RESISTANCE OF LUCERNE TO BLACK BEETLE

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Summary

The weight gain and field survival of black beetle (*Heteronychus arator*) larvae on paspalum (*Paspalum dilatatum*), ryegrass (*Lolium perenne*) and lucerne (*Medicago sativa*) were investigated. The results of these studies indicate that lucerne possesses resistance to black beetle.

INTRODUCTION

The resistance of lucerne (*Medicago sativa*) to grass grub (*Costelytra zealandica*) was noted by Flay and Garrett (1942). Population studies at Takapau demonstrated that grass grub populations were 50 times lower in lucerne paddocks, than in neighbouring pasture (Kain and Atkinson 1970). These reports of resistance to grass grub by lucerne were confirmed by the feeding studies of Farrell and Sweney (1972), who found that larval weight gains and survival on lucerne were significantly lower than on ryegrass (*Lolium perenne*) or white clover (*Trifolium repens*). Wallace (1946) noted that lucerne appeared to have an immunity to black beetle attack in coastal N.S.W.

This paper reports the results of studies of the influence of lucerne on black beetle (*Heteronychus arator*).

METHODS

A laboratory study of black beetle larval performance on a number of plant species was carried out in the 1975 season. Field collected second instar larvae were held in the laboratory until moulting. Individual freshly moulted third instar larvae were fed on plant roots in small pots containing a soil medium. Fresh medium and root material were provided every seven days. The 30 larvae in each treatment were weighed at weekly intervals over the four week trial period.

In a study at the Otakanini Research Area near Helensville, black beetle population changes were monitored over the 1974-75 season in three 0.2 ha plots containing pure stands of either lucerne, ryegrass or paspalum (*Paspalum dilatatum*). The ryegrass and lucerne plots were sown in the autumn of 1974, and the paspalum was derived by herbicide treatment of paspalum-dominant pasture in early spring 1974. Population estimates of black beetle eggs were made on 4 December 1974 by taking 200 randomly located 10 cm diameter soil cores from each plot. Eggs and the small number of first instar larvae present were extracted in the laboratory by wet sieving using a salt flotation technique. The populations were sampled in the same way on 17 February 1975 when larvae and pupae were hand-sorted from soil samples.

RESULTS AND DISCUSSION

Pot experiments

The performance of third instar black beetle larvae on paspalum, ryegrass and lucerne is shown in Table 1. Larval weight gain per day

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over the trial period was eight times greater on the grasses than on lucerne. Observation of larval behaviour on lucerne revealed that the larvae ingested the root material and that poor weight gain was not due to failure to consume lucerne roots. This suggests that resistance may be due to antibiosis. No significant differences in survivals were obtained over the trial period between the plant treatments.

TABLE 1: THIRD INSTAR BLACK BEETLE LARVAL WEIGHT GAINS ON THREE PLANT SPECIES

Treatment					Weight Gain mg/larva/day
Paspalum	.....	.....	.....	.....	6.01 aA
Ryegrass	.....	.....	.....	.....	6.25 aA
Lucerne	.....	.....	.....	.....	0.77 bB
SE	.....	.....	.....	.....	0.77

Field experiments

Black beetle population densities under the three pasture types at Otakanini are shown in table 2. The highest population in December was recorded under paspalum. As shown in table 2, the population in the ryegrass and paspalum pastures did not change over the period from eggs to third instar larvae.

In contrast, the population under lucerne declined by nearly 90% over the period of larval development. This indicates that black beetle larval survival under lucerne is poor and suggests a good correlation between larval weight gain in the laboratory and field survival. Monitoring of population changes under different plant species at Otakanini will continue.

Although the observation on field survival has been restricted to one season so far, the evidence presented here confirms the opinion of many farmers and advisers that lucerne possesses resistance to black beetle.

TABLE 2: BLACK BEETLE POPULATION CHANGES UNDER THREE PLANT SPECIES AT OTAKANINI

Plant Species	Numbers/m ²		% change in population
	4.12.74	17.2.75	
Paspalum	62	62	0 aA
Ryegrass	26	27	0 aA
Lucerne	17	2	88 bB
CV %	9.0		

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