A RATIONAL APPROACH TO GRASS GRUB CONTROL

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Summary

An account is given of an economic method of applying insecticide for retarding the build-up of grass grub (*Costelytra zealandica*) populations. Interim results of research on cultural and management practices for grass grub are summarized. An integrated farm programme for minimizing the incidence of grass grub based on the findings is discussed.

INTRODUCTION

WITH the withdrawal of DDT from the market this year, grass grub (*Costelytra zealandica*) control has now entered a new era.

Increased production in the past has been achieved in some localities by the cheap and efficient control of grass grub with DDT. The effect of withdrawing DDT will depend to a large extent on whether the best use is made of alternative insecticides, management and cultural practices.

Of the many insecticides which have been screened for grass grub control over recent years, only two, diazinon and fensulfothion, have given an acceptable level of control, when applied as granules to pasture. Of these, fensulfothion has given the more consistent results (Kain and Atkinson, 1968). Unfortunately, these chemicals are very expensive. The cost of diazinon and fensulfothion on a per acre basis without application costs but inclusive of the government subsidy are \$5.90 and \$8.50 per acre, respectively.

The other insecticide which is available for grass grub control is lindane. However, because of the animal residue problems associated with it, its continued use must be viewed with uncertainty.

The purpose of this paper is to discuss grass grub control at the farm level in the light of current legislation and results from work conducted over the past three seasons at the Takapau Research Area in Hawke's Bay.

INSECTICIDE CONTROL

Unlike DDT which has been used prophylactically, organophosphates, because of their quicker rate of action and transient life in the soil, are more suited to a therapeutic role. The obvious advantage of these insecticides is that the farmer is not committed to using them until the presence of grass grub is established. Clearly, a more intimate knowledge of the behaviour of grass grub, and a more vigilant approach are needed by the farmer to ensure their efficient use. Provided a high degree of control is achieved in the season of application, grass grub numbers do not cause economic loss for at least two seasons following application.

This trend, which was initially shown on small plot trials, has been demonstrated in farmlet studies at the Takapau Research Area.

Investigations have shown that, in the Hawke's Bay area in well grazed paddocks with low populations of grass grub, infested areas are clearly defined by damage in late March. Over 90% of a population is confined to the visibly infected area or within a surrounding two foot margin. Populations usually increase from season to season by spreading peripherally from the areas initially inhabited. Only very low numbers, and very small areas of damage have been observed which cannot be attributed to increases in grass grub aggregates which were obvious as damage in the previous season. This slow rate of build-up was reported by Fenemore (1965) in his insecticide trials.

In March, 1970, a small plot trial was set up at Takapau to investigate the effect of applying insecticide to damaged areas and a surrounding two foot margin. Less than 20% of the area of each plot was treated. Plots were 1/38th of an acre in size and each treatment was replicated three times. The insecticide used was fensulfothion and sampling was carried out eight weeks after treatment with the following results:

						<i>Mean No. grubs/sq. ft</i>
Fensulfothion	....	....	....	....	....	4.8
Control	....	....	....	....	....	24.8

The above results show that over 80% grub mortality was obtained. Unfortunately, pasture damage at the time of treatment was not as clear as it was later in the season. However, results appear promising and work is continuing on a paddock scale.

For this technique to be effective, pasture damage must be defined clearly enough to indicate the areas of the paddock occupied by grass grub. This is more difficult to observe and impracticable in the higher rainfall areas of New Zealand where grass grub damage is not so obvious.

Both economically and biologically, this method is suitable for retarding the build-up of grass grub populations.

CULTURAL AND MANAGEMENT PRACTICES

At best, such methods may reduce the frequency and area over which high-priced insecticides have to be used. Factors which have been observed to have some impact on grass grub populations at Takapau and at Ruakura are cultivation, resistant plant species, stocking rates, and stock management.

CULTIVATION

Results have shown that cultivation has very little effect on grass grub populations during the larval stage, and any decrease in grub numbers produced by cultivation at this stage has been insufficient to avoid damage to sensitive young plants of the subsequent crop or pasture. On the other hand, cultivation between late September and early October has given exceptionally good results. Over this period, the pupal stage, which is highly sensitive to physical damage, is present in the soil.

Results of spring cultivation are shown below.

						<i>Mean No. grubs/sq. ft</i>
Non-cultivated	....	....	....	....	....	26.0
Cultivated	....	....	....	....	....	2.6

These results show that cultivation gave a 90% reduction in numbers.

RESISTANT PLANT SPECIES

High-producing plants which are resistant to grass grub damage offer good possibilities for control.

A plant which has shown resistance at Takapau and elsewhere is lucerne. In December 1967, sampling demonstrated that seedling lucerne and new grass paddocks had similar grub populations. From that point onwards, populations have continued to fall in the lucerne paddocks and increase markedly in the grass paddocks, until in March of this year the situation in the six lucerne paddocks and the six neighbouring grass paddocks was:

						<i>Mean No. grubs/sq. ft</i>
Lucerne	....	....	....	....	....	0.7
Grass	....	....	....	....	....	34.0

This apparent resistance of mature lucerne to grass grub attack appears to be due to a physical inability of the grubs to feed on the woody taproot. Unable to utilize lucerne as a source of food, the grubs starve. Nevertheless, seedling lucerne is very susceptible to grass grub damage. It is therefore advisable where possible to spring-sow lucerne where paddocks are infested with grass grub. This not only reduces the grass grub population but enables lucerne to establish and mature before the more active feeding stages are present in the soil. The problem of autumn and winter dormancy, which makes lucerne an unacceptable plant in many areas, may be overcome by oversowing it in the autumn with quick-growing grass species. The undersown species may then be removed with herbicides in the spring.

STOCKING RATES AND STOCK MANAGEMENT

As early as 1924, observations in Hawke's Bay were documented on the beneficial effects of mob stocking with cattle and sheep on grass grub infested paddocks. Observations on farms suggest that in some areas the use of this practice for grass grub control is worth while. Mob stocking and feeding out meadow hay on grass grub infested paddocks to sheep and cattle has a threefold effect in that it reduces grass grub numbers, builds up fertility, and results in hay seed re-seeding damaged areas.

A trial set up to investigate the effect of grazing pressure on pasture production at the Ruakura Research Centre showed that, as stocking rate increased, grass grub numbers decreased.

<i>No. dry ewes/acre</i>	<i>Mean No. grubs/sq. ft</i>
3.6	30.9
7.1	21.8
8.9	15.9
10.5	4.7
12.5-21.5	5.0

It is interesting to note that, at stocking rates beyond 8.9 dry ewes/acre, there is an abrupt fall off in grub numbers. Further increases in stock numbers were not accompanied by a decrease in grub numbers. For this reason, grass grub numbers for the stocking rates of 12.5, 14.2, 16.4, 17.1 and 21.5 dry ewes/acre are given as a pooled mean. The decrease in grass grubs with higher stocking rates may be a result of different levels of ground cover over the flight period or more probably the effect of treading over the winter months. The effect of treading on grass grub populations appears to be dependent on soil moisture, depth of grubs and stock numbers. More detailed work on this aspect of grass grub research is under investigation at the Takapau Research Area.

CONCLUSIONS

Economics and legislation dictate that we can no longer rely completely on any one method of control for grass grub.

It is suggested that populations should be prevented from reaching epidemic proportions rather than trying to control epidemic populations.

In view of the evidence presented, and the expense of alternative insecticides, a rational approach to grass grub control on a farm basis would embody, where practical, some or all of the following practices:

- (1) Limited use of blanket application. This type of application should be confined to paddocks which cannot be handled by other methods.
- (2) Spot application of insecticide to damaged areas and a surrounding two foot margin to prevent or retard build-up of grass grub populations.
- (3) Renewal of grass pastures through a spring-sown crop such as barley, leaving cultivation until the pupal stage.
- (4) Greater use of lucerne for grazing, thus limiting the area of the farm which is more prone to grass grub damage.
- (5) The use of mob stocking during the winter months, on areas which are not prone to pugging.

The control of grass grub, like fertilizer programmes, is now more complicated. To make the best use of available practices, farmers in general must be better acquainted with the life-cycle and behaviour of the pest.

One sector of the farming community which has been left in an extremely vulnerable position with the recent banning of DDT is the hill country farmer. The use of cultural and management practices in this situation is limited by topography. This position is further aggravated by the fact that only diazinon and lindane are permitted to be applied from the air. To date no results have been published on the efficiency of aerial application of diazinon. Therefore, any restrictions placed on lindane would be to the detriment of grass grub control in these localities.

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