CONTROL OF PORINA CATERPILLAR

G. R. CASSELS

Geigy New Zealand Ltd., Christchurch

Summary

In a trial to evaluate trichlorophon and two formulations of diazinon for control of porina caterpillar (*Wiseana* spp.) observations were made on larval numbers, pasture yield and botanical composition. Treatments which reduced the larval population appeared to increase both pasture yield and quality compared with untreated areas. These increases were related to the application rate of insecticide. Details on the performance of an emulsifiable concentrate formulation of diazinon are drawn from a second trial.

INTRODUCTION

FARMERS faced with the problem of porina caterpillars (*Wiseana* spp.) are now able to select one of several insecticides which will provide control when used as specifically recommended.

Often in insect control emphasis is placed on reduction in insect numbers rather than on the benefits of increased yield which may be obtained from treatment. In the case of porina caterpillar, the prime object of treatment is to protect pasture from loss of herbage.

When evaluating materials for porina caterpillar control there are three commonly used criteria. They are:

- (1) Presence of dead or moribund caterpillars on the treated area the days immediately following treatment.
- (2) Larval counts obtained by soil sampling in accordance with accepted biological sampling techniques.
- (3) Pasture growth.

The two trials reported below were assessed by using these three methods.

EXPERIMENTAL TECHNIQUE

In both trials, counts of dead or moribund larvae were made the morning after treatment. The larvae were collected and counted from each plot.

Soil samples were taken 12 weeks after treatment for Trial 1 and 4 weeks after treatment for Trial 2. Three spade square samples were taken from each plot and the numbers of larvae counted.

Visual assessments of the percentage ground cover of pasture species were made at intervals throughout the duration of Trial 1 and the figures given in the tables are the final assessments made at the termination of both trials.

Point analysis and herbage yields were obtained from Trial 1.

To obtain yields, plots were mown with a conventional rotary mower, plots being weighed as mown. An attempt was made to minimize the error caused by transpiration losses by harvesting one complete replicate at a time.

Percentage ground cover of pasture species, weeds and bare ground was obtained from the normal 100 point analysis by application of the following formula:

$$\frac{\text{No. of times vegetation is hit per 100 points}}{\text{No. of times a species is hit per 100 points}} \times (100 - \% \text{ bare ground})$$

The percentage density of pasture and weed species in the sward was obtained by application of the formula:

$$\frac{\text{Total number of times a species is hit}}{\text{Total times vegetation is hit}} \times 100$$

The relative yield of pasture species was obtained by expressing the density values of pasture species in Column 6 as a percentage of the green weight yield in Column 4.

RESULTS

Application rates are given throughout in pounds of active ingredient per acre.

TRIAL 1: CANTERBURY, MARCH, 1965

Population at time of treatment was 9 to 12 porina caterpillars per square foot. Plot size was 1/160 acre and 3 replicates were used. Results are given in Table 1.

TRIAL 2: MARLBOROUGH, OCTOBER, 1965

Population at time of treatment was 8 to 12 porina caterpillars per square foot. Plot size was 1/160 acre and five replicates were used. Results are given in Table 2.

DISCUSSION

TRIAL 1

All materials used had an immediate effect and dead or moribund larvae were collected from each treated plot the morning following application. However, the counts obtained for both formulations of diazinon at 0.5 lb and diazinon granules at 1 lb were not significantly different from control. The number of caterpillars found appears to increase with rate of application and seemed to be related to the type of formulation used.

In the trial, significantly poorer counts were obtained with diazinon granules than with diazinon spray at 1.0 lb and 1.5 lb. This initial inferiority is not reflected in the later larval counts obtained by soil sampling or the assessments of pasture response, which suggests, in this instance, that diazinon granules were slower in action than comparable rates of diazinon or trichlorphon sprays. It is also likely that such factors as temperature, humidity or rainfall during the night following application will have some bearing on the result, either by the effect on feeding behaviour of the larvae or by direct influence on the activity of the insecticide.

Thus, while surface counts can provide a useful early guide to insecticidal activity, failure to find large numbers of caterpillars in this way does not always mean poor control.

TABLE 1: ASSESSMENTS OF LARVAL NUMBERS AND PASTURE GROWTH. CANTERBURY TRIAL

Treatment (1b)	Post-treatment Larval Counts			% Pasture Cover		Green Wt.		Point Analysis			
	Per Plot	18 hr Per	spade square	12 wk	Visual Assessment	at 20 Weeks	Yield lb/ac	% Ground Cover	Density	Yield of Pasture spp.	Relative Yield of Pasture spp. lb/ac
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Stat. Means	Signif. cf. Control	Stat. Means	Signif. cf. Control	Stat. Means	Signif. cf. Control	Yield lb/ac	% Ground Cover	Density	Yield of Pasture spp.	Relative Yield of Pasture spp. lb/ac
Diazinon G 1.5	4.47	***	1.00	***	74.38	***	3360	55.6	62.2	37.8	2090
Diazinon G 1.0	2.40	*	1.17	***	66.03	***	2688	60.4	71.5	28.5	1922
Diazinon G 0.5	2.70	*	1.76	**	53.92	***	2240	51.2	63.2	36.8	1416
Diazinon WP 1.5	9.13	***	1.17	***	73.37	***	2768	69.3	77.3	22.7	2140
Diazinon WP 1.0	8.07	***	0.71	***	71.07	***	2880	64.9	70.4	29.6	2028
Diazinon WP 0.5	2.39	*	1.57	**	63.25	***	2480	64.3	75.0	25.0	1861
Trichlorophon SP 1.0	5.47	***	1.87	**	60.82	***	2768	51.9	61.2	38.8	1694
Control	0.71	—	3.06	—	13.23	—	1376	18.0	33.6	66.4	464
Least differences for significance	* = 5% ** = 1% *** = 0.1%	2.13 2.98 4.22	0.77 1.07 1.49	11.75 16.31 22.69							

Counts of surviving larvae obtained from soil sampling some weeks after treatment can give a clearer indication of the true insecticidal activity. The results in Column 2 show that all treatments have given highly significant reductions in the larval population as compared with control.

Both formulations of diazinon gave slightly better reductions than trichlorophon at the 1.0 lb rate. There were no detectable differences between the three rates of diazinon granules used, but the 0.5 lb rate of diazinon spray was slightly poorer than the 1.0 lb rate, although neither were significantly different from the 1.5 lb rate.

Larval counting techniques are useful for assessing the effectiveness of an insecticide and in determining the optimum rate of application. A farmer having treated an infested paddock will undoubtedly feel satisfaction if the larval population is reduced. However, he receives no tangible benefits from treatment unless more and better feed results. Pasture growth and subsequent carrying capacity are the most obvious indications to a farmer of the merits of treatment.

Visual estimates of pasture growth are often made in trial work using some arbitrary scale or by estimating percentage ground cover of pasture species. With practice these estimates are highly repeatable but they do not give a quantitative measurement. Point analysis is generally regarded as being a more accurate measure and can be used to indicate not only percentage ground cover, but also percentage density of any individual species. This, coupled with weight of total herbage produced, can give a quantitative value to pasture production. Greater accuracy could probably be achieved using dry matter yields and botanical dissection.

The insecticides currently available are not generally considered to be fertilizers or growth stimulants. Hence pasture responses attributed to treatments are largely a result of reduction of larval numbers and subsequent pasture damage. However, the control of other pasture pests (where present) will also contribute to the pasture response. Insecticides only remove the source of the damage and, unless conditions are favourable for pasture growth, responses as such will not occur although further damage should cease.

Under these conditions, it is doubtful whether a farmer receives worthwhile benefits from treatment even though satisfactory larval reductions may be obtained. Hence it is suggested that early recognition of porina caterpillar infestations and treatment while conditions are still conducive to pasture growth is in the farmers' best interests. If pasture responses do not occur, assessments based on yield are of little value in trial work.

In Column 3 of Table 1, results are shown for a visual assessment of pasture growth made 20 weeks after treatment. All treatments resulted in highly significant increases when compared with control. There was no significant difference between trichlorophon at 1 lb and the diazinon formulations at 0.5 and 1.0 lb. The 0.5 lb rate of diazinon granules was inferior to the 1 lb and 1.5 lb rates and the 0.5 lb rate of diazinon spray was inferior to the 1 lb rate but not to the 1.5 lb rate.

The data given for yields and point analysis were not statistically analysed, but the figures in the table show a tendency for both yields and percentage of pasture species to increase with application rate.

In both ground cover and density assessments all treatments gave more pasture species and less weed species and bare ground

TABLE 2: ASSESSMENTS OF LARVAL NUMBERS AND PASTURE COVER, MARLBOROUGH TRIAL

Treatment (1b)	Plot Ave. (2 replic.) at 18 hr (1)	Post-treatment Larval Counts		% Pasture Cover		Visual Assessment at 4 wk (3)
		Per Spade Square at 4 wk (2)	Signif. cf. Control	Stat. Means	Signif. cf. Control	
Diazinon WP 1.0	10	1.88	*	75.0	**	**
Diazinon EC 1.0	43	1.43	*	73.0	**	**
Diazinon WP 0.6	2	1.92	*	66.8	**	**
Diazinon EC 0.6	10.5	2.61	N.S.	67.2	**	**
Control		2.98	—	48.3	—	—

Least differences for significance: * = 5% 0.88. ** 1% 9.43

than control. There appear to be no major differences between any of the treatments.

By expressing the density value of pasture species as a percentage of the green weight yield, the relative yield of pasture species is obtained. As previously mentioned, all treatments gave significant reductions in larval populations as assessed by soil sampling and the relative yield of pasture species appears considerably greater with all treatments than that obtained with control. As a result of treatment, it would seem that the reduction in larval populations obtained has permitted an increase in pasture growth.

The relative yield of pasture appears to bear a direct relationship to the amount of insecticide applied. With the diazinon formulations, the yield increases are greatest in the range of 0 to 0.5 lb and tend to become smaller with each increase in application rate. Although trichlorphon was applied at only one rate it is assumed that a similar tendency would apply.

It appears from each of the assessments discussed that the benefits obtained from each incremental increase in application rate are correspondingly less. In other words, there is a diminishing return to each increase of application rate. As each increase in application rate is of equal magnitude and each increase in the benefits appear to be of diminishing magnitude, there will be an economic limit to the amount of insecticide which should be used. This limit will vary with each situation and will probably depend on both the cost of the insecticide and the value which a farmer attributes to the benefits obtained. On the evidence of this trial, the benefits to be obtained from increasing the rate of diazinon above 1 lb do not appear to be justified.

TRIAL 2

Table 2 shows the results of a trial in which an emulsifiable concentrate formulation of diazinon was compared with a wettable powder formulation. Only two replicates of each treatment were counted for larvae dead on the surface the morning following treatment. The figures in Column 1 would suggest that, at the rates used, the EC formulation was at least as good as the WP formulation.

Larval counts obtained from soil samples four weeks after treatment, show that at 1 lb the two formulations have both given similar reductions in the larval population. Diazinon EC at 0.6 lb gave inferior results to all the other treatments and was not significantly different from control.

A visual assessment of the pasture response made at 4 weeks shows that all treatments gave highly significant increases in pasture cover compared with control. No differences were detectable between treatments.

On the overall results of this trial, diazinon EC and WP formulations appear to give roughly comparable results. Current trials now in progress are expected to provide more detailed comparisons, particularly on the effects of diazinon EC at low rates.

ACKNOWLEDGEMENTS

The author wishes to thank A. G. and J. S. Rawlinson of Methven, and D. Hughes of Marlborough for their co-operation in providing trial sites; also J. M. Kelsey, Entomology Division, D.S.I.R., Lincoln, for helpful comments and advice and Miss E. Stevenson, Applied Mathematics Division, D.S.I.R., Lincoln, for statistical analysis.