

NOTES ON THE PEST STATUS OF AND SAMPLING METHODS
FOR SAP-SUCKING BUGS IN COTTON

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Introduction

The use of broad-spectrum insecticides for Heliothis control in cotton generally provides suppression of most secondary or minor pests. However, there are occasions on which secondary pests can reach economically damaging levels (e.g. when Heliothis infestations are light and don't require treatment, or when an insecticide resistance strategy dictates the need for limiting the use of a category of insecticides).

In recent years sap-sucking bugs have been associated with early season damage to cotton crops in most of the production centres in New South Wales and Queensland. Four species have been included in this pest complex: the green mirid (Creontiades dilutus), the apple dimpling (Campylomma livida), the brown smudge bug (Deraeocoris signatus) and the rutherghlen bug (Nysius vinitor). The University of Queensland has conducted a number of preliminary studies on these bugs, concentrating on the green mirid. The studies conducted prior to the 1982-83 season have been discussed by Bishop (1980) and Adams and Pyke (1982). This paper summarises some of the results and observations made since 1982 from field cage, glasshouse and laboratory studies as well as unsprayed and commercial cotton crops.

Materials and Methods

- Field cage and glasshouse studies

Field cages (1.2 x 1 x 1.6 m) were placed over single metre lengths of row. Pretreatment counts of terminals and/or squares were made and all insects found on the plants removed. The number of treatments and replicates used in each experiment depended upon which species were being studied and their availability from lucerne and other crops. All studies included green mirid treatments. Other insects occasionally included in field cage experiments were: apple dimpling bugs, rutherghlen bugs and damsel bugs (Nabis kinbergii). Experiments were usually terminated after 7-10 days and post-treatment counts of terminals and/or squares taken.

Destruction of the field cages in a severe hail storm in January 1984 necessitated the transference of studies to the glasshouse. Three experiments were conducted aimed at examining the relative damage potential of the green mirid, the brown smudge bug and the grey cluster bug, Nysius clevelandensis (used in place of the rutherghlen bug).

- Laboratory studies

Field collected green mirids were reared in the laboratory at 28°C. Washed green beans were used as a food source and as a substrate for egg laying. Beans containing eggs were removed daily and placed in containers under the following range of temperatures: 19, 22, 25, 28 and 31°C. The containers were checked daily and the date each insect moulted was noted.

- Sampling studies

Three sampling methods were compared at two different stages of plant growth (i.e. first square and first flower) within an unsprayed plot. The sampling methods were: 1) visual examinations of 30 plant terminals/sample; 2) 50 single sweeps/sample using a standard sweep net; 3) 25 single metre samples using a shake sheet. Adults and nymphs of the following insects were recorded: green mirid, apple dimpling bug, brown smudge bug, rutherghlen bug, damsel bug and big-eyed bug (Geocoris lubra). The time taken for each basic sample unit was recorded for each sampling method.

Results and Discussion

All of the studies included a green mirid (GM) treatment, therefore, where appropriate in the following discussion, this insect is used as a reference point for comparing other sap-sucking bugs.

- Development

Laboratory studies have shown that the GM has 5 nymphal stages prior to adulthood and takes only 290 day degrees above a base temperature of 12°C for total development. Therefore, at a mean daily temperature of 27°C it would take only 19 days to complete its lifecycle. Development studies of other sap-sucking bugs have yet to be conducted, but in comparison to other cotton pests GM development is very rapid, e.g. Heliothis armiger - 475 day degrees from egg hatch to adult emergence (Twine 1978), and 407 day degrees for total development of the cotton tipworm (Hamilton et al, 1984).

- Damage potential and treatment thresholds

Field cage studies have indicated that the feeding rate of a GM adult during early squaring is approximately 5 squares/m/week. Therefore, assuming an undamaged crop can produce 10-20 squares/m in the first week of squaring, a preliminary threshold for this stage of growth would be 2-3/m. Under cool conditions less than 2/m may prevent squaring entirely and there may be justification for relating thresholds to temperature.

Until recently it was assumed that damage caused by GM was restricted to small squares during the first 3-4 weeks of square production. In 1983 it was firmly established through field cage trials and observed in commercial fields that this pest can cause significant damage to all stages of seedling cotton. Field cage studies only indicated that severe tip damage was caused by less than 3 GM/m, but it is worth noting that thresholds as low as 1 per 3 m to 1 per 6 m were used commercially to prevent excessive tip damage at Emerald, Biloela and Theodore (D. Murray, M. Stone pers. comms).

The damage potential of large GM nymphs was found to be 3.5 times that of adults on seedling cotton. However, these data were collected in field cages using field collected insects and because there was no control over the age of adults released, this estimate will require further refinement.

Table 1 summarises the current information on the damage potential of other sap-sucking bugs relative to the GM. These data were obtained from a limited number of trials for each species and should be considered only preliminary estimates until further studies can be conducted.

- Sampling methods

The rankings of three sampling methods for each of three sap-sucking bugs and two growth stages are given in Tables 2 and 3. The differences in ranking which emerge for different criteria i.e. number/m (Table 2) and number/minute (Table 3) are important when selecting the most appropriate sampling method for pest management purposes. Time spent sampling is a more important consideration to a cotton grower than obtaining the best estimate of absolute numbers per unit area, therefore, shake cloths and sweep nets are more suited for field use than visual methods when sap-sucking bugs are to be sampled.

Conclusions

Sap-sucking bugs can cause significant damage to plant tips and young squares during the seedling stage and first 3-4 weeks of fruiting. The green mirid appears to have at least twice the damage potential of any other bug in the complex. The brown smudge bug will cause squares to shed when caged on plants, but this insect generally does not reach peak population levels until late January, therefore, its pest status is questionable. The rutherglen bug and closely related grey cluster bug do not appear to have any significant damage potential.

Further studies are required to define the best treatment thresholds and sampling strategies for these insects.

References

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- Twine, P. H. (1978) Effect of temperature on the development of larvae and pupae of the corn earworm Heliothis armigera (Hubner) (Lepidoptera: Noctuidae). Q. J. Agric. Anim. Sci. 35: 23-28

PRE-SQUARING

1 GM Adult
per 6m
to
1 GM Adult
per 6m

TABLE 1: The damage potential of some other sap-sucking bugs relative to the green mirid (GM)

Growth Stage	No. adult bug to equal 1 GM adult		
	Apple Dimpling bug	Brown Smudge bug	Rutherglen/grey cluster bug
Seedling	-*	-*	No apparent damage
Early squaring	3.5**	2.0	35.0

*No data

**Bishop (1980)

TABLE 2: Ranking* of sampling methods for sap-sucking bugs based on numbers found/caught per m

Common name	Plant growth stage	Visual	Sampling method	
			Sweep net	Shake cloth
<u>Green mirid</u>				
nymphs	1st sq.	1	3	2
	" Flr.	1	3	2
adults	" sq.	1	3	2
	" Flr.	1	3	2
<u>Apple dimpling bug</u>				
nymphs	1st sq.	1	3	2
	" Flr.	1	3	2
adults	" sq.	1	3	2
	" Flr.	1	3	2
<u>Brown smudge bug</u>				
nymphs	1st sq.	1	3	2
	" Flr.	2	3	1
adults	" sq.	2	3	1
	" Flr.	1	3	2

*Ranking 1 = most found/caught per m, 3 = least/m

TABLE 3: Ranking* of sampling methods for sap-sucking bugs based on numbers found/caught per minute

Common name	Plant growth stage	Sampling method		
		Visual	Sweep net	Shake Cloth
<u>Green mirid</u>				
nymphs	1st sq.	3	2	1
	" Flr.	3	2	1
adults	" sq.	3	1	2
	" Flr.	3	1	2
<u>Apple dimpling bug</u>				
nymphs	1st sq.	1	3	2
	" Flr.	1	3	2
adults	" sq.	2	3	1
	" Flr.	3	1	2
<u>Brown smudge bug</u>				
nymphs	1st sq.	2	3	1
	" Flr.	3	2	1
adults	" sq.	2	3	1
	" Flr.	3	2	1

*Ranking 1 = most found/caught per minute
 3 = least found/caught per minute