BLUE-GREEN LUCERNE APHID DAMAGE IN LUCERNE CROPS WITHIN SOUTHERN NORTH ISLAND

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Summary

Losses in lucerne *(Medicago sativa)* production from blue-green lucerne aphid *(Acyrthosiphon kondoi)* damage in early autumn, in the absence of further aphid infestations, reduced autumn, winter and spring growth by 72%, 47% and 27% respectively. At another site insecticide control of aphids in mid autumn gave significant increases in lucerne production in autumn of 30% and in winter of 12%. Mid winter control of aphids gave significant increases in production of 10% in winter and 20% in spring. Significant linear and reciprocal relationships were found to exist between lucerne production and aphid 'trigger levels' for insecticide application and aphid days respectively.

INTRODUCTION

The symptoms and severity of blue-green lucerne aphid (BGLA) damage in lucerne crops in the southern North Island has been described by Kain *et al* (1976). This paper reports on studies designed to define the relationship between BGLA levels and losses in lucerne production and investigate the effects of aphid damage on lucerne production in order that more objective decisions on aphid control may be made.

METHOD

Trial design

The effects of lucerne damage on herbage productivity were studied at Woodville and Dannevirke. The design of the Woodville trial has been described in detail elsewhere (Kain *et al* 1976) and consisted of six plots (4 x 12 m) each sited randomly across sprayed (dictrotophos 0.25 kg/ha autumn 1976) and unsprayed strips of lucerne so as to provide treated and untreated subplots. Fourteen days later the complete paddock was resprayed and thereafter plots were sprayed to prevent aphids building up so that the carry over effect of autumn aphid damage was not confounded by subsequent aphid infestations. The other trial, at Dannevirke, was of a randomised block design with treatments arranged in a factorial manner. Plots were 6 x 10 m and the four treatments, spraying in mid autumn, mid winter, mid spring and an unsprayed control were replicated five times.

A further trial at Tahoraiti near Dannevirke initiated to study the relationship between aphid numbers and loss of lucerne production was a 20 x 2 x 5 factorial splot plot randomised block design with ten treatments and five replicates. Main treatments were, spraying when aphid levels reached, 5, 10, 15, 20, 25, 30, 40, 60 and 80 aphids per stem and an unsprayed control. Indications from earlier observations were that stage of regrowth has a bearing not only on the suitability of the plant to aphid infestation but also its tolerance to aphid damage. In view of this plots (6 x 11 m) were split longitudinally into two subplots. One subplot was cut at the early regrowth stage of lucerne in the spring and the other at basal bud movement. Thereafter subplots were harvested at basal bud movement. By this means two different stages of lucerne regrowth were present at any one time and harvest times were staggered. Each subplot was sprayed when its required aphid level ('Trigger level') was reached. This trial was run from early November to late January.

MEASUREMENTS

Aphid numbers were usually assessed weekly by harvesting 10 stems at ground level from each subplot. Stems were bulked prior to processing. Aphids were washed off foliage with hot water and counted with a Lowe and Dromgoole (1958) aphid counter.

Subplots were harvested with a sickle-bar mower and herbage was weighed and subsampled for dry matter analyses. Times at which, lucerne was harvested, aphid numbers assessed, and insecticide applications made are given in the appropriate figures or tables. With the exception of the first spray at Woodville 0.25 kg/ha of chlorpyrifos in 200 litres of water were used in all trials described.

RESULTS

Dry matter production and aphid numbers on the treatments in the Woodville trial are presented in Table 1 and for the Dannevirke trial in Fig. 1 and Table 2. Results from the Tahoraiti trial are given in Fig. 2 and aphid numbers in the control treatments over the time the study was conducted in Fig. 1. The relationships in Fig. 2 are based on treatment means and as aphid levels did not exceed 50 aphids per stem, all treatments of 40 aphids/stem and above were pooled. Usually subplots of each harvest time in each treatment were sprayed together as growth in aphid populations at each harvest time was similar. As a result the number of sprayings treatments received fell off as 'trigger levels' rose. Most subplots in the 5 aphid per stem treatment were sprayed four times over the duration of the trial. The relationship between aphid days (number of aphids x days between sampling) and lucerne production was examined for one harvest time by pooling subplots with similar aphid days into groups of five. This is shown in Fig. 3 together with relationship between 'trigger levels' and aphid days.

TABLE 1: Seasonal herbage production of lucerne (DM/kg/ha), damaged and undamaged by BGLA in autumn and aphid numbers at Woodville.

Season	Damaged		Undamaged		LSD (0.05)	% loss
	Aphid No./stem	kg/ha	Aphid No./stem	kg/ha		
Autumn	0.5	294	1.5	1036	158	72
Winter	4.5	743	6.0	1415	405	47
Spring	0	2501	0	3410	797	27

TABLE 2: Seasonal production of lucerne, (DM/kg/ha) sprayed with insecticide at different times for BGLA control.

TREATMENTS	Autumn	Winter	Spring	Summer	Total
Mid autumn and mid winter, early spring		2163	3572	3243	10069
Mid autumn and mid winter	1091		3727	3494	10475
Mid autumn		2093	3324	3144	9652
Mid winter	930	2084	3606	3209	9829
Control (unsprayed)	762	1882	2901	3263	8808
LDS (0.05)	294	195	571	602	812

Spray times: April 22nd; July 17th; October 18th

Production periods
Autumn : March 30th – May 31st
Winter May 31st – Sept. 22nd
Spring : Sept. 22nd – Nov. 9th
Summer : Nov. 9th – Jan. 17th

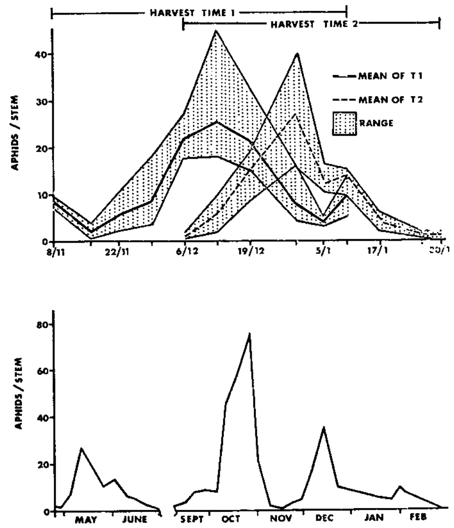

Fig.1 Above Mean and range of BGLA No./stem in control plots at Tahoraiti harvested at different times.

Below Mean BGLA No./stem in control plots at Dannevirke.

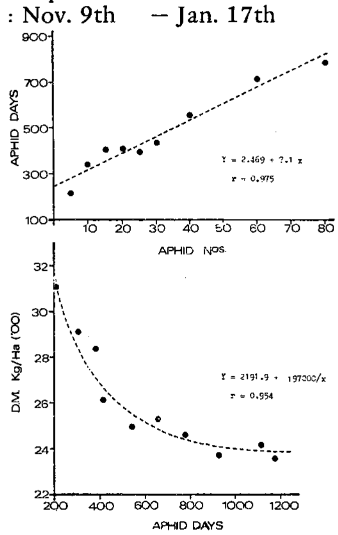

Fig. 3 Above Relationship between aphid days and BGLA 'trigger levels' for insecticide application.

Below Relationship between aphid days and lucerne production.

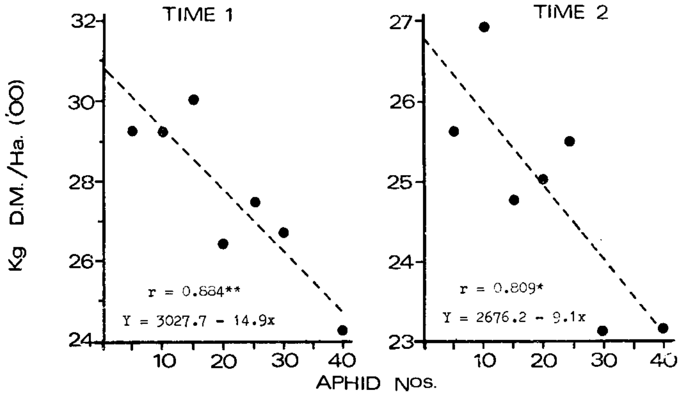

Fig. 2 Relationship between BGLA 'trigger levels' for insecticide application and lucerne production recorded from subplots with staggered harvest times.

DISCUSSION

Counts and observations on all trials showed that insecticidal control was better than 99% and aphid numbers in sprayed plots in autumn and winter did not reach high levels until flight began in spring. Reinfestation in mid to late spring, 14 days after spraying, was usually rapid but at Dannevirke aphid levels fell off abruptly in all plots, in early spring and did not rise again until December.

Aphid damage in early autumn at Woodville affected not only autumn production but carried over into both winter and spring production (Table 1). Losses in lucerne production recorded at Woodville were about 72%, 47% and 27% for autumn, winter and spring respectively. As well as losses in production a 15% loss in plant density was recorded in late autumn (Kain *et al* 1976). These results emphasis the importance of controlling aphid populations in autumn to prevent losses in production in subsequent seasons. Production of lucerne sprayed in different seasons and combinations of seasons at Dannevirke in comparison with untreated lucerne gave significant increases in production in autumn from mid autumn spraying which carried over into winter production and in winter from mid winter spraying which carried over into spring (Table 2). Spraying in mid autumn and again in winter gave significant increases in production in autumn, winter and spring of about 40%,14% and 22% respectively. It is interesting to note that, spring spraying of plots sprayed in autumn and again in winter did not significantly increase spring production compared with plots sprayed both in autumn and winter and recovery of damaged lucerne was rapid in summer. At Tahoraiti, where the relationship of aphid 'trigger levels' and lucerne production was under study, damage carried through into early summer. The relationship between aphid 'trigger levels' for spraying and lucerne production over the range of aphid levels studied for both harvest times was shown to have a significantly linear component (Fig. 2). However, whether similar relationships can be expected from aphid populations or lucerne in other areas or seasons where growth patterns of both the insect and plant differ, requires further examination. Aphid levels encountered in these trials (Fig. 1) in the untreated plots were fairly low compared with those commonly encountered in spring and autumn in the southern North Island. The closeness of the reciprocal relationship between aphid days and lucerne production suggests that not only aphid levels but the time these are sustained have a pronounced effect on aphid damage. This may explain the reason for severe aphid damage in lucerne crops which are reputed to have had low aphid levels. These studies suggest that sustained aphid levels of above 5 per stem in spring and autumn require spraying if damage is to be avoided.

In view of these studies it seems important to control aphids in autumn until flight stops in about mid May so that lucerne does not suffer autumn damage, the effects of which may severely reduce production not only in autumn but also in winter and spring. Lucerne entering the winter aphid free, will not be reinfested until flight begins in late September to early October, when aphid control may be necessary. These trials and field observations suggest that lucerne suffering aphid damage in spring recovers rapidly in summer and hence aphid infestations in this period are not as critical as those in early autumn.

REFERENCES

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