GRASS GRUB ADULTS DEFOLIATE TAMARILLOS IN NORTHLAND

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SUMMARY

Grass grub (*Costelytra zealandica*) is common on the red and brown loam soils throughout Northland, which are the principal soils suitable for subtropical fruit crops. Grass grub flight activity and leaf damage were monitored at eight commercial tamarillo (*Cyphomandra betacea*) orchards during the spring of 1981. The large adult feeding flights that occurred in some orchards resulted in up to 80% of tamarillo leaves showing chewing damage with an average loss of leaf area of up to 13%. Diazinon sprays applied by the growers did not prevent damage.

INTRODUCTION

Grass grub is commonly considered to be a pest of pasture from the Waikato area southwards. The adult beetles, which are present from October to December, feed on leaves of trees, shrubs, brassicas and pasture plants (East and Kain 1977). This paper describes populations found in Northland and levels of feeding damage on the subtropical fruit crop tamarillo.

MATERIALS AND METHODS

Grass grub larval populations on a red loam soil at Maungatapere, which was potentially suitable for horticultural development were monitored by taking 100 soil cores (100 mm diameter) to a depth of 180 mm at 10 m spaced intervals across a ryegrass (*Lolium perenne*) and a Kikuyu grass (*Pennisetum clandestinum*) dominant paddock. Adult flight activity was recorded at the same site using a light trap. A light trap and collecting pool, similar to that described by Watson (1979) was switched on at sunset by a time switch in the three seasons of 1977 to 1979. In 1980 an automatic light trap (Wrenn 1980) was used which caught approximately 20% of the catch of the pool trap.

All tamarillo sites consisted of 3 to 6 year old commercial plantings of red tamarillos except for Site 3 which was a 3 year old yellow tamarillo orchard. Sites 1 to 3 were near Whangarei on red and brown loam soils with both pastoral and horticultural land in the neighbourhood. Sites 4 to 8 were at Kerikeri on brown loam soils and were completely surrounded by horticultural land, except for Sites 4 and 8, which had some adjacent pastoral land.

The tamarillo orchard blocks at each site were randomly split into two replicates, each comprised a large sprayed and a small unsprayed plot. The unsprayed plot was usually located in a corner of the block and was at least four tree rows wide and twelve trees deep. Leaf damage assessments were taken at random from two trees within each plot so that there was at least one guard tree between plots. Two young leaves (50-100 mm) and two mature leaves (>100 mm) were assessed randomly from within three zones; within the tree canopy North (or East) and South (or West). The percentage of leaf area lost due to chewing insects was visually estimated for each leaf. Growers were asked to follow the MAF recommended export spray programme, which included a three weekly spray application of the insecticide diazinon (50 g/100 litres), and to avoid contamination on unsprayed plots. Male grass grub flight was monitored at each site using two sex attractant traps (Lauren 1979; Henzell *et al* 1979) which were elected and replenished with attractant at fortnightly intervals. Grass grub larval populations from between tamarillo rows were assessed from 50 soil cores at Sites 1, 2, 6 and 7 taken in April 1982.

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Fig. 1: Distribution of red and brown loam soils in Northland.

RESULTS

Grass grub have been observed by the authors to be common on the red and brown loams (volcanic soils derived from basalt flows and scoria) throughout Northland (Fig. 1). The largest areas of these soils occur in the Whangarei and Bay of Islands Counties and, because of their free-draining properties, these are the principal soils suitable for the rapidly developing subtropical fruit industry.

Grass grub larval populations have been monitored for 5 years (Table 1) in an area which is rapidly changing from pastoral to horticultural based enterprises. Pasture damage consisting of characteristically bared out circular patches was visible in the autumn of 1977 and 1978 in ryegrass but not in Kikuyu grass dominant paddocks. No damage was apparent in the following years when numbers were lower. Massive spring flights occurred in 1977 and 1978 and reflected the high populations throughout the Maungatapere area in these years, whereas flight was low in 1979 and 1980. Flights commenced in the middle of October each year and the 50% cumulative catch occurred

TABLE 1: Grass grub larval populations and adult light trap catches from a pastoral location at Maungatapere 1977 to 1981.

Year	Pasture Type	Larvae/m ²		Total	Adult flight		
		Feb-Mar II & III instar	Jul-Aug III instar		First	50% cumulative	Last
77	ryegrass	a	97	25,872	9.10.77	17-22.11.77	17.1.78
	Kikuyu	a	57				
78	ryegrass	83	60	22,484	24.10.78	22-25.11.78	21.12.78
	Kikuyu	116	40				
79	ryegrass	28	3	2,742	25.10.79	15-22.11.79	16.1.80
	Kikuyu	62	3				
80	ryegrass	35	25	4,987 ^b	22.10.80	23.11.80	17.12.80
	Kikuyu	14	4				
81	ryegrass	16	25	a	a	a	a
	Kikuyu	11	4				

a = not assessed   b = automatic light trap

from the 15-25 November. The last flights varied considerably between seasons but were finished by mid-January.

Grass grub adults were the major cause of chewing damage on tamarillos over the November to December period. Beetles feed on foliage at dusk causing damage characterised by chewed leaf margins. No other insect was observed in any numbers on the trees or to cause the levels of damage measured or the characteristic feeding marks. Small numbers of bronze beetle (*Eucolaspis brunnea*) were captured on sticky traps at some sites but their feeding damage was characterised by epidermal marks. The first looper caterpillars, *Chrysodeixis eriosoma*, were not seen until late December and damage was characterised by circular holes.

Foliage damage and male flight activity was monitored at eight commercial tamarillo blocks during the spring of 1980 are shown in Tables 2 and 3. Male trap catches were greatest in November at all sites with fewer beetles caught in December. The highest catches were obtained at the Whangarei sites (1-3) which also had the highest foliage damage in November, with 56-80% of foliage damaged and the average loss of leaf area ranging from 6-13%. The Kerikeri sites (4-8) had lower grass grub catches with 34-60% damage to foliage and average loss of leaf area ranging from 3-13%. The diazinon spray programme as applied by the growers did not significantly reduce damage compared to unsprayed controls although at three sites sprays were not applied until after the major November flight period. Larval populations of 12/m² were found within tamarillo orchards at Sites 1 and 6, no larvae were found at Sites 2 and 7.

TABLE 2: No. of male grass grub caught in attractant traps during Spring 1980 flights at eight tamarillo orchards.

Site	11-26.11.80	26.11-9.12.80	9-23.12.80	23.12.80-6.1.81
1	219	7	5	1
2	389	63	15	1
3	867	154	33	4
4	7	0	1	0
5	39	8	9	0
6	95	15	3	0
7	56	12	1	1
8	0	0	0	0

TABLE 3: Diazinon spray application dates and insect chewing damage to tamarillo foliage expressed as a mean % of foliage damaged and mean % area loss of damaged leaves at assessment one (11.11.80), two (26.11.80), three, (9.12.80) and four (23.12.80).

Sites	Spray dates	Treat	% foliar damage assessment				% loss leaf area assessment			
			1	2	3	4	1	2	3	4
1	2.12	unspr.	69	80	56	56	10	9	6	6
		spray	-	-	58	40	-	-	6	7
2	2.12	unspr.	56	61	27	40	13	6	3	3
		spray	-	-	25	40	-	-	8	3
3	18.12	unspr.	62	66	58	75	7	7	8	8
		spray	-	-	-	63	-	-	-	7
4	11.11	unspr.	37	53	28	27	6	6	4	3
	21.12	spray	-	44	34	35	-	3	4	3
5	14.10									
	6.11	unspr.	35	38	34	31	5	3	2	2
	29.11	spray	44	28	41	31	5	5	2	3
	21.12									
6	29.10	unspr.	36	38	41	22	11	9	4	4
	1.12	spray	63	41	63	44	10	8	3	5
7	14.11	unspr.	-	77	33	44	-	10	8	7
	8.12	spray	-	77	33	44	-	10	8	7
8	21.10	unspr.	53	38	44	28	8	6	4	5
	4.12	spray	41	53	59	38	13	4	5	3

DISCUSSION

Grass grub can occur in sufficiently high numbers in Northland on the red and brown loams to cause pasture damage in some years. East and Kain (1977) stated areas from Waikato southwards are susceptible to attack without commenting on the situation in Northland.

With the rapid horticultural development of these free-draining soils in Northland much of the pasture previously used for dairy production is now coming under orchard management practices such as mowing, irrigation and herbicide application which often lead to a clover dominant sward. Such clover dominant swards would be favourable for the development of grass grub larvae (East and Kain 1977). The 120,000 larvae per ha found in two orchards indicates that large numbers of adults can originate from within the orchard in addition to those originating from neighbouring farm land. In areas such as central Kerikeri most of the adult beetles must originate from within the orchards as farm land is several kilometers away.

Grass grub adults have not been previously recorded as a pest of tamarillos (Fletcher 1975). Many growers have mistaken chewing damage in spring for looper caterpillar attack.

The level of grass grub damage in November and early December varied considerably between tamarillo blocks ranging from 28 to 80% of the leaves damaged. The loss of leaf area was relatively small but at the high levels of attack gave the trees a tattered appearance. In some tamarillo orchards (Sites 1, 2 and 6) sufficient grass grub damage occurred to check the new spring growth following the winter pruning, whereas in other orchards there was only minor damage. The chewed areas on the leaves are ideal sites for the entry of the tamarillo leaf spot fungus (*Phoma exigua*) which if unchecked can cause large brown lesions across the leaf. This fungal disease is particularly troublesome in spring.

In Northland, other fruit crops such as peach, plum and grapefruit can also be eaten by grass grub adults in spring. However, because of the high proportion of mature leaves damage may only be of minor importance unless severe defoliation occurs such as may happen on young trees. Grass grub can severely damage grafted kiwifruit and avocado seedlings because of the limited number of buds available on the scion for the production of new shoots.

The insecticide sprays applied by growers did not prevent grass grub damage. This could be because the timing of application is crucial and/or reinvasion occurred and/or diazinon was ineffective. There may be a need to develop a spray programme to reduce damage on horticultural crops susceptible to grass grub attack. The new pyrethroid insecticides which have a rapid knockdown and repellent properties may be useful for this purpose. Grass grub flights commence in late October to early November in Northland and susceptible crops such as tamarillos can be easily monitored to determine if sprays are necessary.

CONCLUSIONS

This study draws attention to the presence of grass grub in the major soils suitable for horticulture in Northland. Adults were responsible for leaf damage to tamarillos and other subtropical crops in spring. This defoliation appears to be a minor problem, but could potentially be of local importance in the absence of effective spray programmes.

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