STEM WEEVIL CONTROL

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Summary

In order to study their toxicity in the field towards adult stem weevils, *Hyperodes bonariensis*, a total of nine organophosphate compounds were applied to pasture in the form of sprays. In three experiments only diazinon and methidathion were found to be highly effective. At 2 lb per acre these two achieved a good kill whereas 1 lb was found to be insufficient. The spray volume was 100 gal per acre throughout. Evidence is given that adult weevils are actively mobile in the winter.

OWING to their small size, the adults of the stem weevil *Hyperodes bonariensis* are not readily killed in pasture by the surface applications of insecticides in pelleted or granular form. This was shown by Nielson (1964). It was therefore decided to examine the effect of spray applications upon the adult insects.

MATERIALS AND METHODS

The insecticides used were selected on the basis of their relative effectiveness in topical tests. They were commercial preparations supplied either as wettable powders or emulsifiable concentrates except in the case of phorate which was in the form of 10% granules; this material was shaken vigorously with water until the active material was in suspension. The insecticides were applied in fine weather in water at the rate of 100 gal per acre with a garden spray pump.

The effectiveness of the materials was determined by digging turfs of half a square foot in area and counting the weevils recovered by the flotation technique described by Nielson (1964). There were three experiments; the first was a preliminary screening test and only one plot was employed for each treatment. All rates are given in active ingredient per acre.

TRIAL I

This was set up at the Rukuhia Soil Research Station on February 19, 1965, on a 4-year-old pasture about 2 in. high. All materials were applied at the rate of 2 lb. Three days after application, four turfs from each treatment were examined for live weevils.

The results are given in Table 1.

TRIAL II

The above results were next applied to a replicated trial in which the three most promising materials in Table 1 were employed with fenitrothion. Again the rate was 2 lb applied in water as before at 100 gal per acre. There were eight plots per treatment, the plot size being 12 ft × 12 ft (1/300 acre approx.). The spraying was done on May 5, 1965. Sampling was carried out 5 days and 19 days after treatment. Light rain fell on 3 days before the first sampling, with a total of 0.11 in., while over the subsequent 14 days the rain-

TABLE 1: LIVE ADULT STEM WEEVILS RECOVERED THREE DAYS AFTER TREATMENT
(Rate 2 lb)

<i>Insecticide</i>	<i>Total of 4 Samples</i>	<i>Mean No. Per Sample</i>
Diazinon	0	0
Methidathion	0	0
Fenthion	0	0
Parathion-methyl	1	0.25
"Imidan"	3	0.75
Malathion	6	1.5
Phorate	24	6.0
Dichlorvos	27	6.75
Control	33	8.25

TABLE 2: NUMBERS OF LIVE ADULT STEM WEEVILS RECOVERED FROM 24 SAMPLES
(Rate 2 lb)

<i>Insecticide</i>	<i>5 Days</i>		<i>19 Days</i>	
	<i>Total</i>	<i>Mean</i>	<i>Total</i>	<i>Mean</i>
Diazinon	0	0	0	0
Methidathion	0	0	0	0
Fenthion	11	0.46	11	0.46
Fenitrothion	7	0.29	8	0.33
Control	223	9.30	236	9.83

fall was 1.00 in. spread over 7 days of the period. The results are summarized in Table 2. The totals given are those from 24 samples of $\frac{1}{2}$ sq. ft each comprising three samples taken from each of the 8 plots per treatment.

In addition to the live beetles, dead ones were found with total figures at the first sampling as follows: diazinon, 40; methidathion, 37; fenthion, 35; fenitrothion, 35; control, 0. At the second sampling the figures were between 8 and 11 for the insecticides and 0 for control. Insects generally, and especially Collembola, were greatly reduced by all four materials but spiders were apparently unaffected. In the case of methidathion, the 8 plots had a total of 30 dead lumbricid earthworms at the surface on the second day after application. No dead worms were found in the soil. The earthworm population comprised five species, with a total density of 120 per square foot.

By June 17—that is, 6 weeks after spraying—all plots, both control and insecticide, gave an average of 3 to 4 weevils per sample; there was no significant variation between any treatment and control. This was due apparently to migration from both control plots and adjacent unaffected pasture, coupled with a general lowering of toxicity.

The capacity of stem weevils to travel in winter months was examined by individually painting 240 which were then released in pasture within a pegged area 18 in. square. Eighteen hours later, a few were found 22 in. from the edge of the square and in a further 18 hours some were found scattered about 8 in. further out. At this

time, only 50 marked specimens were recovered from the release area. From the arrangement of the plots in Trial II it was evident that the stem weevils had migrated at least 20 ft in the six weeks' observation period.

TRIAL III

In a third experiment, the two most effective materials in the previous trial were applied at 1 lb on June 4, 1965. All other conditions duplicated those of Trial II. Over the observation period, only 0.10 in. of rain fell at night on the fourth day; the following morning a total of 6 dead earthworms were found on the methidathion plots alone. Doubtless others were eaten by birds.

Sampling carried out 12 days after spraying revealed a weevil mortality considerably lower than that of the 2 lb rate. This is shown by the results given in Table 3. No further sampling was carried out.

TABLE 3: NUMBERS OF LIVE ADULT STEM WEEVILS
RECOVERED FROM 24 SAMPLES 12 DAYS AFTER
APPLICATION
(Rate 1 lb)

<i>Insecticide</i>	<i>Total</i>	<i>Mean</i>
Diazinon	28	1.20
Methidathion	7	0.29
Control	140	5.83

SUMMARY AND CONCLUSIONS

Of the materials tested, diazinon and methidathion were the most effective and only at 2 lb. It is not known whether their effectiveness would have been reduced with a lower spray volume.

A spray application to be of any value would need to be used before the breeding cycle commenced—that is, at the end of August in the South Island (Kelsey, 1958) and the middle of July in the North Island (May, 1961). Overwintering populations of adults, though small (7 or so per square foot is a normal July figure at this Station), are sufficient to provide the subsequent larval generations which may cause serious pasture damage.

The plot sizes used in the experiments described were small enough to show fairly rapid invasion from adjacent untreated pasture. Hence it seems evident that any control programme based on the form suggested would be really effective only if applied on a whole farm scale or at least covering all known areas of infestation on any given farm.

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