TWO-YEAR GRASS GRUB CAUSE DAMAGE IN MIDSUMMER IN CANTERBURY

TREVOR A. JACKSON and RICHARD J. TOWNSEND

AgResearch, P.O. Box 60, Lincoln

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The grass grub (*Costelytra zealandica*) is usually univoltine throughout most of New Zealand. However, the insects frequently enter a two-year life cycle in parts of Otago and Southland (Stewart and Stockdill 1972). The prolonged development of these insects is caused by low summer and autumn soil temperatures which reduce the growth rate so that larvae fail to reach a critical minimum weight (120 mg) required before a period of winter chilling in order to induce pupation (Wightman 1974). The two-year larvae usually change to the third instar in spring, complete their feeding by early summer and return to synchronous adult flight with univoltine populations after chilling of the mature larvae in the second winter. Feeding by high numbers of two year life cycle larvae often results in spring and early summer grass grub damage (Barratt *et al.* 1990). Two-year life cycle larvae also occur in Canterbury where development can be delayed by drought (East and Pottinger 1975; Jackson unpublished).

In January 1993, a farmer near Alford Forest, Ashburton Co., Canterbury, reported severe grass grub damage in an established pasture which resulted in turf pulling during feeding by cattle. The situation was investigated in early February and 15 spade samples (15x15x15 cm) were taken from the pasture, which was predominantly cocksfoot (*Dactylis glomerata*) and poa (*Poa annua*). There was extensive lifting of the poa and some cocksfoot, with high numbers of grass grub larvae under the remaining cocksfoot plants. The larvae were extracted and weighed and the disease status of the population was assessed. Paddocks on the farm had previously been sampled in November 1992 and a second sampling of the target paddock took place in April 1993.

The grass grub population in February was estimated at $240 \pm 39(\text{SEM})/\text{m}^2$. Ninety-two percent of the larvae were early 3rd instars with dark guts indicative of feeding larvae and had a mean weight of 156 mg. The remaining 8% were first instar larvae with a mean weight of 10 mg. There was little disease evident in the population. In April, the population was estimated as $198 \pm 36(\text{SEM})/\text{m}^2$ with 89% mature 3rd instar larvae. The remainder (11%) were in the 2nd and early 3rd instar.

The majority of the larvae were clearly in the second year of a synchronised two year life cycle. While larvae of two-year life cycle grass grub are frequently found in Canterbury in dryland pastures and close to the mountains, these usually complete feeding in spring or early summer. This is the first time in our records that development has been delayed so much as to cause feeding and damage in midsummer. It appears that the occurrence of this phenomenon was due to the peculiar combination of climatic events during 1992 in Canterbury. The summer and autumn were marked by a period of prolonged drought which was not broken until April 1992. Over the period January-April, rainfall at Winchmore Research Station was 30% of average with only 6% of normal monthly rainfall in March. This period of dry weather delayed grass grub development in unirrigated pastures throughout the region. 1992 was also marked by cool temperatures which were 1-2°C below normal for most months of the year at the Winchmore Research Station.

Thus it appears that the combination of drought conditions during the early instars and low soil temperatures delayed the development of larvae such that feeding was still occurring in midsummer. Our records showed that 80% of the grass grub population

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sampled on the farm in the previous November were in the 2nd instar. Further sampling on the farm in February showed a predominance of two-year larvae (77-92%) in three other established pastures. High numbers of feeding two-year larvae were subsequently found in many parts of Canterbury, even in dryland pastures close to the coast.

These observations have implications for grass grub management in Canterbury, especially for the sowing of new crops and pasture renewal. In years where grass grub development is delayed by drought and/or cool conditions sampling should be carried out prior to sowing of spring and summer-sown grasses and crops. Insecticides could be applied with the seed if warranted by numbers and feeding status of the larvae.

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