GRASS GRUB DAMAGE IN IRRIGATED AND DRYLAND PASTURES NEAR CAREW, MID-CANTERBURY

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The district of Carew, mid-Canterbury is recognised as an area with a persistent grass grub (*Costelytra zealandica* (White)) problem. The region around Carew consists of predominantly flat land on the Canterbury plains with approximately 50% under border dyke irrigation. Pastoral farming of sheep for wool and meat production is the main farming activity in the area. Grass grub is invariably present in pastures throughout the district with signs of damage of varying severity occurring every year. In the winter of 1990 extensive damage was noted on dryland paddocks in the area but little damage was evident on irrigated paddocks. This could have been due to higher populations in the dryland pastures or a higher damage threshold in the irrigated. To confirm the validity of this observation and to determine which factors were responsible, we examined data from an aerial photographic survey of the district to quantify the extent of damage in the area, and carried out a ground survey to determine population levels in both types of pasture. We also examined aerial photographs from previous seasons to gain information on the history of grass grub damage in the area.

A strip of approximately 100 paddocks near Carew is monitored each winter as part of an annual aerial photographic survey of grass grub damage in mid-Canterbury. Photographs are taken from approximately 1000 metres on slide film for later projection and grading of individual paddocks for severity of grass grub damage on a 0-5 scale (0 = no damage; 1 = 1-10% damage; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = >60% damage). In addition, in 1990, a general aerial photographic survey was made of the district on 19 July to record damage similar to that in the monitored strip. From the photographs, paddocks were differentiated between border dyke irrigated and unirrigated (dryland) and the damage grading of each paddock noted.

In the dryland paddocks the mean damage grading was over twice that of the irrigated (Table 1). Sixty percent of the dryland paddocks showed considerable signs of grass grub damage (>10% area damaged). Twenty percent were severely damaged (>40% damaged). By way of contrast, only 10% of irrigated pastures showed damage greater than 10% and, of this damage, none was severe. The total area damaged in the dryland pastures was calculated as approximately 20% of the surface area compared to 5% in the irrigated pastures (using averages of percent damage obtained from the gradings; 0 = 0%, 1 = 5%, 2 = 15%, 3 = 30%, 4 = 50%, 5 = 80%).

TABLE 1: Grass grub damage, populations, and disease in irrigated and dryland pastures near Carew, winter 1990.

	Aerial survey of pasture			Ground survey of grass grub	
	No. of paddocks	Mean damage grading (0-5 scale)	Estimated % area damaged	Mean no./m² (and range)	% with amber disease (and range)
Dryland	22	2.1	21	233 (102-331)	13 (0-42)
Irrigated	36	0.9	5	74 (0-186)	9* (0-18)
LSD (5%)	—	0.5	—	77	15

*Based on six paddocks where the population exceeded 30/m².

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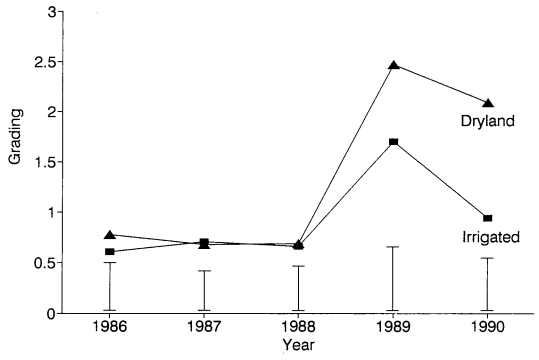
For the ground survey, 10 pairs of paddocks, one irrigated and one dryland, were selected from the area. The paddocks within each pair were adjacent, with similar histories and management, where possible. Each paddock was sampled between 7 and 14 August by taking 15 spade samples (15 x 15 x 15 cm) in a transect across the paddock. Grass grub larvae were sorted from the soil, counted and brought back to the laboratory for examination of disease status.

The mean population in the dryland paddocks was three times that of the irrigated (Table 1). Thus the observed differences in damage between the dryland and irrigated pastures were principally due to higher populations in the dryland pastures. However, there was also evidence of a higher damage threshold in the irrigated pastures, because they consistently showed a lower damage grading than dryland pastures with grass grub populations of similar size.

Photographs from previous surveys indicated that grass grub damage in the monitored strip had been low between 1986 and 1988, but both classes of paddock had been severely affected in 1989 (Fig. 1). This pattern of damage (Fig. 1) indicates a favourable period for grass grub growth in Carew through the late 1980's leading to extensive damage in the dryland pastures in 1989 and 1990. Populations in irrigated pastures, however, seem to have peaked in 1989 and collapsed in 1990 which may indicate that higher summer moisture levels have affected populations.

Fig. 1: Mean damage gradings on dryland and irrigated pastures near Carew, 1986-1990 (Bars represent LSD (5%)).



Irrigation could aid the survival of pathogens, particularly those operating over the summer (East and Wigley 1985), but there was no evidence of this from our winter sampling. Milky disease (*Bacillus popilliae*) and the fungus *Metarhizium anisopliae* were found infecting low numbers of larvae in both pasture types. Larvae infected with amber disease, caused by bacteria belonging to *Serratia* spp, were found in most populations but numbers were variable (Table 1). Where high levels of disease were recorded (>30%) a population collapse would be expected by the 1991 season (Jackson 1984).

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