THE EFFECTS OF PASTURE SPECIES ON WHITE-FRINGED WEEVIL POPULATIONS

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Summary

Field populations of white-fringed weevil (*Graphognathus leucoloma*) were observed to increase very rapidly in pure plots of white clover (*Trifolium repens*) and lucerne (*Medicago sativa*) but did not increase under paspalum (*Paspalum dilatatum*). Insectary studies showed that adult weevils fed on legumes have much greater longevity and fecundity than adults fed on grasses.

INTRODUCTION

Pasture composition is known to have a major influence on populations of insect pests such as grass grub (*Costelytra zealandica*) (Kain *et al* 1975) and black beetle (*Heteronychus arator*) (King 1976). The effects of pasture plant species on white-fringed weevil (*Graphognathus leucoloma*) populations is therefore being investigated as part of studies of white-fringed weevil population dynamics at the Otakanini Research Area, near Helensville. This paper reports the initial observations from these long term field studies.

METHODS

At Otakanini 0.2 ha plots containing pure stands of 'Wairau' lucerne (*Medicago sativa*) and 'Grasslands Pitau' white clover (*Trifolium repens*) were sown in late winter 1974. A similar sized plot of pure paspalum (*Paspalum dilatatum*) was established by herbicide treatment of a paspalum-dominant pasture in spring 1974. Population estimates of white-fringed weevil were made in December 1974, June and December 1975, by taking 200 randomly located 10 cm diameter soil cores from each plot on each occasion, using the soil corer described by Kain and Young (1975). Larvae were extracted by the mechanical method of Kain and Atkinson (1976).

The fecundity and adult longevity of white-fringed weevils fed on different plant species were measured by feeding plant foliage to young field-collected adults kept individually in small plastic pots in a screened outdoor insectary. Food was replaced and the eggs were counted and removed daily. Longevity was measured as days since field collection. There were 35 adults per treatment.

RESULTS AND DISCUSSION

White-fringed weevil is a flightless, parthenogenetic species and adults are present at Otakanini from December to May, with peak numbers in January and February. The large increases in the populations in the white clover and lucerne plots between December 1974, before oviposition had commenced, and June 1975, when the bulk of the weevils were small larvae arising from eggs laid during the 1974-75 summer, contrast with no population increase in the paspalum plot over the same period (Table 1). This difference appears to be explained by the effects of

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legumes and grasses on adult longevity and fecundity (Table 2). The legumes tested included sainfoin (*Onobrychis viciifolia*), lucerne, white clover, red clover (*T. pratense*), subterranean clover (*T. subterraneum*), Kenya white clover (*T. semipilosum*), *Lotus pedunculatus*, *Lotus corniculatus* x *L. pedunculatus* hybrid, *Desmodium intortum* and *D. uncinatum*. The grasses included paspalum, perennial ryegrass (*Lolium perenne*), cocksfoot (*Dactylis glomerata*), Kikuyu grass (*Pennisetum clandestinum*), tall fescue (*Festuca arundinacea*) and *Phalaris tuberosa*.

TABLE 1: WHITE-FRINGED WEEVIL POPULATIONS UNDER THREE PLANT SPECIES AT OTAKANINI

Plant species	Numbers/m ² ± standard error		
	December 1974	June 1975	December 1975
white clover	11 ± 3	761 ± 55	308 ± 20
lucerne	8 ± 2	281 ± 26	139 ± 13
paspalum	32 ± 5	31 ± 5	10 ± 3

TABLE 2: FECUNDITY AND LONGEVITY OF WHITE-FRINGED WEEVIL ADULTS FED ON DIFFERENT PLANTS

Diet (see text)	Average fecundity (eggs/female)	Average longevity (days)
sainfoin	631 aA	87 aA
clovers, lotuses and lucerne	313 bB	54 bB
<i>Desmodium</i> spp	165 cB	40 bBC
grasses	10 dC	20 cC

Young *et al* (1950) also reported that adults laid fewer eggs when fed on grasses. Larval mortality in the field was of the same order (50-67%) under white clover, lucerne and paspalum between June and December 1975 (Table 1).

These results demonstrate the ability of white-fringed weevil populations to increase very rapidly under legume dominance, in contrast to black beetle populations, which are higher under grasses than legumes in the same plots at Otakanini (King *et al* 1975). White-fringed weevil is primarily a pest of lucerne but the root-feeding larvae can also cause damage to pastures (Cumber 1960).

Chemical control of white-fringed weevil larvae is difficult (Todd 1969), although chemical control of adults offers some promise (East *et al* 1975; Gross and Harlan 1975). The reduction or elimination of legumes during summer may therefore be a useful technique for the suppression of white-fringed weevil populations in infested pasture, particularly in the case of pasture which is to be converted to a susceptible crop such as lucerne, potatoes or maize, which can be severely damaged by white-fringed weevil larvae at the seedling stage (Given 1973).

When altering the grass-legume balance it is important to consider the possible effects on other insect pests which may be present. For example, black beetle and white-fringed weevil often occur together in pastures in the northern North Island. Suppression of legumes may reduce white-fringed weevil populations but increase black beetle numbers, unless the grasses in the sward are unfavourable to black beetle (King 1976). Conversely, increasing the proportion of white clover in the sward, at the expense of ryegrass and paspalum, may reduce black beetle populations but increase white-fringed weevil numbers. In the Waikato, Bay of Plenty and southern North Island, white-fringed weevil occurs alongside grass grub in pastures, but in this case suppression of clover

during summer is likely to reduce populations of both grass grub (Kain *et al* 1975) and white-fringed weevil. In developing pastures which are resistant to major pests such as grass grub and black beetle it is clearly necessary to consider the possible effects on other insects.

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