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PEST STATUS OF AUSTROASCA VIRIDIGRISEA (PAOLI) (CICADELLIDAE) ON LUCERNE IN CENTRAL QUEENSLAND

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SUMMARY

The pest status of *Austroasca viridigrisea* (Paoli) in irrigated lucerne was investigated in two field cage experiments during summer. Different population densities of *A. viridigrisea* were maintained on the lucerne during one plant production cycle.

Dry matter production and stalk length but not leaf nitrogen were significantly reduced at adult densities greater than 650 per m^2. Maximum reductions in dry matter production were 19% with 1 300 adults per m^2 in one experiment and 8% with 2 600 in the other. Leaf stippling was the only visible symptom. Possible alternative causes of leaf yellowing, leaf fall and major loss of plant vigour commonly attributed in error to *A. viridigrisea* are briefly discussed.

Damaging densities are unusual in the field and the species rarely warrants specific control measures. *A. viridigrisea* is not a serious pest of lucerne.

I. INTRODUCTION

The vegetable jassid *Austroasca viridigrisea* (Paoli) and the lucerne jassid *Austroasca alfalfae* (Evans) are the most abundant species of cicadellids on lucerne in Queensland.

In the limited number of experiments reported to date, populations have been markedly reduced by the application of insecticides but the population reductions have not been accompanied by increases in yield or quality (Hooper 1959, Waite 1973). Despite this, some industry practice has involved the application of insecticides for control of these species.

In trials reported in this paper, the pest status of *A. viridigrisea* was further investigated by caging populations of known size on irrigated lucerne.

II. MATERIALS AND METHODS

Experiments

Adult insects at different population densities were caged over field grown lucerne during one plant production cycle. Experiment 1 was carried out as a 10 × 3 randomized block with five densities of adults applied at each of two times, immediately after cutting and one week after cutting. Insects were added on 21 November 1970, replaced on 2 December and 10 December and the lucerne

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TABLE 1

POPULATIONS OF *A. viridigrisea* (MEAN NUMBER PER m^2 ± SD) RECOVERED BY ASPIRATION FROM LUCERNE UNDER CAGES ONE WEEK AFTER INTRODUCTION OF ADULTS—EXPERIMENT 1

No. Introduced (m^{-2})	Time of Introduction	Nymphs			Adults		
		Week 1	Week 2	Week 3	Week 1	Week 2	Week 3
0		..	..	8	..	..	11
0*		..	..	0·8	..	..	3
162	At cutting	0·8	5·4	38 ± 35	46 ± 16	43 ± 8	97 ± 16
162	One week later	..	0·0	16 ± 14	..	78 ± 5	111 ± 5
325	At cutting	0	24 ± 27	176 ± 181	165 ± 16	162 ± 35	192 ± 65
325	One week later	..	2·7	5·4	..	122 ± 22	241 ± 76
650	At cutting	0·8	149 ± 130	370 ± 249	287 ± 49	324 ± 141	433 ± 157
650	One week later	..	2·7	32 ± 8	..	192 ± 16	422 ± 205
1 300	At cutting	0·8	189 ± 124	443 ± 70	624 ± 84	611 ± 130	787 ± 165
1 300	One week later	..	8·0	78 ± 51	..	557 ± 227	889 ± 51

* Dimethoate at 0·05% applied at commencement of experiment.

TABLE 2

POPULATIONS OF *A. viridigrisea* (MEAN NUMBER PER m^2 ± S.D.) RECOVERED BY ASPIRATION FROM LUCERNE UNDER CAGES ONE WEEK AFTER INTRODUCTION OF ADULTS—EXPERIMENT 2

No. Introduced (m^{-2})	Time of Introduction	Nymphs				Adults			
		Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4
0	At cutting ..	0·0	11 ± 11	27 ± 11	19 ± 22	3	5	8	16
162	At cutting ..	1·4	130 ± 95	438 ± 165	608 ± 222	97 ± 208	49 ± 27	65 ± 22	208 ± 65
325	At cutting ..	4·6	389 ± 295	843 ± 332	657 ± 327	181 ± 49	114 ± 78	214 ± 30	506 ± 151
650	At cutting ..	1·4	708 ± 319	1 330 ± 178	1 400 ± 365	335 ± 62	238 ± 141	470 ± 86	768 ± 86
1 300	At cutting ..	1·4	1 203 ± 705	2 184 ± 503	2 673 ± 565	689 ± 122	587 ± 262	965 ± 173	1 195 ± 107
2 600	At cutting ..	2·7	2 060 ± 830	2 884 ± 441	2 208 ± 627	1 187 ± 254	887 ± 362	1 570 ± 384	1 584 ± 335

harvested on 16 December 1970. Experiment 2 compared six densities of adults applied immediately after cutting in a 6 × 6 latin square design. Insects were added on 21 January 1972, replaced on 21-22 January, 28-29 January and 4-5 February and the lucerne harvested on 19 February 1972.

Lucerne

Both experiments were carried out using well grown stands of irrigated lucerne of the Hunter River variety on a sandy clay loam soil at Biloela in Central Queensland. Experiment 1 was located on a two-year-old stand cut on 21 November 1970, forage harvested on 23 November, then trimmed with hand shears to a height of 76 mm. Experiment 2 was located on a seven-month-old stand cut on 12 January 1972 and forage harvested on 20 January 1972 so that the lucerne was approximately 90 mm high. The lucerne was aspirated immediately prior to placement of cages to remove naturally occurring insects.

Cages

Cages were 610 mm square and 200 mm high with a wooden framework. The sides were of fine brass gauze (0·25 mm diameter wire, 0·60 mm interspace), and the top of clear polyethylene plastic 0·02 mm thick (experiment 1) or fine terylene material (experiment 2). At the base of the cage a 150-mm-wide apron of clear polyethylene plastic was attached to the framework and sealed with soil.

Test insects

Mixed populations of nymphs and adults were aspirated from lucerne in the field using a "D vac" vacuum unit. In the laboratory, required numbers were held temporarily on lucerne foliage before being introduced to the field cages. For experiment 1 this was accomplished by transfer to the lucerne foliage with a fine camel-hair brush following anaesthesia with carbon dioxide. In experiment 2 the process was expedited by releasing the field collected insects in an insect proof room and counting the required numbers during aspiration from a window.

Subsequently all test insects were anaesthetized briefly (40 s) and transferred to the field cages. Parent insects and developing progeny were aspirated from the cages weekly and replaced with the initial numbers of field collected adults. Details of the number of adults applied and the numbers of nymphs and adults subsequently recovered are given in tables 1 and 2.

Damage assessment

The degree of stippling and yellowing of the leaves for each treatment was assessed visually at harvest. Plots were harvested with hand shears by cutting the lucerne 76 mm above the ground. Numbers of stalks per plot and the length of each stalk were recorded. Dry weight per plot was measured following oven drying for twenty-four hours at 88·9°C. Percentage nitrogen was determined using the Kjeldahl method.

III. RESULTS

Visible leaf damage

Some degree of leaf stippling was visible in all plots. Stippling was negligible in plots without added insects. It affected 30 to 50% of the leaf area in plots with 650 adults per m^2 (experiment 1), 70 to 90% with 1 300 per m^2 (experiments 1 and 2) and more than 90% with 2 600 per m^2 (experiment 2).

Yellowing of leaves and leaf fall were negligible in all plots.

TABLE 3

EFFECT OF DIFFERENT NUMBERS OF *A. viridigrisea* CAGED OVER LUCERNE THROUGHOUT ONE PLANT PRODUCTION CYCLE—EXPERIMENT 1, 1970

No. of *A. viridigrisea* (m^{-2})	Time of Introduction	Yield (gm^{-2})	Nitrogen (%)	Number of Stalks (m^{-2})	Stalk Length (mm)
0	At cutting	240·6	4·25	624	431·0
0*	At cutting	235·7	3·97	565	451·3
162	At cutting	250·8	4·11	611	442·0
162	One week later	241·9	4·17	565	444·5
325	At cutting	257·6	4·28	627	431·0
325	One week later	210 8	4·33	605	377·9
650	At cutting	204·6	4·62	581	378·5
650	One week later	231·7	4·33	584	418·3
1 300	At cutting	196·0	3 99	565	361·4
1 300	One week later	220·8	4·23	608	386·1
Necessary differences for significance P < 0·05		45·1	0·17	81	56·6

* Dimethoate at 0·05% applied at commencement of experiment.

TABLE 4

EFFECT OF DIFFERENT NUMBERS OF *A. virdigrisea* CAGED OVER LUCERNE THROUGHOUT ONE PLANT PRODUCTION CYCLE—EXPERIMENT 2, 1972

No. of *A. viridigrisea* (m^{-2})	Time of Introduction	Yield (gm^{-2})	Nitrogen (%)	Number of Stalks (m^{-2})	Stalk Length (mm)
0	At cutting	177·2	3·54	705	362·3
162	At cutting	174·2	3·45	716	345·2
325	At cutting	174·2	3·42	654	350·5
650	At cutting	168·6	3·42	641	332·5
1 300	At cutting	168·1	3·47	670	312·8
2 600	At cutting	163·2	3·36	651	293·0
Necessary difference for significance P < 0·05		11·9	0·215	N.S.	56·6

Dry matter yield

Data on dry matter yields are included in tables 3 and 4. Analyses of variance established that there were no significant differences due to adults applied a week after cutting irrespective of infestation levels (table 3). In both experiments there were significant yield reductions with adult densities equal to or greater than 650 per m^2, applied immediately after cutting. The reduction in yield varied between experiments. There was a 19% reduction in dry weight with a density of 1 300 adults per m^2 in experiment 1 but only an 8% reduction with 2 600 adults per m^2 in experiment 2.

Nitrogen content

Data on nitrogen content are given in tables 3 and 4. There was a significant increase in nitrogen content with 650 adults per m^2 applied immediately after cutting in experiment 1 but no other differences were found.

Number of stalks and stalk length

There were no significant differences in numbers of stalks in either experiment. In both experiments adult densities equal to or greater than 650 per m^2 applied immediately after cutting significantly reduced stalk length.

IV. DISCUSSION AND CONCLUSIONS

A. viridigrisea is not a major pest of lucerne.

The densities of *A. viridigrisea* shown to cause significant yield reductions in these experiments, i.e. those greater than 650 per m^2, were greater than those which typically occur in the field. In Central Queensland the maximum density tested (2 600 per m^2) was recorded only once during sampling at two sites over a three-year period (Page 1978). In Southern Queensland the maximum density reported was 360 per m^2 (Waite 1973).

The caging technique used here ensured the presence of relatively constant numbers of adults and was superior in this regard to the comparison of yields from insecticide treated and untreated plots (Waite 1973). Caging had the disadvantage of modifying the environment and especially the growth of the lucerne. Despite these limitations the technique was adequate to establish the major results. Both techniques have generally been implemented only in short term experiments.

Populations of *A. viridigrisea* in lucerne are sometimes controlled in the belief that the species is responsible for leaf yellowing, leaf fall and serious loss of plant vigour. The data show that the species causes leaf stippling and a modest reduction in yield. It does not cause yellowing, leaf fall or reduction in leaf nitrogen. This is consistent with its habit of feeding on mesophyll tissues (Waite 1973).

It is probably significant that the more serious symptoms can result from other factors which are associated with lucerne at the same time *A. viridigrisea* is present and conspicuous. The related species *A. alfalfae* (Evans) causes leaf yellowing and is generally more destructive since it feeds on conductive tissues (Waite 1973). Lucerne rust *Uromyces striatus* Schroet, *Pseudopeziza medicaginis* Lib and root rot *Phytopthora megasperma* Dreschler var *sojae* Hilderbrand all cause leaf yellowing (Purss 1965, Hanson 1972, Irwin 1974). High temperatures, frequent harvests and boron deficiency may reduce plant vigour (Hanson 1972, Waite 1973).

The economics of control measures to be applied against *A. viridigrisea* must be considered in relationship to the necessity to control other members of the lucerne pest complex. Currently an insecticide such as dimethoate may be required to control spotted alfalfa aphid *Therioaphis maculata* form *maculata* (Buckton) and will simultaneously control *A. viridigrisea* (Waite 1976). Control measures aimed specifically at control of *A. viridigrisea,* are warranted only on the rare occasions that high populations, i.e. greater than 650 adults per m^2, are present soon after cutting.

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REFERENCES

HANSON, C. H. (1972).—'Alfalfa Science and Technology', Madison, Wisconsin, USA, American Society of Agronomy, Inc.

HOOPER, G. H. S. (1959).—Studies of seasonal variations in populations of some insect pests of lucerne, and some aspects of their control. M.Sc. thesis, University of Queensland.

IRWIN, J. A. G. (1974).—Reaction of lucerne cultivars to *Phytophthora megasperma,* the cause of a root rot in Queensland. *Australian Journal of Experimental Agriculture and Animal Husbandry* 14:561-565.

PAGE, F. D. (1978).—The bionomics and pest status of *Austroasca viridigrisea* (Paoli). M.Agr.Sc. thesis, University of Queensland.

PURSS, G. S. (1965).—Diseases of lucerne. *Queensland Agricultural Journal* 91:196-206.

WAITE, G. K. (1973).—Seasonal history and pest status of lucerne jassids in south-east Queensland. M.Agr.Sc. thesis, University of Queensland.

WAITE, G. K. (1976).—The economic status of lucerne jassids (*Austroasca* sp.) in south-eastern Queensland. *Queensland Journal of Agricultural and Animal Sciences* 33:67-72.

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