THE USE OF PHORATE, AC 92/100 AND CHLORMEPHOS FOR THE CONTROL OF LARVAL SOLDIER FLY IN MAIZE

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Summary

Four granular insecticides, phorate, AC 92/100, chlormephos and carbofuran, were applied with maize seed at the time of planting. All treatments gave a significant reduction in numbers of soldier fly (*Inopus rubriceps*) larvae and corresponding increases in dry matter and grain yields. Phorate at 2 kg/ha gave the greatest reduction (81%) in larvae numbers and AC 92/100 at 2 kg/ha gave the greatest increase (34%) in grain yield. (AC 92/100 = terbufos.)

INTRODUCTION

With the increase in maize acreage in South Auckland over the past two years the importance of soldier fly (*Inopus rubriceps*) as a pest has increased. The chemical control of soldier fly in maize is well documented in New Zealand. Fellowes (1971) claimed grain yield increases as high as 3450 kg/ha with the use of parathion and grain yield increases with parathion and carbofuran were cited by MacKay and Rowe (1973) but a clear relationship between larval mortality and grain yield was not established. Dixon and Grimmer (1973) after screening 18 compounds, concluded that the contact insecticides used in their trials had little effect on larval numbers but that three systemic insecticides, carbofuran, fenamiphos and phorate significantly reduced larval populations and warranted further investigation.

This trial was initiated to evaluate phorate and two new insecticides, AC 92/100 and chlormephos, for the control of soldier fly using carbofuran as a standard. Whereas AC 92/100 is an analogue of phorate, chlormephos is a contact, non-systemic insecticide for controlling wireworms and soil Diptera larvae (MacDiarmid 1974).

METHOD

The trial was located near Hamilton on a Horotiu sandy loam. The pasture was ploughed, disced and roller-tilled twice over a period of 10 weeks before planting commenced on 29 October 1974. The soil pH was 6.6, the rainfall over the establishment period was 7.6 mm for the first week, 17.7 mm for the first month and 160 mm for the second month. Weeds were controlled with a standard herbicide mixture.

The trial design incorporated five treatments and five replicates in a randomised block. A precision two-row planter with a separate insecticide box attached was used to sow maize, variety 'XL 45'. The insecticide granules were sown using a Horstine Farmery granule applicator in the row with the seed to a depth of 5 cm. Each plot was four rows wide and 20 m long, with the rows 56 cm apart.

The plant population was measured three weeks after sowing by counting four samples of 5.4 m per plot. Eight weeks after planting the soldier fly population was assessed by taking cores 8 cm in diameter and 15 cm deep, over the base of 20 plants in each plot and separating the larvae by a sieving and flotation technique before counting. After 14 weeks, 10 plants per plot were harvested at the first node and the fresh

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TABLE 1: SOLDIER FLY LARVAE NUMBERS AND AGRONOMIC DETAILS OF MAIZE SOWN WITH GRANULAR INSECTICIDES

Treatment	Rate kg/ha	No. plants 1000's/ha	Live larvae 1000's/m ²	FW kg/10 Plants	DM kg/ha	No. cobs 1000's/ha	Grain Yield increase % control
control	0	69.2 bB	5.28 aA	2.26 cC	2440 dC	38.9 dD	0 bB
phorate	2	59.0 cC	0.98 cC	4.14 aA	3810 bA	39.7 dCD	27 aA
AC 92/100	2	75.8 abAB	1.34 bcBC	3.46 bB	4013 abA	53.5 bB	34 aA
chlormephos	2	57.9 cC	1.38 bBC	3.61 bAB	3093 cB	44.7 cC	28 aA
carbofuran	1	81.3 aA	1.54 bB	3.19 bB	4124 aA	58.4 aA	33 aA
CV%		7	13	10	7	6	8
Control yield							7,933 kg/ha

weight (FW) recorded. A 1 kg sub sample from each treatment was dried and the dry matter (DM) yield was combined with the plant population to give DM/ha. On 16 April 1975, the cobs from the full length of two rows per plot were picked by hand, shelled and the grain weight corrected to 14% moisture. The cob numbers were also recorded.

RESULTS AND DISCUSSIONS

Each insecticide used in the trial significantly reduced the number of soldier fly larvae eight weeks after planting and this resulted in a significant increase in both DM/ha and grain yield (Table 1). The correlation between soldier fly larvae numbers and grain yield was highly significant ($r = -0.81$, $n = 25$).

Seedling emergence was higher in the AC 92/100 and carbofuran treatments than in the control. On the other hand, phorate and chlormephos showed a reduction in emergence, probably caused by phytotoxicity. The treatments with no apparent phytotoxicity had the greatest cob numbers.

The increases in DM/ha ranged from 27% with chlormephos to 69% with carbofuran. These represent a worthwhile response at the silage and greenfeed stages of the maize crop. The highest FW/plant was in the phorate treatment and was probably a result of decreased plant competition.

The increases in grain yield in this trial were associated with a reduction in soldier fly numbers and are comparable with those reported by Fellowes (1971). The smaller increases obtained by Dixon and Grimmer (1973) and Mackay and Rowe (1973) may have been due to lower soldier fly populations in their trials.

CONCLUSION

The incorporation of granular insecticides with maize at sowing gave a reduction in the larval soldier fly population with a corresponding increase in both plant and grain yields. The effectiveness of phorate for larval control was offset to some extent by its effect on seedling emergence, but this may be overcome by reducing the application rate. The results obtained with chlormephos in this trial suggest that specific contact insecticides may be as effective as systemic insecticides for controlling soldier fly larvae.

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REFERENCES

- Dixon, G. M. and Grimmer, D. C., 1973. The potential of insecticides as a means of controlling soldier fly. *Proc. 26th N.Z. Weed and Pest Control Conf.*: 201-205.
- Fellowes, R. W., 1971. Control of Australian soldier fly damage in maize. *Proc. 29th N.Z. Weed and Pest Control Conf.*: 164-167.
- MacDiarmid, B. N., 1974. Chlormephos and quinalphos for grass grub control. *Proc. 27th N.Z. Weed and Pest Control Conf.*: 208-209.
- Mackay, A. and Rowe, G., 1973. A study in the use of granular insecticides for soldier fly larvae control in establishing maize. *Proc. 26th N.Z. Weed and Pest Control Conf.*: 206-209.

GRASS GRUB AND BLACK BEETLE

CHAIRMAN'S SUMMARY

R. EAST

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The papers by Stewart and French and Pottinger were concerned with the control of pasture pests in areas of the South Island with peculiar pest problems.

Dr Stewart's paper on grass grub control in Otago and Southland revealed a situation which is rather unusual to those familiar with grass grub in other parts of New Zealand, the two-year life cycle necessitating a spring/early summer application of insecticides to achieve control with a single application, rather than the usual late summer/autumn application. The regulations governing the use of the two recommended insecticides, fensulfothion and lindane, were queried in the discussion. It emerged that while these materials are only permitted to be surface broadcast in the periods December to May (fensulfothion, no permit required) and April to June (lindane, on sheep and beef farms only, permit required) fensulfothion may be surface broadcast in the spring under permit and applications by direct drilling may be made at any time without a permit. Subsurface applications of lindane may be made under permit at any time of the year. The cause of the two-year life cycle of grass grub in Otago and Southland was also raised and Dr Stewart attributed it mainly to the effect of low temperatures. It was pointed out in the discussion that drought conditions have been observed to cause a two-year life cycle in grass grub in Canterbury, by delaying larval development.

The paper by French and Pottinger on the control of pasture pests on the West Coast revealed a different porina situation from that which is encountered on the eastern side of the Southern Alps, with a predominance of summer-flying rather than spring-flying moths and a consequent need to delay application of insecticides until late winter to achieve effective control of porina. This paper also highlighted the need for more work on pest control in some parts of New Zealand which have unique problems but are under-researched at present, partly for geographical reasons. This point was stressed by Dr Pottinger but elicited little response from the audience during the discussion.

The two papers on black beetle covered the two approaches currently recommended for black beetle control, plant resistance and insecticides. The paper by King *et al.* confirmed the resistance of lucerne to black beetle, which underlines the value of lucerne as a means of maintaining and increasing production in the face of black beetle infestations. This is a particularly noteworthy development in view of the problems of chemical control of black beetle in pasture. The question of the age or stage of growth at which lucerne becomes resistant to black beetle was raised in the discussion. While it is known that seedling lucerne, unlike mature lucerne, is not resistant to grass grub, even this much information is not available in the case of black beetle. Likewise there is no information available on the effects of black beetle adults on lucerne seedlings. There is a need for more research into these aspects of the resistance of lucerne to pasture scarabaeids.

The final paper was a very interesting one by Watson and Webber on chemical control of black beetle in pasture and maize. This paper demonstrated that pot trials can be a very effective technique for screening insecticides, with the proviso that promising materials still have to be thoroughly field-tested before control recommendations can safely be made. The protection of seedling maize against insect attack clearly requires insecticides which are active against each of a number of different pest species, which together make up a diverse pest complex.