, dissatisfaction with maldison has been expressed.

In order to find possible alternatives, two materials, phosmet and omethoate were chosen for evaluation with maldison. These are the standard recommendations for control of lucerne flea in Australia (MacFarlane 1966) and South Africa (Bot *et al* 1976) respectively. Insecticides with known activity against springtails, which could not be applied at comparable cost to maldison (\$0.45-1.80/ha), depending upon rate), or, which had long withholding periods when used on pasture, were not included in the trials for evaluation.

METHODS

Two trial sites were located at Ruawaro, near Huntly. A third site at Rotognaru was abandoned because the infestation declined. Three rates were decided on for each chemical, the recommended rate for phosmet, omethoate and maldison in Australia, South Africa and New Zealand respectively, and the two higher rates (Table 1). The nine treatments and untreated control were replicated four times, in a randomised block design, at each site. Each plot was 10 x 4 m with a 2 m wide buffer zone between replicates.

The insecticides were applied with a mistifier knapsack sprayer, using a 172 kPa nozzle pressure with a 2 m boom giving a coverage of 250 litres/ha at a ground speed of 0.67 m/s.

The trials were sampled by sweeping foliage with a 0.3 m diameter net. Each plot was sampled immediately before treatment and again at 2, 7, 15, 21, 28 and 35 days after treatment. In each case, four sweeps at arm length were taken, one in each quarter of the plot. This was done so that the area sampled was not swept again at subsequent samplings.

RESULTS

The results are summarised in Table 1. As statistical analysis revealed no trial x treatment interactions, the results obtained from both sites were pooled. All data was adjusted to the pre-treatment sample

Table 1. Percentage reduction in lucerne flea numbers compared with untreated.

Treatment	Rate g/ha	Days after treatment					
		2	7	15	21	28	35
maldison	75	98.3	98.2	64.2	55.2	40.8	20.5
	150	98.6	98.7	63.1	60.3	-44.2	25.9
	300	99.1	99.4	63.8	55.6	-4.7	22.9
phosmet	50	97.4	99.2	52.1	51.5	-38.5	3.9
	100	96.5	99.5	67.9	65.1	16.0	22.9
	200	99.0	99.6	80.3	87.9	63.7	46.7
omethoate	35	98.6	99.7	76.0	64.4	27.7	30.9
	75	98.1	99.6	73.9	90.4	82.9	63.6
	150	98.9	99.4	88.9	97.5	94.9	67.7

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counts obtained on day 0. The main trends evident are as follows. Phosmet and omethoate increased in effectiveness with increasing rates ($p < 0.01$), although rate differences were not evident for maldison. The level of control given by maldison dropped below the other two chemicals, apart from the lower rate for phosmet, on day 15, and was poor in the fourth and fifth week after treatment. Both phosmet and omethoate exerted useful control at the higher rates in the third and fourth weeks, although omethoate gave better control than phosmet at all rates after day 15 ($p < 0.001$).

DISCUSSION AND CONCLUSIONS

The results obtained clearly indicate that both phosmet and omethoate are good alternatives to maldison for the control of lucerne flea in New Zealand pastures. Both are cost competitive with maldison but have the advantage of a much longer residual effect, which should reduce or eliminate the need for repeat applications necessary, at times, with the use of maldison. Neither material is registered for such use at the present time and their use will be dependent upon the establishment of withholding periods for grazing animals and their acceptability to the Agricultural Chemicals Board. On the basis of the two trials reported in this paper, omethoate effects control longer, at lower rate, than phosmet. At both 75 and 150 g/ha, omethoate gave control in excess of 80% up to 4 weeks after application.

The results obtained confirm the choice of phosmet and omethoate by Australia and South Africa for use against lucerne flea. The rate of insecticide recommended for control of pasture pests in those two countries is much lower than is required on New Zealand's denser pastures. This study suggests a doubling of the rate for omethoate and at least a threefold increase in rate for phosmet, compared to the South African and Australian recommendations respectively.

ACKNOWLEDGEMENTS

The authors wish to thank Mr M.D. Darby for making his land available for this trial and Dr N.R. Cox for assistance with the statistical analysis of results.

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