QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES
DIVISION OF PLANT INDUSTRY BULLETIN No. 726

EFFECT OF VARIOUS TEMPERATURES ON DEVELOPMENT OF THE LUCERNE JASSID AUSTROASCA ALFALFAE (EVANS) (HOMOPTERA: CICADELLIDAE) WITH REFERENCE TO POPULATION LEVELS IN LUCERNE

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

SUMMARY

The development of eggs and nymphs of *Austroasca alfalfae* was studied in the laboratory at various temperatures ranging from 15°C to 30°C. The maximum rate of development occurred at 30°C with mean periods of 3 days for eggs and 8·5 days for nymphs. Development at 24°C and 27°C was slightly slower than at 30°C while at 15°C, 18°C and 21°C development was prolonged. Survival of nymphs at 15°C was low. Seasonal variations in the number of *Austroasca alfalfae* occurring in the field are discussed on the basis of these results.

I. INTRODUCTION

Field studies (Hooper 1959, Waite 1974) have shown that jassids (*Austroasca* spp.) are most abundant in lucerne (*Medicago sativa*) in late summer and autumn when seasonal temperatures and rainfall are decreasing. Hooper considered rainfall to be the main suppressant of jassid populations in lucerne and Waite emphasized the controlling effect of mowing.

The minimum temperature at which normal jassid development may proceed is important in the context of the time period between successive lucerne cuts. This interval varies with seasonal temperatures, and under irrigation lower temperatures are responsible for the lengthening period between cuts in autumn (Anon. 1962). This study was conducted to determine the effect of temperature on the development of *Austroasca alfalfae* (Evans) and to relate the findings to previously observed field population fluctuations.

II. MATERIALS AND METHODS

Eggs were obtained from groups of four to six male and female insects collected in the field and caged for 5 to 6 hours on lucerne seedlings grown in plastic vials, 7·8 x 2·8 cm. During the study period, the seedlings were watered continuously by capillary action.

The vials were sealed with gauzed plastic lids and kept at ambient temperature and in natural light for oviposition as recommended by Page (personal communication 1971). After oviposition, the adults were removed and the eggs were incubated at specific temperatures in temperature-controlled incubators illuminated internally by an 8W 'daylight' fluorescent tube on a 12:12 light:dark cycle. Vials were inspected three times each day for hatching and ecdysis. Nymphs were removed when found and placed individually on fresh seedlings. Egg and nymphal periods were determined on approximately 30 insects surviving to maturity at five temperatures between 15°C and 27°C and on 40 insects at 30°C.

III. RESULTS

Development times for eggs and nymphs are given in table 1.

IV. DISCUSSION

The data show a decrease in the development period for eggs and nymphs with increasing temperature in the range 15°C to 30°C. Development time for eggs varied from 22 days at 15°C to 5 days at 30°C and for nymphs were 46 days to 8.5 days. At 24°C and 27°C, development times for eggs and nymphs were only slightly less than at 30°. The lowest temperature investigated, 15°C, was marginal for *A. alfalfae* nymphs while eggs hatched normally at that temperature. Winter field populations have been shown to be negligible (Waite 1974) and consistently low temperatures at and below the threshold for survival of nymphs would appear to account for this. Survival of nymphs was satisfactory at each of the four highest temperatures but deaths of 44.9% at 18°C and 96.3% at 15°C demonstrate the increasing adverse effect on nymphs as temperatures decrease below 21°C.

It is clear that the buildup of *A. alfalfae* numbers in late summer to autumn cannot be attributed to the effect of temperature on the insect. However, the data indicate that satisfactory development of *A. alfalfae* occurs at temperatures approximating those experienced in the field at this time and, at these temperatures, the growth rate of lucerne is reduced (Anon. 1962). Whereas during summer lucerne is cut at approximately four-weekly intervals, during late summer-autumn the inter-cut period extends to 6 to 8 weeks. Thus jassid development continues at moderate rates while the lucerne stands for a longer period of time.

The data tend to support the view of Waite (1974) that mowing frequency is the chief regulator of jassid populations in lucerne by interrupting the breeding of discreet populations when a large proportion of the insects are in the susceptible egg and nymph stages. The rapid development noted at 24°C to 30°C would soon result in high populations in summer if mowing did not have this effect.

The thesis of Hooper (1959) that the decrease in rainfall at the end of summer results in an increase in jassid numbers is also supported. The effect of overhead irrigation on jassids could be considered similar to rainfall. Lower

TABLE 1

Development Time (Days) for Eggs and Nymphs of *Austroasca alfalfae* at Various Constant Temperatures

Temp. °C	Egg	Instar 1	Range	Instar 2	Range	Instar 3	Range	Instar 4	Range	Instar 5	Range	Nymphs	Egg and Nymphs	No. and % insects maturing
15	22·0	14·0	13·1–16·0	6·0	5·7–6·5	4·0	. .	9·0	. .	13·0	. .	46·0	68·0	1 (3·7)
18	14·5	4·3	3·8–5·8	4·1	3·0–6·7	3·7	2·0–5·0	4·5	2·3–6·0	5·6	5·0–6·0	22·2	36·7	27 (55·1)
21	10·0	3·8	3·0–6·5	2·5	1·0–5·2	2·6	1·0–5·3	2·1	1·0–4·8	3·5	2·0–5·8	14·5	24·5	30 (69·8)
24	7·0	1·8	1·5–2·0	1·6	1·0–3·0	1·7	1·0–3·0	1·8	1·0–3·0	3·2	2·0–5·0	10·1	17·1	32 (84·2)
27	5·5	1·6	1·2–3·0	1·6	1·0–1·9	1·7	0·8–2·5	1·8	1·2–3·1	2·4	1·5–3·0	9·1	14·6	28 (73·7)
30	5·0	1·2	1·0–1·4	1·6	1·0–2·7	1·3	1·0–1·8	1·4	1·0–2·0	3·0	2·7–3·2	8·5	13·5	40 (71·4)

temperatures are reflected in the decline in water use by lucerne, hence the need for frequent irrigation is reduced. If, as Hooper suggests, rainfall and possibly irrigation do suppress populations, the extent to which both operate at this time is minimal.

Increased incidence of *A. alfalfae* in lucerne in late summer to autumn is considered to result from continuous breeding at modest rates while the growth rate of lucerne is reduced by lower temperatures in the absence of rainfall and regular overhead irrigation.

REFERENCES

ANONYMOUS (1962).—*The Queensland Agricultural and Pastoral Handbook Vol.* 1. 2nd ed. P. 456. (Mirror Newspapers Ltd: Brisbane.)

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. thesis: Univ. Qd.)

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

(Received for publication 12 September 1975)

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