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CONTROL OF WEEVILS IN SEEDLING BRASSICAS

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SUMMARY

Pitfall trap captures of weevils in field trials indicated that an ethyl/methyl formulation of parathion was consistently effective as a spray in reducing numbers of weevils in crops of seedling swedes (*Brassica napus*) and turnips (*B. rapa*). Carbofuran, oxamyl, phoxim, azinphos ethyl, chlorpyrifos and sulprofos reduced weevils in some trials but were not consistently effective. Pitfall traps were also used to estimate the relative activity of weevils in pasture and chou moellier (*B. oleracea*), during spring and summer.

INTRODUCTION

Damage by insect pests to seedling brassicas is common in the South Island when conditions for seedling establishment are unfavourable, particularly in dry seasons.

Farmers frequently blame either 'turnip fly' or 'springtails' for poor strikes in their crops, but these names are often used as all-embracing terms for any type of insect damage. In the author's experience, damage from 'turnip fly' (identified as grass grub, *Costelytra zealandica* by Miller (1924)) is common only in those areas where grass grubs are a serious pest of pasture. Their damage is characterised by sudden disappearance of brassica seedlings (French and Douglas 1967) and no control measures applied at the time of damage are recognised to be effective.

Although serious above-ground damage by springtails has been recorded in Canterbury (Cleland 1955), it is uncommon in Otago and Southland, and no cases of crop failures due to this pest have been observed by the writer. Subterranean damage by springtails may occur but this is difficult to verify in the field.

Many cases of reported 'turnip fly' or 'springtail' damage have been found on inspection to be due to weevils, possibly *Irenimus* spp., Argentine stem weevil (*Listronotus bonariensis*) and other species which are also usually present. *Catoptes* spp. (some now classified as *Irenimus*) are well known pests of brassica seedlings (Lowe 1958) and damage by *L. bonariensis* (which had previously been mis-identified as *Hyperodes griseus*), has been reported by Kelsey (1958).

Upritchard and Park (1976) obtained control of weevils by drilling phorate and terbufos granules with brassica seed, but in those areas, such as Otago and Southland where damage is uncertain, pre-emergent prophylactic measures are not as acceptable to farmers as those applied after the appearance of damage.

This paper described six field trials which were carried out at Palmerston, Otago to screen insecticides, mostly as sprays, against weevils in seedling brassicas. There is no published work on the use of sprays on weevils in brassicas in New Zealand. French and Douglas (1967) used sprays against the total pest complex present in brassica crops, but they recorded effects only on plant establishment and not on insect numbers.

The paper also contains information on the activity of four common species of weevil throughout the period when brassica sowings are practiced in Otago and Southland.

METHODS

In 1980-81, thirty pitfall traps (plastic pottles 8 cm in diameter and half-filled with a saturated solution of picric acid) were placed in each of two paddocks of pasture at

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Palmerston, Otago. The traps were emptied weekly from 11.11.80 to 17.3.81. One of the paddocks was ploughed on 17.11.80 and sown with a crop of chou moellier on 20.11.80. Traps in this paddock were removed during the period of cultivation and sowing.

Insecticide sprays were applied at a nearby site on crops of swedes and turnips in the cotyledon stage. Five pitfall traps 7 cm in diameter were placed in each plot on the date of treatment and were emptied one to three weeks later. Plots were 4 x 4 m or 6 x 6 m and treatments were replicated five or six times in randomised blocks. Sprays were applied at 220 litres/ha and at 279 kPa pressure by hand operated sprayer. Parathion was used as a standard since it has been used with success for weevil control in the Palmerston area (S.M.J. Stockdill, pers comm). In one trial phorate granules were applied on the soil surface by hand shaker.

RESULTS

Weevils

Numbers of weevils* most commonly collected in the weekly pitfall trapping in pasture and ploughed soil are shown in Fig. 1. It is seen that captures of Argentine stem weevil were greater than for other species. *Nicaeana cervina* was the only species which may possibly have been more numerous (or active) in February than in November.

Each of the species in Fig. 1, except for *N. cervina* which was not tested, caused severe damage to swede seedlings when placed with them in 5 x 2.5 cm vials in the laboratory.

Fig. 1: Weekly moving average of numbers of weevils caught in pitfall traps in pasture and chou moellier.

* Weevil specimens identified by Dr G. Kuschel, Entomology Division, DSIR.

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At the time of the insecticide trials the most common species were Argentine stem weevil, *Irenimus obscurus*, *Brachyolus* spp. and *N. cervina*. Other species were present but have not been identified at present. Because of difficulties in identification, effects of treatments were not recorded on individual species.

Trial 1

Fensulfothion spray at 4 kg/ha and parathion spray (a commercial mixture of ethyl and methyl formulations) at 2 and 4 kg/ha gave significantly lower numbers than untreated and did not differ from each other (Table 1). There was no significant difference between the means of rates.

TABLE 1: Mean numbers of weevils trapped per plot in Trial 1: (laid down 26.2.74, assessed 15.3.74). Rainfall within four days after treatment, 19.5 mm.

Insecticide	Rate (kg/ha)			mean
	2	nil	4	
untreated	-	9.8	-	
phorate 10 G	9.6	-	8.6	9.1
fensulfothion 10 EC	8.0	-	4.4	6.2
parathion 52 EC	2.8	-	4.4	4.1
	(SED = 1.7)			(SED = 1.2)
Mean (SED = 1.0)	7.1		5.8	

Trial 2

Carbofuran, parathion and oxamyl sprays at 2 and 4 kg/ha all reduced weevil captures, whereas dicotophos gave no significant reduction (Table 2). There was no difference between means of rates.

TABLE 2: Mean numbers of weevils trapped per plot in Trial 2: (laid down 4.3.75, assessed 10.3.75). Rainfall within four days after treatment, 4 mm.

Insecticide	Rate (kg/ha)			mean
	2	nil	4	
untreated	-	39.0	-	
dicotophos 51 EC	29.6	-	26.2	27.9
oxamyl 20 EC	6.6	-	3.6	5.1
parathion 52 EC	3.4	-	5.6	4.5
carbofuran 75 WP	4.2	-	3.6	3.9
	(SED = 5.1)			(SED = 3.6)
Mean (SED = 2.5)	10.9		9.8	

Trials 3, 4 and 5

Analysis of variance on square root transformed data shows that significant differences from untreated were given by parathion and carbofuran at 1 kg/ha in Trial 3; parathion, azinphos-ethyl, oxamyl, phoxim, chlorpyrifos and endosulfan at 1 kg/ha in Trial 4; parathion and carbofuran at 2 kg/ha in Trial 5 ($P \leq 0.05$) (Table 3).

In a sixth trial, which included sprays of dichlorvos, pirimiphos-methyl, parathion-ethyl, sulprofos, propoxur, methamidophos and pirimiphos-ethyl, only sulprofos reduced weevils on square root transformed data ($P \leq 0.05$).

DISCUSSION

Damage to brassica crops in North Otago is more common after February-March sowings than in crops sown earlier (S.M.J. Stockdill, pers comm). There was no suggestion, except possibly for *N. cervina*, that weevils were more active in February-

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TABLE 3: Mean numbers of weevils trapped per plot in Trials 3,4 and 5: (laid down 25.1.74, 9.3.75, 19.1.76 respectively, assessed 8.2.74, 23.3.75, 5.2.76 resp.). Insecticides applied at 1,1 and 2 kg/ha resp. Rainfall within four days after treatment 43.7, 10, 21 mm resp.

Insecticide		Mean No. of weevils (square root transformation)		
		Trial 3	Trial 4	Trial 5
oxamyl	20 EC	-	2.2	4.7
parathion	105 EC	5.5	1.5	4.2
prothiophos	50 EC	-	2.6	4.9
carbofuran	75 WP	5.8	2.9	4.3
azinphos ethyl	40 EC	7.5	1.6	4.6
endosulfan	25 EC	6.6	2.4	4.7
chlorpyrifos	40 EC	6.9	2.3	4.6
phoxim	50 EC	6.7	2.3	5.2
omethoate 20 EC + azinphos ethyl	20 EC	6.8	3.3	4.8
trichloronat	50 EC	6.6	3.7	4.6
maldison	50 EC	7.3	3.3	4.7
fensulfothion	10 EC	6.7	3.7	5.0
fenitrothion	50 EC	6.5	3.8	5.4
diazinon	80 EC	7.8	4.1	4.5
untreated		7.5	3.3	5.4
LSD (0.95)		1.2	0.8	0.9

March than in November, which suggests that damage in Otago may be related to dry late summer weather. Damage in Canterbury is more common in November-January (K. Muscroft-Taylor, pers comm) which may reflect different weather patterns.

In the present trials, conditions for seedling establishment were good, and little damage by weevils was evident. Consequently, no measurements of crop damage were taken. Previous experience was that measurements of seedling damage and establishment gave highly variable results. This was also found by French and Douglas (1967).

It is a reasonable assumption that any insecticide which reduced numbers or activity of weevils would also have reduced damage, and therefore pitfall trapping represented a reasonable way of estimating the potential value of the insecticides tested. Nevertheless, their evaluation by this method must be regarded as a preliminary investigation.

The ethyl/methyl parathion mixture performed consistently well. Other chemicals gave good results in some trials but not in others even at 2 kg/ha. Of these, the most promising were oxamyl, phoxim, azinphos-ethyl, chlorpyrifos, endosulfan, carbofuran and sulprofos. In Canterbury, chlorpyrifos sprays controlled adult stem weevils in ryegrass (Forgie 1974). This chemical did not, however, increase plant establishment in brassicas whereas phorate and terbufos granules did do so when sown with seed (Upritchard and Park 1976). The latter method may be more desirable than the use of parathion spray which is highly toxic to humans. If farmers are unwilling to apply insecticides with seed without knowing whether or not they will experience damage, more work will be necessary on post-emergence sprays if an alternative recommendation to parathion is required.

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