QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES
DIVISION OF PLANT INDUSTRY BULLETIN No. 728

THE ECONOMIC STATUS OF LUCERNE JASSIDS (AUSTROASCA spp.) IN SOUTH-EASTERN QUEENSLAND

by G. K. WAITE, M.Agr.Sc.

SUMMARY

The economic status of *Austroasca alfalfae* (Evans) and *A. viridigrisea* (Paoli) in lucerne was investigated in nine field trials conducted in the summer-autumn periods of 1972 and 1973. Low to average populations of both species caused no reduction in yield or quality of irrigated crops. Unusually high populations of *A. alfalfae* were observed to reduce yield and quality.

Control sprays directed specifically at jassids could be justified only when high populations of the insects occurred, coupled with the onset of severe damage. Regular control sprays are not justified because of the confusion of growers about the occurrence of moderate jassid numbers concurrent with common leaf-spot symptoms.

I. INTRODUCTION

Jassids have been regarded as pests of lucerne *Medicago sativa* for many years (Evans 1940; Hooper 1958, 1959), and commercial spraying against these insects in south-east Queensland is commonly practised. However, limited experimental data (Hooper 1959) and field observations appeared to indicate that economic damage occurred only when unusually large populations infested a crop. It was considered therefore that, under normal conditions of crop growth and average jassid populations, some reduction in pesticide usage might be possible. This would have the benefits of reducing residues in lucerne hay as well as reducing production costs.

In North America, the potato leaf-hopper *Empoasca fabae* (Harris), regularly causes damage to lucerne. Symptoms of attack are leaf-yellowing and wilting accompanied by red and purple colorations which are similar to those caused by boron deficiency (Poos 1942). These symptoms have only occasionally been observed in south-east Queensland and were associated with heavy infestations of *Austroasca alfalfae* (Evans).

The present study was conducted at Grantham and Lawes in the Lockyer Valley during the summer-autumn periods of 1972 and 1973. Fields of lucerne in excess of 5 ha and carrying natural jassid populations were employed in preference to the technique of Kouskolekas and Decker (1968) who caged known numbers of leaf-hoppers on small areas. Cages utilizing mesh fine enough to confine jassids affect the environment of both insects and plants so that normal behaviour may be affected (Woodford, 1973) and thus direct extrapolation of results obtained under such conditions to field situations is not possible.

II. METHODS

Nine trials utilizing insecticidal control were carried out on uniform, weed-free, irrigated lucerne crops. Trials 1 to 3 were laid out in a 10 x 4 randomized block design with plots measuring 12 m x 12 m. The following treatments, determined on the basis of recommendations made by Passlow and Waite (1969), were applied—

(a) dimethoate at 70, 140 and 280 g a.i. ha^{-1} applied 7 days after cutting
(b) dimethoate at 70, 140 and 280 g a.i. ha^{-1} applied 16 days after cutting
(c) dimethoate at 140 g a.i. ha^{-1} applied at 7 and 16 days after cutting
(d) no treatment.

Insecticide was applied through a 3·6 m wide boom mounted on a Howard 2000 garden tractor. This spray system delivered 335 litres ha^{-1} at 480 kPa from 14 fan-jet nozzles.

Three yield samples each consisting of a strip 10 m long and 0·5 m wide were cut through the middle of each plot. The green weight of the samples was recorded and subsamples of approximately 1 kg each were taken, weighed and dried in a forced-draught oven at 60°C for 48 hours. Oven-dry weights were recorded and further subsamples extracted and ground. Nitrogen determinations were carried out on the ground samples using the Kjeldahl method.

In trials 4 to 9, half of the plots were treated with dimethoate at 140 g a.i. ha^{-1} to suppress populations while the remaining plots were not treated. The plot size was increased to 15·5 m x 15·5 m to minimize reinfestation of treated plots and the area harvested for yield assessment was increased to 50 m^2 from two strips each 10 m x 2·5 m cut through the middle of each plot.

Populations were sampled before each treatment was applied and before harvest from two, 12 m lengths of lucerne (each equivalent to 2.5 m^2) using a mechanical suction unit.

Analysis of variance was carried out on yield and nitrogen data.

III. RESULTS

(a) Mean dry weights of samples and mean nitrogen levels are given in tables 1 to 4 for trials 2, 5, 7 and 8. Data for the remaining five trials show similar trends.

(b) Additional observations were made on two occasions when jassid numbers reached extremely high levels.

In one instance, in a section of crop adjacent to trial 8, datum area populations six times greater (3 820 per 12 m) than in unsprayed trial plots were recorded. Where this high population existed, stand height was reduced to

15 cm compared with 38 cm for trial datum unsprayed plots and the yield and nitrogen levels given in table 5 were recorded. Affected plants were chlorotic and wilted and some red and purple coloration of the foliage was evident. *A. alfalfae* accounted for 99% of the jassids, the remaining 1% being *A. viridigrisea.*

TABLE 1

MEAN DRY WEIGHT, PERCENTAGE NITROGEN AND PRE-TREATMENT AND PRE-HARVEST JASSID NUMBERS TRIAL 2

Treatment active constituent of dimethoate per ha	Mean dry weight yield per plot (kg)	Mean %N	Mean number of jassids per 12 m			
			Pre-treatment		Pre-harvest dates	
			Adults	Nymphs	Adults	Numphs
70 g (1)*	1·409	2·533	68·0	0	23·4	8·2
70 g (2)†	1·588	2·643	72·6	0	16·4	2·5
140 g (1)	1·594	2·555	45·0	0	34·2	8·5
140 g (2)	1·572	2·588	49·4	0	17·0	2·5
280 g (1)	1·694	2·648	56·0	0	28·5	1·5
280 g (2)	1·615	2·595	55·0	0	17·2	1·2
140 g (1 and 2)	1·475	2·503	108·0	0	14·5	1·5
No treatment	1·555	2·483	65·0	0	38·6	31·4
Necessary differences for significance {5% / 1%	0·280 0·379	0·319 0·432				

(1)* = 7 days after harvest.
(2)† = 16 days after harvest.

TABLE 2

MEAN DRY WEIGHT, PERCENTAGE NITROGEN AND PRE-TREATMENT AND PRE-HARVEST JASSID NUMBERS TRIAL 5

Treatment	Mean dry weight yield per plot (kg)	Mean %N	Mean number of jassids per 12 m			
			Pre-treatment		Pre-harvest	
			Adults	Nymphs	Adults	Nymphs
Jassids controlled ..	13·450	3·227	63·0	13·0	7·7	0·8
Jassids not controlled ..	13·358	3·232	69·0	13·0	30·2	15·0
Necessary differences for significance {5% / 1%	1·352 1·944	0·197 0·283				

TABLE 3

MEAN DRY WEIGHT, PERCENTAGE NITROGEN AND PRE-TREATMENT AND PRE-HARVEST JASSID NUMBERS TRIAL 7

Treatment	Mean dry weight yield per plot (kg)	Mean %N	Mean number of jassids per 12 m			
			Pre-treatment		Pre-harvest	
			Adults	Nymphs	Adults	Nymphs
Jassids controlled ..	13·93	2·81	57·3	6·0	19·2	23·8
Jassids not controlled ..	13·77	2·77	54·5	6·0	170·1	87·8
Necessary differences for significance 5% / 1%	0·764 1·098	0·178 0·294				

TABLE 4

MEAN DRY WEIGHT, PERCENTAGE NITROGEN AND PRE-TREATMENT AND PRE-HARVEST JASSID NUMBERS TRIAL 8

Treatment	Mean dry weight yield per plot (kg)	Mean %N	Mean number of jassids per 12 m			
			Pre-treatment		Pre-harvest	
			Adults	Nymphs	Adults	Nymphs
Jassids controlled ..	8·300	3·18	307·0	5·2	18·0	0
Jassids not controlled ..	8·514	3·25	284·4	5·2	188·0	440·0
Necessary differences for significance 5% / 1%	0·951 1·367	0·104 0·172				

TABLE 5

COMPARISON OF MEAN DRY WEIGHT YIELD, MEAN NITROGEN PERCENTAGE AND PRE-HARVEST JASSID NUMBERS IN TRIAL 8 AND AN ADJACENT STUNTED AREA OF THE SAME CROP

—	Mean dry weight yield (kg)	Mean % nitrogen	Pre-harvest jassid numbers per 12 m		
			Adults	Nymphs	Total
Treated	8·51	3·20	18·0	0	18
Untreated	8·30	3·25	188·0	440·0	628
Stunted lucerne	6·01	2·33	2 100·0	1 720·0	3 820

IV. DISCUSSION

In the first three trials, jassid populations were low. A lack of response to treatments was attributed to initially overall low populations in the locality believed to be due to extensive use of pesticides against outbreaks of the lucerne leaf-roller (*Merophyas divulsana* (Walker)). In the remaining six trials, half the plots were treated only when it was necessary to maintain low or zero populations. In the untreated plots, jassid populations varied from low to moderate, but ranged over levels at which growers would normally apply control measures. Yields as mean dry weight and mean nitrogen percentage did not differ significantly between treated and untreated plots ($P=0 \cdot 05$). Associated pretreatment and preharvest jassid population samples show that moderate levels were reached only in trial 8. Both *A. alfalfae* and *A. viridigrisea* were present.

At population levels such as developed adjacent to trial 8, where 3 820 *A. alfalfae* per 12 m were present, control measures to prevent loss in yield and nutrient content would be justified. However, it has been shown that such populations are unusual, an average peak figure being 150 to 200 per 12 m (Waite, 1974). Losses in yield and quality were not apparent at this population level in trial 8, an infestation level at and below which commercial growers apply control. The data indicate that such measures are unnecessary.

Provided populations are sufficiently high, *A. alfalfae* alone appears to be responsible for leaves turning yellow. *A. viridigrisea* feeds on the mesophyll tissue and large numbers cause extensive white stippling of the leaves, generally without the complete chlorosis associated with the feeding of *A. alfalfae,* thought to be from the conductive tissue (Waite, 1974). A high population of *A. alfalfae* then, provides greater cause for concern than a comparable population of *A. viridigrisea.*

It may be relevant that the total number of both species and of *A. alfalfae* in particular, reach a peak in the cooler autumn months when the fungus *Pseudopeziza medicaginis* (Lib.) Sacc. which causes common leaf spot in lucerne, is also prevalent (Purss, 1965). Diseased leaves turn yellow and fall and lower leaves are the first to be infected and display symptoms, a sequence of events usually attributed to jassid attack (Hooper, 1958). Lucerne growing slowly under poor conditions tends to be more severely affected by the disease than crops growing under ideal conditions (Purss, 1965). Proper crop management with respect to watering and harvest schedules will assist in the maintenance of a vigorous stand in which jassid control is rarely warranted.

The conclusion reached from this study is that jassids do not constitute a problem in every summer-autumn crop nor to the extent formerly believed. *A. alfalfae* is more likely to cause losses than *A. viridigrisea* which was not observed to reach the same population levels nor to cause the same type of damage. Commercially, extensive control measures have been initiated during the cooler months following observations of moderate jassid numbers associated with leaf-yellowing caused by common leaf-spot.

Specific jassid control should be considered only when the damage previously described results from high populations of jassids, in particular of *A. alfalfae.*

REFERENCES

EVANS, J. W. (1940).—Some Queensland leaf-hoppers (Jassoidea:Homoptera) that attack lucerne. *Proc. R. Soc. Qd* 52:10-13.

HOOPER, G. H. S. (1958).—Lucerne pests and their control. *Qd agric. J.* 84:595-7.

HOOPER, G. H. S. (1959).—Studies of seasonal variations in populations of some insect pests of lucerne, and on aspects of their control. (M.Sc. degree thesis: Univ. Qd.)

KOUSKOLEKAS, C. and DECKER, G. C. (1968).—A quantitative evaluation of factors affecting alfalfa yield reduction caused by the potato leaf-hopper attack. *J. econ. Ent.* 61:921-7.

PASSLOW, T., and WAITE, G. K. (1969).—Control of lucerne pests on dairy farms. *Qd agric. J.* 95:843-5.

POOS, F. W. (1942).—The potato leaf-hopper—A pest of alfalfa in the eastern States. *U.S. Dep. Agric. Leaflet No.* 229.

POOS, F. W., and WHEELER, NANCY H. (1943).—Studies on host plants of the leaf-hoppers of the genus *Empoasca. U.S. Dep. Agric. Tech. Bull. No.* 850.

PURSS, G. S. (1965).—Diseases of lucerne. *Qd agric. J.* 91:196-206.

WAITE, G. K. (1974).—Seasonal history and pest status of lucerne jassids in south-east Queensland. (M.Agr.Sc. degree thesis: Univ. Qd.)

WOODFORD, J. A. T. (1973).—The climate within a large aphid-proof field cage. *Entomologia exp. appl.* 16:313-21.

(Received for publication 12 September 1975)

The author is an officer of Entomology Branch and is stationed at Emerald.