ISOFENPHOS AS A LARVICIDE FOR BLACK BEETLE

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SUMMARY

Isofenphos granules at 1.0 and 2.0 kg/ha were applied against black beetle (*Heteronychus arator*) larvae in three trials in pasture. Larval reductions exceeded 80% from applications between October and early December. An application in early January gave reduced control. The results were comparable to those of fensulfothion and isazophos.

INTRODUCTION

In published work on currently acceptable insecticides for the control of black beetle in pasture fensulfothion and isazophos have given consistently favourable results (Watson and Webber 1976; Blank and Olson 1978). Success for these chemicals appeared to relate to the persistence of biologically active residues in the soil during the early larval period (Watson *et al* 1978a). Isofenphos is claimed to have similar soil residual properties with activity against soil insects including Scarabaeidae (Bayer, Technical Information).

In trials investigating liquid formulations for black beetle larval control, isofenphos gave comparable control to isazophos in three trials (Watson and Wrenn 1980). The chemical did not, however, give good results against the adult stage in seedling maize (Watson *et al* 1978b). The trials discussed here were conducted in 1980/81 to evaluate granular applications of isofenphos against black beetle larvae in pasture, in comparison with the standards fensulfothion and isazophos.

METHODS

Two trials were conducted at Otamarakau, Bay of Plenty (Ohinepanea loamy sand) and one at Te Rore, Waikato (Ohaupo silt loam). Soils on both the sites were yellow brown loams derived from volcanic ash. The Otamarakau site was set stocked with sheep and cattle, while the Te Rore site was grazed by dairy stock. Pasture on the latter site had been opened up to some extent by previous black beetle activity and contained considerable summer grass (*Digitaria sanguinalis*).

In one trial at each site granules of fensulfothion, isazophos and isofenphos at rates of 1.0 and 2.0 kg/ha were broadcast onto plots measuring 5 x 10 m in late November/December. The trials were of randomised block design using five replciates.

In the second trial at Otamarakau, the above treatments were applied at monthly intervals on different plots, from early October to early January. The trial was of split plot, randomised block design with five replicates. Main plots 9 x 5 m in size contained the time of application and insecticide rate treatments, including untreated controls. Each treated main plot was divided into three 3 x 5 m sub-plots for application of the three insecticides. Soil moisture levels at application of insecticides and rainfall following each application were recorded.

Black beetle larval and post larval numbers on the three trials were assessed between 21 and 26 January 1981. Treatments on trials 1 and 2 were assessed from 20 soil cores (10 cm diameter) taken on each plot. In the third trial 30 samples were taken from each sub-plot. All samples were taken at least 1 m from the edge of each plot or sub-plot. Samples were sorted in the field to recover black beetle and other insects.

RESULTS

In the two trials with single application times there were no significant differences between chemicals (Table 1). All treatments exceeded 80% reduction in larval numbers and were significantly different from untreated plots (P◄0.01). There was a suggested reduction in control at the lower rate of application (P◄0.1) but the difference was small (average control of 87.5% ± 5.0 compared with 94.2% ± 3.7 at the 1.0 and 2.0 kg/ha rates respectively).

TABLE 1: Percentage reduction in black beetle on two sites using three chemicals and two rates of application.

Treatment		Rate (kg/ha)	Otamarakau	Te Rore
Fensulfothion	10G	1	89	87
		2	94	92
isazophos	10G	1	95	90
		2	92	100
isofenphos	5G	1	82	82
		2	90	97
Date of treatment			26 November	23 December
Untreated No./m² ± S.E. (January)			48 ± 27	50 ± 27

Data based on arithmetic means of larval numbers.

In trial 3 the three chemicals gave comparable results at the October-December applications, with reductions in larval numbers exceeding 75% (Table 2). There was reduced control at the January application, particularly for the fensulfothion and isofenphos treatments. There was a significant rate effect (P◄0.001) with 26% fewer larvae overall on the 2 kg compared with 1 kg treatments.

TABLE 2: Percentage reduction in black beetle numbers from insecticides at four times of application (Otamarakau).

Treatment		Rate (kg/ha)	Time of application 1 10 October	2 7 November	3 10 December	4 7 January
fensulfothion	10G	1	83	76	84	37
		2	89	83	81	41
isazophos	10G	1	90	86	82	73
		2	90	91	91	83
isofephos	5G	1	90	85	77	44
		2	90	92	90	33

Untreated No./m² ± S.E. 62 ± 31. SED between chemical treatments = 9. Data based on geometric means of larval numbers on sub-plots.

DISCUSSION

A small number of the surviving larvae sampled from the January application were affected by the insecticide when sampled. Such individuals may have died subsequently The results however, bear out field observations where treatments of fensulfothion applied by farmers in January gave lower apparent control than did isazophos (Watson, unpublished data). Normally, to reduce the risk of inadequate soil moistures at application and poor control, insecticide application against black beetle should not be made after mid December. Because of its toxicity to birds, fensulfothion is restricted from use before 1 December (Agricultural Chemicals Board).

Climatic conditions during the trials were ideal for effective application of insecticide, with soil moistures exceeding 20% Mw and rainfall following each application. This probably contributed to the high levels of control achieved.

Larval development of the Otamarakau black beetle populations was about 3 weeks in advance of the Te Rore population. Pasture destruction by black beetle is more severe and widespread in warm dry seasons. In such conditions early applications of insecticides, especially on the generally warmer and drier soils in the coastal Bay of Plenty, may have an advantage over later applications.

CONCLUSIONS

Isofenphos granules gave good reductions of black beetle larval numbers, comparable to those of fensulfothion and isazophos. With an appropriate registration isofenphos could be regarded as an alternative insecticide for the control of black beetle larvae in pasture.

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