INSECTICIDES FOR CONTROL OF THE RED-HEADED PASTURE COCKCHAFER IN CANTERBURY

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Summary

First and second stage larvae of the red-headed pasture cockchafer *(Adoryphorus couloni)* were effectively controlled by broadcast ganular lindane (4 kg/ha), fensulfothion (2 kg/ha) and isazophos (4 kg/ha). Adults and third stage larvae were not significantly affected. Larvae of red-headed pasture cockchafer appeared to be more susceptible to these insecticides than grass grub *(Costelytra zealandica)* larvae.

INTRODUCTION

The red-headed pasture cockchafer (RHPC) was recently found in a small area of the Port Hills, near Christchurch, Canterbury (Somerfield and Thomas 1976). It is now found in *ca.* 3000 ha of rough hill pasture in the Port Hills and northern Banks Peninsula. Our studies (Stufkens and Farrell 1980) show that the life cycle lasts two years. Development stages were found as follows: eggs in October-November, 1st stage larvae in December-January, 2nd stage larvae in February, and 3rd stage larvae from March onwards, pupating in February of the second year. Adults appear in March, and emerge and mate in September-October. Adults do not feed: some emigrated from the infested area.

RHPC is a serious pest of pastures in Victoria (Douglas 1972) and in Tasmania, where insecticides applied to the soil surface were ineffective against the pest (Hardy and Tandy 1971). This paper reports the results of two insecticide trials, carried out in the Port Hills in order to develop chemical control measures against RHPC.

METHODS

Two trials were carried out on steep rough pasture on Scarborough hill soils on the east side of Horotane Valley, in the Port Hills. The pasture was of tussocky grass 10-30 cm high, composed of browntop *(Agrostis tenuis),* red fescue *(Festuca rubra).,* dogstail *(Cynosurus cristatus)* and cocksfoot *(Dactylis glomerata).* In the first trial we used the following insecticide treatments :

1. lindane 20% granules broadcast at a rate of 4 kg/ha
2. fensulfothion 5% granules, broadcast at a rate of 2 kg/ha

Plots were 12m² in area, laid out in a randomised block design with six replicates. Materials were applied on 22 June 1979. We examined five soil samples (0.05m² area, 0.3 m deep) taken at random in each plot on 20 June (pre-treatment), 14 August and 14 November 1979, and on 11 March 1980, recording numbers and stages of RHPC and grass grub. Pre-treatment samples yielded numbers of RHPC (81, 95, 76/m²) and grass grub (127, 110, 128/m²) that showed no significant difference between plots of treatments 1, 2 and 3 respectively.

In the second trial we used isazophos 10% granules broadcast at a rate of 4 kg/ha. Plots were 24m² in area, laid out in a randomised block design with three replicates. Materials were applied on 11 February 1980. We examined 15 random samples/plot on 25 January (pre-treatment) and 20 samples/plot on 14-21 April, recording numbers and stages of RHPC and grass grub. Pre-treatment samples yielded numbers/m² of RHPC (122, 91) and grass grub (37, 50) that showed no significant difference between plots of treatments 1 and 2 respectively.

RESULTS

Lindane and fensulfothion had no significant effect on the numbers of adults and third stage larvae recorded on 14 August in Trial 1 or on numbers of adults and eggs recorded on 14 November, of either RHPC or grass grub (Table 1). By 11 March, however, numbers of 2nd and 3rd stage larvae of both RHPC and grass grub were significantly ($P \leq 0.05$) lower in lindane and fensulfothion treatments than in the untreated plots (Table 1). RHPC densities in treated plots were 1-7% of the untreated level, but grass grub appeared to be less affected by the insecticides as densities in treated plots were 28-38% of the untreated level. In Trial 2, numbers of RHPC and grass grub larvae on 14-21 April were significantly (≤ 0.05) lower in the isazophos treated plots (5, 21/m²) than in the untreated (65, 67/m²). RHCP numbers in treated plots were 8% of the untreated level: numbers of grass grub (31% of untreated) were again less affected by insecticide.

TABLE 1: Effect of insecticides on mean no./m² of red-headed pasture cockchafer (RHPC) and grass grub (GG) in Trial 1

Date	Stage	lindane 4 kg/ha		fensulfothion 2 kg/ha		untreated	
		RHPC	GG	RHPC	GG	RHPC	GG
14 Aug 1979	larva	18 a	92 a	25 a	71 a	24 a	83 a
	adult	63 a		99 a		81 a	
14 Nov 1979	adult	5 a	7 a	15 a	9 a	11 a	7 a
	egg	130 a	102 a	237 a	151 a	128 a	111 a
11 March 1980	larva	1 b	31 b	6 b	42 b	86 a	111 a

Means of the same stage and species on the same sampling date bearing different letters are significantly different ($P \leq 0.05$) in ANOVA test.

DISCUSSION

Our results suggest that lindane and fensulfothion killed 1st stage RHPC larvae 5-6 months after applicaltion but did not give immediate control of third stage larvae and adults. Watson *et al* (1978) found a similar situation in a trial of fensulfothion and isazophos against black beetle *(Heteronychus arator)* in the North Island. Insecticides applied in October had no effect on adult numbers and oviposition in December, but severely reduced numbers of young larvae recorded in February. They found fensulfothion residues were reduced to 11-14% of the original deposit (in loam soils) by 12 weeks, but were still effective up to 4 months after application. Long term persistence of lindane residues is described by Collett and Harrison (1967). Thus RHPC larval mortality recorded in March (Table 1) may be attributed to contact with persistent insecticide residues, but we do not know if the lack of effect in June and August was due to slow insecticide penetration of the soil or tolerance to insecticides on the part of large third stage and adult RHPC. In trial 2, isazophos applied in February penetrated the soil with sufficient rapidity to severely reduce RHPC numbers in April. Our results show that RHPC can be controlled with insecticides, contrary to the findings of Hardy and Tandy (1971). Control should be more easily obtained than in the case of the grass grub, as RHPC was apparently more susceptible to all three insecticides tested.

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