A WINTER APPLICATION OF GRANULAR ORGANOPHOSPHORUS FORMULATIONS

B. F. A. ROUGH

Henry H. York & Co. Limited, Wellington

Summary

An application of various 5% organophosphorus granules was made to a Rangitikei pasture community of porina (*Wiseana* spp.) and grass grub (*Costelytra zealandica*) larvae in July, 1967. Bayer 77488 2 lb a.i. per acre in its original pumice form (Bayer 5860) failed to give porina or grass grub control, but for performance in terms of visual pasture response it was the equivalent of fenitrothion. From the various methods adopted for determining the most effective treatment for porina, the calcite granules of fenitrothion at 1 lb a.i. per acre gave what appeared to be best results. Two different calcite formulations with fensulfothion at 2 lb and one at 1 lb gave variable results that were not significantly different from fenitrothion. Fensulfothion gave inadequate control of grass grub and this was attributed to the diminishing effect of the chemical as larval development advances towards the prepupal stage. The tangible values of winter application relative to pasture response and carrying capacity are discussed, and an alternative application period is suggested as being in the best interest of farmers.

INTRODUCTION

EXCELLENT pasture response and a high level of grass grub (*Costelytra zealandica*) control consequent to a May 5 application of the original 5% pumice formulation of Bayer 77488 prompted further evaluation. By this time it was early July, 1967.

Of primary consideration at this stage was the lethal effect on porina (*Wiseana* spp.), so for re-appraisal of Bayer 77488 the site chosen in the Rangitikei was not only infested with grass grub but also grazed short with porina. The trial was proceeded with despite the advanced maturity of larvae at the time of sampling.

With fenitrothion recently described as an effective chemical for the control of porina in pasture it was utilized in its granular form as the standard treatment in the exercise and likewise, fensulfothion for grass grub.

EXPERIMENTAL

LOCATION AND LAYOUT

The trial was carried out at T. & J. Adkin's sheep station, Silverhope, on an elevated yet flat Kimitea loam* site where ryegrass (*Lolium* spp.) and white clover (*Trifolium* spp.) and some weed invasion made up the pasture cover.

* Reference No. 76a, *Soil Bureau Bulletin* No. 5.

TABLE 1: TREATMENT & SAMPLING DATA, PORINA & GRASS GRUB TRIAL, T. & J. ADKINS, SILVERHOPE

Treatment	12/7/67	Rate (lb)	Growth Response 6/9/67 4 Visual assessments 0-5 scale	Porina Cast Count 6/9/67 Ave. of 4 counts	Porina Dawn Counts 13-20/7/67 Ave. of 8 consec. dawn Counts
			Means*	Re-trans. Means*	Re-trans. Means*
Bayer 77488 (Bayer 5860)† ...	...	2.0	2.95	17.5	1.09
Control (no treatment) ...	...	—	1.40	24.9	0.25
fenitrothion‡ ...	...	1.0	2.85	11.2	6.28
fensulfothion (German origin)‡	‡	2.0	2.20	18.7	4.52
fensulfothion (N.Z. origin)‡ ..	..	2.0	2.15	8.3	3.22
Bayer 77488 (Bayer 5860)† ...	...	1.0	2.15	21.2	0.43
fensulfothion (German origin)‡	‡	1.0	2.35	25.7	2.87
			CV 37.6%		

* Refers to plot replicate totals and not to the sum of 5 replicates or Treatment totals.

† 5% pumice formulation.

‡ 5% calcite formulation.

The area was marked out first in $\frac{1}{4} \times \frac{1}{4}$ chain plots for 7 treatments with 5 replicates forming a single rectangular block. Sampling then took place by removing three soil samples from each plot at points equidistant on a single diagonal. With a surface measurement of 7 in $\times$ 7 in. and a depth to the bottom of the porina tunnels of 12 in. the soil samples were taken and crumbled in shallow wooden boxes, and larvae extracted by hand. The figures were not used as a guide to the arrangement of plots.

The majority of the porina larvae at this stage were near 2 in. long although the growth range extended from $\frac{1}{2}$ to $2\frac{1}{2}$ in. and the species were not limited to *W. cervinata*.

APPLICATION

Granular treatments were pre-weighed and applied between 3 and 5 p.m. on July 12, using a hand-operated rotary dusting appliance. The area was covered several times to ensure evenness of spread.

The herbage was damp and close grazed, the soil wet but not sticky, and there was a very light air movement during application. Intermittent drizzle was falling.

A rain gauge and Fahrenheit thermometer were set up on the site.

ASSESSMENT OF RESULTS

1. *Dawn Counts*: Each morning for eight consecutive mornings from the day following treatment, a search for dead porina larvae was made over each plot. Those found were recorded relative to the plot on which they were found, then removed, and the whole exercise completed each morning before birds could intervene (see Table 1).

2. *Soil Counts*: Soil sampling for live larvae after treatment was identical in procedure to that adopted prior to treatment, except there were three separate diggings for survivors. The first on August 16 (35th day) was diagonal sampling, and the remaining two on August 23 and 25 (42nd and 44th day) were sampled at random over each plot. The thought behind this $3 \times$ increase in sampling was that a clearer picture would emerge of the value of treatments and their relative differences (see Table 2).

3. *Growth Response*: Plots were examined on September 6 (55th day) for possible pasture growth differences, and scored on an arbitrary scale of 0 to 5 (0 equalled bare ground and 5 the maximum amount of pasture recovery that can be expected in the circumstances). The differences were very difficult to score as climatic conditions since application had not been conducive to growth. Four separate assessments were carried out by two observers (see Table 1).

4. *Cast Count*: There was little difficulty in this instance in identifying the porina caterpillar casts present on each plot on September 6. The figure tabulated represents the plot average of four counts taken over the 5 replicates of each treatment by two observers (see Table 1).

CLIMATOLOGY

Intermittent light rain persisted throughout the day of application and the day following. Rain fell on 6 of the first 8 days and totalled 0.65 in.

TABLE 2: SOIL SAMPLING DATA, PORINA AND GRASS GRUB TRIAL, T. & J. ADKINS, SILVERHOPE.

Treatment 12/7/67	Rate (lb)	PORINA		GRASS GRUB	
		Before 11/7/67 Replicate Ave. $\times 3$	After* 16-25/8/67 Mean (Sampling $\times 3$)	Before 11/7/67 Replicate Ave. $\times 3$	After* 16-25/8/67 Mean (Sampling $\times 3$)
Bayer 77488 (Bayer 5860)	2.0	18.6	7.2	70.2	53.0 A
Control (no treatment)	—	9.0	7.8	84.0	51.2 A
fenitrothion	1.0	22.8	2.8	89.4	66.8 A
fensulfothion (German origin)	2.0	15.6	6.8	65.4	45.2 A
fensulfothion (N.Z. origin)	2.0	18.6	3.8	88.8	46.2 A
Bayer 77488 (Bayer 5860)	1.0	10.2	4.0	94.2	59.8 A
fensulfothion (German origin)	1.0	16.2	7.0	75.6	57.0 A
CV 31.6%					Min. significant difference = 25.45

* A covariance analysis was done using the pre-application and post-application figures. The regression was found to be non-significant, so a straight analysis was carried out on the post-application figures. The results are shown above.

Apart from one 3° frost on the 4th day, 9 a.m. temperatures ranged from 38 to 45°F. for the first 8 days. No rain fell for the remainder of July and 9 a.m. temperatures averaged 34°F. Over the 16 days of August preceding first sampling, temperatures averaged 45°F at 9 a.m. and 2.71 in. of rain fell on 7 days.

SUMMARY OF ARITHMETIC RESULTS

- (1) Bayer 77488 performed poorly in the initial porina mortality rating. A statistical analysis of dawn sampling counts, of which there were 8, showed fenitrothion 1 lb to be significantly different at 1% from Bayer 77488 2 lb (all rates in a.i. per acre).
- (2) The two fensulfothion formulations gave comparable porina counts initially which did not differ significantly from fenitrothion. Fensulfothion 1 lb and fenitrothion 1 lb were not significantly different from each other.
- (3) Post-application porina soil sampling 35 to 44 days after treatment put Bayer 77488 back on a par with all other treatments although fenitrothion was the only treatment to be significantly different at the 5% level from control.
- (4) Bayer 77488 gave no grass grub control but neither did fensulfothion. The New Zealand fensulfothion formulation looked most promising numerically, but statistically there was no difference from control which lost 39% of its grass grubs from natural causes in little over one month.
- (5) The regrowth rating placed Bayer 77488 2 lb on top, but still on a par statistically with fenitrothion 1 lb in being significantly different from no treatment at 5% level.
- (6) Cast counting favoured the New Zealand fensulfothion formulation which did not differ in significance from fenitrothion, but was the only treatment at 1% level to differ from control.
- (7) Over the period of 5 to 6 weeks between the first and last soil sampling, the population of porina and grass grub declined in controls by 13 and 39%, respectively.

DISCUSSION

The arithmetic analysis allows one to conclude there is value in fenitrothion 1 lb applied in July. If the porina species is *W. cervinata*, as it predominantly appears to be at present in the Rangitikei, then the caterpillars are about to pupate anyway, so poisoned or pupating there will be no further loss of herbage. Consequently, there is little to be gained from the outlay if the return is only in the form of dead caterpillars.

If stocking rate is determined by the level of available feed in July and August as it appears to be in the Rangitikei, and the likelihood of rapid pasture recovery diminishes with the onset of winter, then it can be assumed that a better return on expenditure on insecticide can be obtained from application of treatments while conditions are still conducive to pasture growth.

The obvious difficulty is knowing *where* the treatment is required, as few people apparently have the skill to assess an infestation while the porina caterpillars are small, and this also applies to grass grub larvae.

Both can cause substantial pasture damage before recognition.

If, then, it is correct to assume that farmers take no action to control the pests until after pasture damage has become visually apparent, then it is in the farmer's best interests to waive *winter* control in the light of poor pasture response and apply the insecticide the following summer-autumn when more precise timing will give more tangible benefits. Application will be based on reinfestation from the preceding generation and not on the recognition of the pests or their apparent damage.

ACKNOWLEDGEMENTS

Thanks are due to the farmers T. & J. Adkins for making the trial site available; to J. Brandon, Department of Agriculture, for assistance in sampling for larvae and other methods of assessment; and to Mrs Gregson, late Department of Agriculture, for statistical analysis of results.