THE TIME OF ROLLING FOR CONTROL OF GRASS GRUB

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SUMMARY

Heavy rolling of pasture in March, April, May and August was evaluated as a means of controlling grass grub (*Costelytra zealandica*). Up to 66% control of larvae was achieved during March and April provided soil moisture was near to field capacity. Rolling in May and August produced lower grass grub mortality. Grass grub control from fensulfothion granules applied at 2 kg ai/ha was no better than that of the best rolling treatment.

INTRODUCTION

Previous studies by Stewart and van Toor (1983) showed that rolling of pasture in early May in Southland with an 8 t tandem roller gave 61% mortality of grass grub and subsequent increases in pasture yields in the following spring and autumn. However the optimum time for rolling has not been ascertained. The effects of rolling on grass grub density in pasture and on pasture production were observed therefore at four times of the year from March to August. The results are reported in this paper.

METHODS

The trial was laid down at Wendonside, Northern Southland in 1982 on a 4 year old pasture, of predominantly ryegrass (*Lolium perenne*) and sweet vernal (*Anthoxanthum odoratum*) and containing only 3% clover. The soil was an Oreti stony silt loam, a yellow grey earth.

Treatments were a control (with and without irrigation), a single pass of a tandem roller on 26 March (with and without irrigation), 28 April, 28 May or 24 August, and fensulfothion (Dasanit 5G) insecticide applied at 2 kg ai/ha on 7 April with a hand-held shaker. Irrigation was carried out on rolled and untreated plots in March only when soil conditions were relatively dry. Water (25 mm) was applied on 23 March and again 2 days later.

Treatments were replicated 6 times in a randomised block design. Plots were 20 m x 2.5 m except for irrigated plots which were 3.0 m wide allowing a 0.25 m buffer strip on either side to prevent water spreading to adjacent plots.

The 2.2 m wide tandem roller consisted of a 400 m diameter front roller with grooves 50 mm deep x 100 mm wide x 100 mm apart, and a 600 mm diameter rear roller which was smooth-surfaced. Both were under a platform supporting a load of concrete giving a total weight of 8 t, the maximum attainable before slippage of the tractor wheels or sledging of the roller caused damage to the turf. The roller was towed at 4 km/hr by a 46 kw or 53 kw rear wheel drive tractor.

Grass grub sampling

Density of larvae was estimated by taking 30, 100 mm diameter cores 250 mm deep per plot. All plots were sampled on 22 March before treatments were applied. Thereafter the rolled and untreated plots were sampled within 3 weeks of each rolling treatment. In September 1982 and October 1983 all plots were sampled. The position of larvae in the soil profile was assessed by dividing cores into 50 mm depths.

Soil Measurements:

Soil moisture was measured gravimetrically at 3 depths, 0-50, 50-100 and 100-150 mm in rolled plots immediately prior to each rolling treatment.

Field capacity, determined as described by Rickard and Cossens (1965), was: 0-50 mm soil depth: 53%; 50-100 mm: 39%; 100-150 mm: 35% of oven dry weight.

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Soil bulk density was measured on the oven dry weight of 54 mm diameter cores taken on 4 May in the untreated plots and those rolled in March and April, and on 3 June for plots rolled in May.

Pasture Measurements:

Pasture dry matter production was assessed from 8 cuts in the 1982/83 season by mowing a strip 0.46 x 20 m to 30 mm after the pasture height reached 100 mm. Sward composition was assessed by point analysis in May 1982 and October 1982 and by dissection of herbage in November 1982 and April 1983.

Management:

A basal dressing of 375 kg/ha potassic super was applied on 2 April 1982. Nitrolime at 24 kg N/ha was broadcast on every plot on 16 December to counteract a visible nitrogen deficiency. The pasture was grazed by sheep after all cuts except the first two where trimming was done only with a mower.

Analysis:

Analysis of variance was performed on soil density and pasture data and on the natural logarithms of grass grub density with covariate adjustment for initial density (Table 1). The LSR (Table 1) is the back-transformed least significant difference between the means of the $\log_e$ transformed data.

TABLE 1: Geometric mean of grass grub density (no./m²) and least significant ratios.

Treatment	1982					1983
	22 March	4 April	15 May	19 June	19 Sept.	October
Untreated	167	165	168	124	136	85
Irrigation	218	167	—*	—	101	77
Roll March	243	158	—	—	97	123
no irrigation						
Roll March	201	79	—	—	47	24
after irrigation						
Roll April	281	—	57	—	56	67
Roll May	221	—	—	105	69	74
Roll August	224	—	—	—	85	81
Insecticide	199	—	90	87	69	34
LSR (5%)	.72 ¹	.77 ²	.50 ³ .78 ⁴	.71 ²	.67 ²	.56 ¹

¹ For all treatment comparisons

² For comparison of treatment with untreated

³ For comparison of Roll April with untreated

⁴ for comparison of insecticide with untreated

* Not measured

RESULTS AND DISCUSSION

Irrigation in March raised soil moisture from 34, 32 and 31% at the 0-50, 50-100 and 100-150 soil depths to within 2% of field capacity. There was no significant grub mortality in the non-irrigated plots, whereas with irrigation, a 52% mortality occurred after rolling (Table 1). Irrigation alone did not result in grass grub mortality.

Grass grub mortality from rolling in April, when rainfall had raised soil moisture to field capacity, was 66%. No significant mortality of grass grub was measured from rolling in May, when soil moisture was in excess of field capacity (59% and 43% at 0-50 mm and 50-100 mm depths respectively). Rolling in August, when moistures were again at field capacity, gave a grub kill of 37%.

Sampling in September showed that all rolling treatments had reduced grub populations, with those applied in April and in March (irrigated) still proving the most effective.

Fig. 1: Position of grass grub in the soil profile at the different times of sampling in 1982.

In the non-irrigated soil in March there was no increase in soil density. In plots where soil moisture was near field capacity, rolling caused an 8% increase in soil bulk density at the 0-50 and 50-100 mm depths. In May no change in density was observed.

The poor mortality of grass grub from rolling in May and in August was possibly related to the redistribution of grubs to lower levels in the soil as indicated in the June sampling (Fig 1) and also found by Stewart and van Toor (1983). It may also be due to a lower susceptibility of mature third instar grubs to rolling.

Grass grub control from insecticide application was poor (49%) when assessed in September, although the effects of this and the March rolled and irrigated treatment continued into the following year resulting in 60% and 72% reductions respectively of the larval population (Table 1). Treatments gave no observed carry-over effects on grub density.

The rolling treatments had no significant effects on pasture yields or species composition, probably a result of favourable climatic conditions for growth and low numbers of grubs. Insecticide application resulted in an increase of 90 kg/ha (18%) in April 1983 only.

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