SIX YEARS' RESULTS WITH FENSULFOTHION FOR THE CONTROL OF GRASS GRUB

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Summary

This paper is a precis of six years' evaluation of the insecticide fensulfothion for the control of grass grub larvae (*Costelytra zealandica*). Tables are used to indicate the percentage control of grass grub larvae obtained, the percentage pasture response, and the effectiveness of fensulfothion granular formulations in the year following application. Specific results are recorded from South Island trials to show the increase in pasture dry matter production following fensulfothion treatment, and to show the percentage control of grass grubs that has been obtained in specific trials. Comments are also made on the possible effect of fensulfothion on wild life and soil fauna. All the trials recorded confirm the reliability and effectiveness of fensulfothion for the control of grass grub.

INTRODUCTION

SEARCH for an organophosphate insecticide to control grass grub (*Costelytra zealandica*) started in 1964. Soon after laying down the trials, clear-cut growth responses showed up on all replicates treated with, in particular, fensulfothion granule, at 2 lb (all rates in a.i. per acre). This effect of fensulfothion to improve grass production (which continued into the spring flush of growth) has been repeatedly demonstrated over the years, both in small plot and field trials.

As well, grass grub control is consistently significantly higher than for many other insecticides tested, including DDT. Trials were extended on various soil types in different localities using fensulfothion granule at both the 1 lb and 2 lb rates.

Here, again, significant control of grass grub with fensulfothion was achieved even where DDT proved negative. Six years of trials and tribulations have consistently demonstrated fensulfothion's potential for grass grub control and consequently improved pasture production at varying rates of application and at various times. The most consistent and superior results were obtained from treatment with 2 lb of 5% granule in the February/March period (see Figs. 1 and 2) but effective control was obtained from applications made from January through to the end of May.

In some areas, such as Taranaki and Rotorua, earlier application — *i.e.*, in December and January — is being seriously considered. The persistence of fensulfothion enables such an application to take advantage of the more reliable rainfall at this period and still provide control of grass grub.

Since the ban on DDT for agricultural use, greater pressure to find a replacement pesticide is now being applied. A number of insecticides con-

trolling insects susceptible and resistant to DDT are available, but most lack certain requirements essential for the control of exclusively soil-inhabiting insects. The requirements as they relate to the control of grass grub larvae are:

- (1) Strong insecticidal potency and selectivity against soil-inhabiting pests.
- (2) No phytotoxic effect on the plant itself.
- (3) Ability to withstand the process of penetration to the site of grass grub activity on various soil types, different in soil moisture, texture and composition.
- (4) Gradual decomposition of the compound to non-toxic substances so as to eliminate residue problems.
- (5) A nil effect on wild life.
- (6) No deleterious effect on soil fauna.

Whether the organophosphorus insecticides would measure up to these requirements is the basis of the trials which commenced in the autumn of 1964 and have continued until the present.

Since fensulfothion complies with the first four of the requirements, greater emphasis is now placed on satisfying the fifth requirement by investigation of a suitable carrier in terms of size, shape and colour; suitable alternative formulations to eliminate hazard to wild life; and a description of conditions under which the application of fensulfothion will have the least hazard to wild life, the grazing animal and the operator.

Worm counts have been taken over the years and in all our trials and those we have been associated with there is no significant reduction in worm numbers with an application of 2 lb. Overseas information has confirmed these findings (Kring, 1969).

A full dissection of pasture composition over the years has shown little difference in composition between one treatment and another (Rough and Haeske, 1966). The propensity of fensulfothion to promote pasture response is demonstrated in Tables 1 and 2.

SAMPLING AND ASSESSMENTS

It is considered that, to gain an accurate assessment of control and pasture response, grub numbers both pre- and post-application should be counted, and visual assessment, green matter and dry matter weights of pasture recorded. Whenever possible, this has been done.

TABLE 1: EFFECT OF FENSULFOTHION ON DRY MATTER PRODUCTION

Treatment (lb)								D.M./acre (lb)
fensulfothion 2	....	....	....	....	....	....	....	4,139
DDT 2	....	....	....	....	....	....	....	991
Control	....	....	....	....	....	....	....	409

(This trial was laid down in early April. It is apparent that treatment in March will give a far greater pasture response than an application in May.)

TABLE 2: RESULTS OF SOUTH ISLAND TRIALS WITH FENSULFOTHION

Treatment (lb)	Grass Grub % Effectiveness (after Abbot)		Pasture Response (% cover remaining)	Month Treated	Rain†
	1st Season	2nd Season			
1. fensulfothion 2	95	87	82	Apr.	A
fensulfothion 1½	87		85		
fensulfothion 1	88		79		
Control	0	0	24		
2. fensulfothion 2	96	85		Mar.	A
Control	0	0			
3 fensulfothion 1½	77		91	Mar.	C
Control	0		73		
*4. fensulfothion 2	79		80	Apr.	A
fensulfothion 1½	74		75		
fensulfothion 1	65		76		
Control	0		51		
*5 fensulfothion 2	89		80	Mar.	B
fensulfothion 1½	91		78		
fensulfothion 1	79		78		
Control	0		44		
6. fensulfothion 2	88		82	May	A
fensulfothion 1	82		81	May	
Control	0		47	May	
7. fensulfothion 2	75		94	Apr.	B
Control	0		36		

*DDT-resistant.

†A = rain within 1 wk. B = rain between 1 and 2 wk. C = rain after 2 wk.

As fensulfothion gives a high, rapid kill of grass grub larvae, the pasture is able to recover quickly and to produce a significant response. The pasture cover figures (Table 2) clearly show that the application of fensulfothion prevents a loss in pasture cover ranging from 90 to 20%. However, these figures do not show the pasture production in dry matter per acre gained. This is shown more clearly in Table 1.

The percentage effectiveness for 2 lb in the trials summarized in Fig. 1 and from the South Island in Table 2 ranges from 65 to 98. These figures are based on the number of live larvae remaining and the percentage control may be greater if the number of grubs that do not rebury were included in those controlled.

Of the trials reported, many have been retained for two seasons but of these the results from only 18 are available and summarized in Fig. 3.

FIG. 1: Percentage control of grass grub obtained over six years with fensulfothion. (Total number of trials, 67. Figures inside histograms represent number of trials, figures below indicate rates applied. Shading denotes range of control.)

In these instances, fensulfothion 2 lb has given excellent control and pasture response in the season following treatment. Field observations have reported that up to 80% control is still occurring in the second year with equivalent pasture growth.

Rain immediately after application is not essential, and it is apparent that the insecticide will still be effective if rain falls within four weeks after treatment in the South Island and eleven weeks in the North Island — the periods so far recorded between application and 1 to 2 in. rainfall.

FIG. 2: Percentage pasture response following treatments recorded in Fig. 1.

FIG. 3: Effect of fensulfothion 2 lb twelve months after treatment. A, percentage control of grass grub. B, pasture response.

CONCLUSION

An attempt has been made to summarize the results of trials with fensulfothion over six years against grass grub. In all cases, effective control has been obtained with resultant pasture growth.

Where trials have been carried through into the season following treatment a significant reduction in larvae counts and an increase in pasture production have occurred. Treatment with fensulfothion for grass grub control should therefore be required only every second year.

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REFERENCES

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