AN EVALUATION OF PITFALL TRAPPING AS A METHOD OF ESTIMATING BLACK BEETLE POPULATIONS IN SPRING

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Summary

The activity of black beetle (*Heteronychus arator*) adults in pasture in spring as determined by pitfalls was found to be independent of density and influenced by pasture management. Pitfall trapping of adults in spring is an unsatisfactory method for estimating adult numbers in the pasture.

INTRODUCTION

Black beetle is a spasmodic pest in some pastures in the northern areas of the North Island. The application of insecticides remains the only effective control strategy against this pest in pastures available to farmers. Esson (1973) and Watson and Webber (1976) have demonstrated that optimum control is achieved through the application of insecticides in the late November early December period. Due to the very transient and spasmodic nature of damaging black beetle populations, farmers must be able to confine the use of expensive insecticidal controls to those paddocks most likely to be damaged in order to maximise the cost/benefit of control.

In the comparative absence of spring flight, Watson and Wrenn (1980) found larval populations in February were significantly related to adult numbers in the previous September. This relationship has been shown to provide an effective basis for a farm survey approach based on spade sampling to reach decisions on the need for control strategies against black beetle (Watson *et al* 1980). Cameron and Butcher (1979) found that the number of adults caught in pitfall traps in pasture at seven sites in Northland in November/December was significantly related to the density of larvae found in January.

This reports the results of an evaluation of pitfall traps as a simple method which could be used by the farmers to assess adult numbers in spring and to provide a basis for decisions on the need to use insecticidal controls.

METHODS

Black beetle population monitoring sites were established on five farms in the Waikato region in September 1979 with one site per farm. All the sites were in areas with high black beetle populations following establishment of the pest in the previous 2-4 year period. The sites were in three areas: near Otorohanga, at Te Rore and Te Pahu adjacent to Mt. Pirongia, and in the Manawaru area of the Matamata district.

At three sites, ten plots, 10 x 10 m, were laid down in a 5 x 2 pattern, while at the other sites, eight plots only were established. The black beetle population at each site was sampled in September 1979 and February 1980 by taking 20, 10 cm diameter soil cores using the sample corer of Kain and Young (1975) and a centric systematic pattern of sampling which Milne (1959) showed could be treated as a random sample. Soil cores were dry-sorted in the field to establish the numbers of black beetle present.

Either 12 or 15 pitfall traps consisting of 680 ml plastic food containers were set in 10 cm diameter holes in the plots at each site in October. The traps were placed in the middle of each plot and on the boundary between adjacent plots so that each trap was 5 m from another. Drainage holes were drilled in the bottom of each trap which contained 4 cm of coarse pumice sand to provide a refuge for the trapped adults. Wire milk crates were placed over each trap to prevent trampling by stock. Pasture height

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within the cage was maintained similarly to that in the surrounding pasture. Traps were emptied once a week between September and the end of December and the adults present counted.

RESULTS AND DISCUSSION

If a relationship between adult trap numbers in spring and adult numbers in the pasture exists, then a decision on the need to apply controls by early December must be made on adults trapped until the end of November. There was no significant relationship between either mean adults or mean female adults caught per trap until the end of November and larval numbers in February or adult numbers as determined by the September population sample (Table 1). This result is in contrast to that of Cameron and Butcher (1979) obtained from predominantly Kikuyu grass (*Pennisetum clandestinum*) pastures in Northland.

TABLE 1: Black beetle adult population densities (No./m²) in September and February at five sites in the Waikato and average number of adults trapped between October and the end of November at five sites (Adults/-trap/week). (Adults in September; larvae, pre-pupae, pupae and teneral adults in February).

Site	No/m ²		Average No. adults/-trap/week Sep-Nov	
	in Sep	in Feb	Females	Total
1	8.9 ± 2.3	48.4 ± 6.1	1.2	2.5
2	11.9 ± 3.4	35.8 ± 5.1	2.4	4.9
3	24.8 ± 2.1	79.5 ± 6.8	0.4	0.9
4	25.5 ± 5.1	56.5 ± 6.2	3.6	7.8
5	46.9 ± 6.6	103.4 ± 8.6	2.3	5.7

The numbers of adults per pitfall trap between October and the end of December for two sites are shown in Fig. 1 as an example of the adult activity noted at all sites. Peak activity occurred either in the week ending 28 November or 17 December. The decline from peak activity coincided with a reduction in pasture height by grazing or the removal of conserved pasture. This suggests an association between the reduction in pasture height and the subsequent level of adult activity. If adult surface activity is favoured by long pasture, then variation in pasture management between sites will influence the level of adult activity and hence numbers trapped. This would make a significant contribution to the failure to demonstrate a relationship between the number of adults trapped in pitfalls and the actual adult density in the pasture.

CONCLUSIONS

Although Cameron and Butcher (1979) found that the number of black beetle adults trapped in the pasture in November/December was related to the subsequent summer larval populations, it is apparent that adult activity may be influenced greatly by pasture management. Studies made with other insects have shown that pitfall traps are of little value for the direct estimation of populations (Southwood 1966). This study has shown that pitfall trapping black beetle adults is an unsatisfactory method for obtaining estimates of adult numbers in spring which could be used as a basis for predicting summer larval populations.

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Fig 1 The mean number of black beetle adults/pitfall trap at sampling dates between October and the end of December 1979 at M. Jerebine, Te Pahu and J. Rodgers, Otorohanga, and the effect of a reduction in pasture height on numbers trapped.

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