INSECTICIDE RATES, SEEDING RATES AND AUSTRALIAN SOLDIER FLY CONTROL IN PASTURE

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SUMMARY

Australian soldier fly (*Inopus rubriceps*) can be controlled in pasture by direct drilling systemic insecticide with seed during renovation. Two trials (autumn and spring) using a triple disc drill to sow ryegrass (*Lolium perenne*) seed compared sowing rates of 10 to 40 kg/ha in combination with carbofuran insecticide at rates of 0.5 to 3 kg/ha. Highest larval mortalities occurred at the higher seeding rates. Soldier fly larvae were attracted to the rows of seedlings in proportion to the quantity of germinating seed.

INTRODUCTION

Control of soldier fly larvae is possible with intensive cultivation, or minimum/nil cultivation with systemic insecticides sown with seed (Dixon 1977; Davison *et al* 1979). Broadcasting insecticides on existing pasture gives poor control (Robertson 1979). Direct drilling of grass seed and insecticide into chemically desiccated pasture has given good pasture establishment, adequate control of soldier fly and it relatively cost-effective (Davison *et al* 1979; Robertson *et al* 1980).

A review of recent drilled insecticide trials suggested that insecticidal control of soldier fly may be enhanced at high seeding rates (Robertson *et al* 1980). Dixon and Davison (1976) established that larvae move onto the rows of seedlings and concluded that placement of insecticide with the seed enhanced mortality of soldier fly. The use of herbicide to remove the existing plant cover before drilling resulted in improved larval control as larvae are forced to feed on the toxic seedlings. Trial work was designed to test whether low rates of insecticide could be utilised with high seeding rates to control soldier fly.

METHODS

Trial 1.

A triple disc direct drill (16 row "Duncan multiseeder") was used to sow 'Grasslands Nui' ryegrass seed to 10, 20 and 30 kg/ha in factorial combination with four insecticide rates (0, 1.0, 2.0 and 3.0 kg carbofuran/ha. The insecticide granules (10% a.i.) were mixed with reverted superphosphate which was drilled with the seed at 110 kg/ha.

The existing pasture was killed 7 days before drilling with glyphosate at 2.0 kg in 100 litres/ha. Four replicates of each of the 12 treatments were drilled on 27 March 1980 in a randomised block design. Plot size was 2.5 x 10 m. The original pasture was dominated by paspalum (*Paspalum dilatatum*), ryegrass and white clover (*Trifolium repens*) at the trial site near Matangi, Waikato.

Trial 2.

The same equipment was used to drill 10, 25 and 40 kg/ha ryegrass seed with 0, 0.5, 1.0 and 1.5 kg carbofuran/ha in 110 kg/ha reverted superphosphate on 25 September 1980. The trial design was similar to that of Trial 1, except that each plot was split treated with glyphosate (2.0 kg in 200 litres/ha 7 days before drilling) and paraquat (0.66 kg in 200 litres/ha 1 day before drilling). The trial site was adjacent to that of Trial 1.

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Pasture Pests

Both trials were sampled for soldier fly larvae 6 weeks after drilling by taking seven soil cores of 7.6 cm diameter from rows of seedlings in each plot. Larvae were extracted for counting by wet sieving and flotation in MgSO_4 solution (sp.gr. 1.3). Herbage production was monitored 6 weeks and 16 weeks after sowing on Trial 1, and at 9 weeks on the glyphosate treatments in Trial 2. Larval densities and dry matter differences were compared by analysis of variance.

RESULTS AND DISCUSSION

Table 1 gives the results of the autumn trial treatments on soldier fly larval populations. No significant differences in levels of control of soldier fly were noted between 1, 2 and 3 kg/ha insecticide, within seeding rates but higher seeding rates increased control. The grass dry matter production on Trial 1 is given in Table 2.

Dry matter production was not significantly affected by insecticide rate, although all insecticide rates gave yield increases over the no insecticide treatments ($P \leq 0.05$, at 6 weeks).

TABLE 1: Soldier fly densities on rows of seedlings 6 weeks after treatment, Trial 1 (autumn) (larvae/m²).

		Carbofuran (kg/ha)				% control (from mean of all insecticide rates)
		0	1	2	3	
Ryegrass	10	2280	1390	1700	1600	30*
Seed Rate	20	3310	1040	890	790	73***
(kg/ha)	30	3870	880	720	1110	76***

Levels of statistical significance: * $P \leq 0.05$ *** $P \leq 0.001$

TABLE 2: Total DM yields 6 weeks and 16 weeks after sowing, Trial 1 (kg/ha) (yields after 6 weeks in brackets).

	Ryegrass Seed rate (kg/ha)		
	10	20	30
No insecticide	(310) 1300	(410) 1800	(470) 1650
Insecticide (all rates)	(390) 1550	(610) 2000	(590) 2050
% increase	(26) 19	(49) 11	(26) 24

In Trial 2, there were no significant differences in larval densities within treatments between glyphosate and paraquat pre-treatments, therefore results have been combined in Table 3. No significant differences between 0, 0.5 and 1.0 kg/ha insecticide rates were evident, but there were significant reductions in soldier fly larvae with 1.5 kg/ha (Table 3).

Dry matter production was not monitored on the paraquat-treated plots of Trial 2 due to the poor control of paspalum and flatweeds by this herbicide. Dry matter yields

TABLE 3: Soldier fly densities on rows of seedlings 6 weeks after treatment, Trial 2 (spring) (larvae/m²).

		Carbofuran (kg/ha)				% control (1.5 cf. 0)
		0	0.5	1.0	1.5	
Ryegrass	10	1780	1290	2470	1140	36**
Seed rate	25	2540	1720	1320	1380	46*
(kg/ha)	40	2680	2200	2620	1090	59*

Levels of significance: * $P \leq 0.05$ ** $P \leq 0.01$

Pasture Pests

after 9 weeks from drilling are given for glyphosate pre-treatments in Table 4.

In the autumn (Trial 1), the interaction between insecticide and increased seeding rates enhanced control of larvae. The effect was less marked in the spring trial. More larvae were recovered from the rows of seedlings at higher seedling rates with no insecticide (Tables 1 and 3), and this suggests that the greater concentration of germinating seedlings had a stronger attraction to soldier fly larvae. Larvae may also have moved more quickly to the rows with high density seedlings, as the levels of control by the transient insecticide were proportionately higher on these compared with that of the low density seedlings. Apparently more larvae survived on the low density seedlings than on high density at similar insecticide rates.

TABLE 4: DM yields 9 weeks after sowing Trial 2 (kg/ha)

		Carbofuran (kg/ha)				DM increase at 1.5
		0	0.5	1.0	1.5	
Ryegrass	10	1980	1830	2220	2550	570
Seed rate	25	1970	2360	2440	2520	550
(kg/ha)	40	2170	2410	2620	3200	1030

Interaction between DM and insecticide rates: $P \leq 0.05$.

The two trials are not directly comparable due to the seasonal difference, but it is likely from these results that 1.0 to 1.5 kg/ha is the lowest effective rate of carbofuran when applied by this method against soldier fly. The insecticide was apparently more effective in the autumn than in spring which was consistent with most other published information (Robertson 1979).

CONCLUSION

It can be concluded that increased seeding rates in autumn pasture renovation can result in increased efficiency of insecticides when applied as in these trials. More work on the lower rates of other systemic chemicals against soldier fly in autumn drilling would be desirable.

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