Effects of lucerne strips on the distribution of pest and beneficial insects in a cotton field.

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Introduction

The value of lucerne as a trap crop for cotton pests has been recognised in America for some time (DeLoach and Peters 1972, Robinson *et al.* 1972, Sevacherian and Stern 1974). The major use of this cultural control technique in America has been for trapping the *Lygus* bug.

Although possibilities of strip cropping for insect control have drawn considerable interest from Australian farmers, few studies have been done on the effects of strip cropping on the pest/predator complex of Australian cotton. Mirids, the *Lygus* bug's Australian relative, are an occasional pest of cotton in the Macquarie valley of NSW. An experiment was devised to determine the effect of strip cropped lucerne on the spatial and temporal distribution of pests, including mirids and *Helicoverpa*, and predators within a commercial cotton crop.

Materials & Methods

Field 1 of Auscott's Warren farm, a 93 hectare red clay field on the southern extremity of the main growing area, was planted to 4 per cent lucerne in June, 1993. The lucerne was grown in 11 strips, each 8 m wide and separated by 192 rows of Sicala V1 cotton planted in late October. Insect sampling used a D-vac sampler, with an operating nozzle speed of approximately 10 m/s. Samples were taken at 9 am, and covered 16 transects each of 20 m length, totalling 320 m of row per sample date. The first transect was in the lucerne strip, with the remaining three in cotton at 2, 12 and 72 m from the lucerne. This progression was followed at four sites, two facing the south and two facing the north to confound wind effects, thus giving 16 samples. The five sample dates were the 3rd, 10th, 15th, 18th and the 30th of December, 1993. Up until the 2nd of January the experimental block received only

two Dipel (Bt) sprays, on the 5th and 16th of December respectively. The lucerne strips were half-slashed on alternate sides approximately every 3 weeks to provide both young vigorous growth and flowering plants. D-vac sampling incorporated 10 m of each stage of growth.

Results & Discussion

The results were analysed using two-way analyses of variance with distance from lucerne and time as the two factors, and are summarised in Table 1.

Arthropod	Significance level of :		
	Distance from lucerne	Time	Interaction
Juvenile mirids	NS	NS	NS
Adult mirids	NS	NS	**
Apple dimpling bugs	***	*	*
Helicoverpa grubs	NS	***	***
Spiders[1]	NS	***	*
Red and blue beetles	NS	***	**
2 spotted ladybirds	**	NS	*
Other ladybirds[2]	***	***	***
Damsel bugs	NS	***	NS
Lacewings	**	***	*
Jassids (leafhoppers)	***	**	NS
Ants	***	**	*
Total predators	NS	***	***

Table 1. Summary of an analyses of variance for effects of time and distance from lucerne on the numbers of various arthropods. NS = not significant, * = P< 0.05, ** = P< 0.01 and *** = P< 0.001. [1] Lynx, yellow night stalker and jumping spiders. [2] Transverse, three banded and striped ladybirds.

A common pattern was for numbers in the lucerne to increase over time while numbers in the cotton declined or remained steady. This pattern was demonstrated by the pests - adult mirids (figure 1) and *Helicoverpa*, and most natural enemies (figure 2) - spiders,

red and blue beetles, 2 spotted and other ladybirds, damsel bugs and lacewings. Insects that did not follow this pattern were the apple dimpling bug, jassids (figure 3) and ants. These groups were always more abundant in the cotton. It could be argued that these trends were an artifice of the sampling method, due to the rapidly growing cotton causing the D-vac to become less effective in cotton relative to the slower-growing lucerne. There is evidence that this was not the case, however, as numbers of many species did not show a steady decline in cotton. Analysis of the entomoLOGIC data for this field and a nearby solid-planted cotton field is still being completed, but there were at least two less insecticide sprays required in field 1 than anywhere else on the farm up to January.

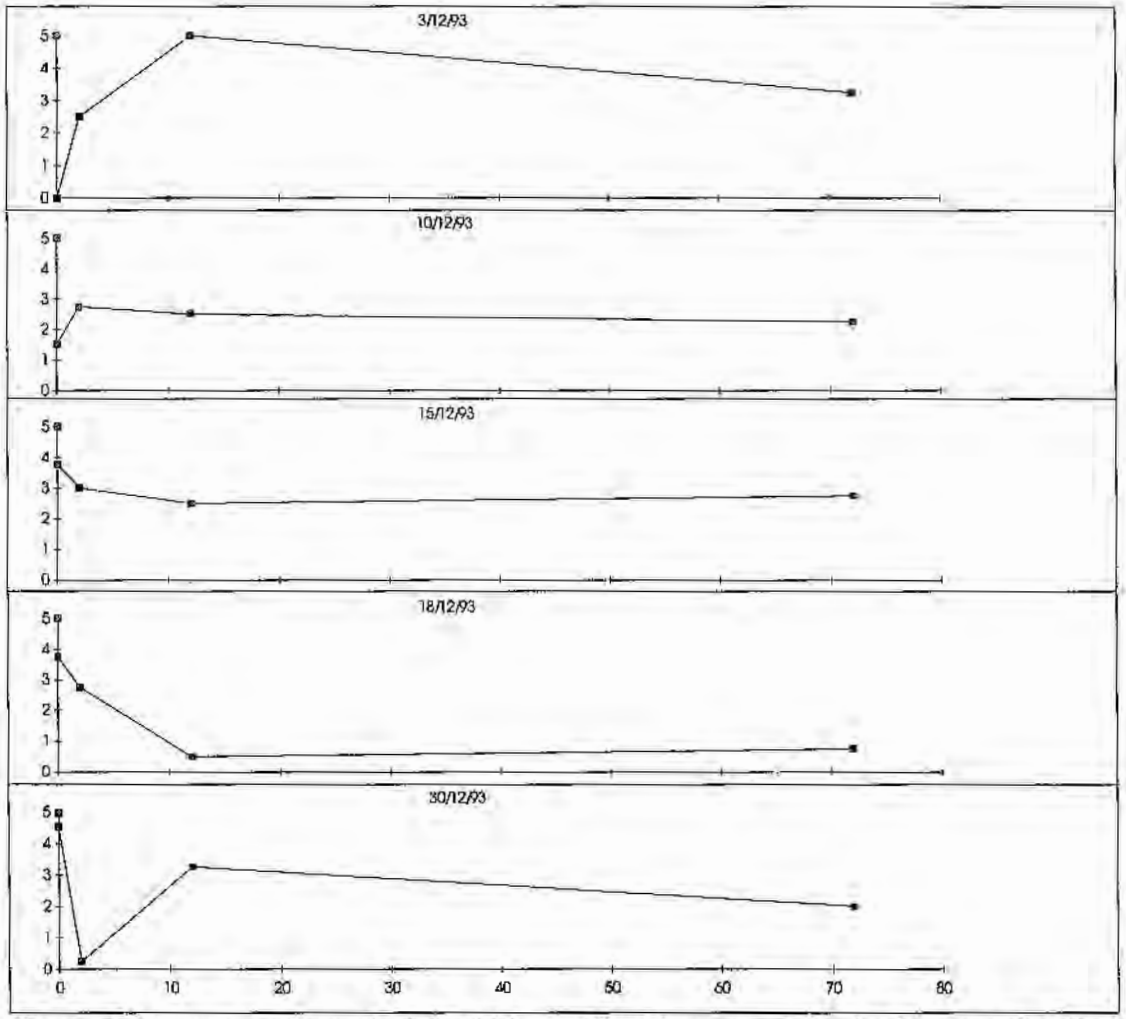

Figure 1. Average numbers of adult mirids per 20m D-vac sample in the lucerne strips (0m) and at various distances (m) from them, on 5 occasions.

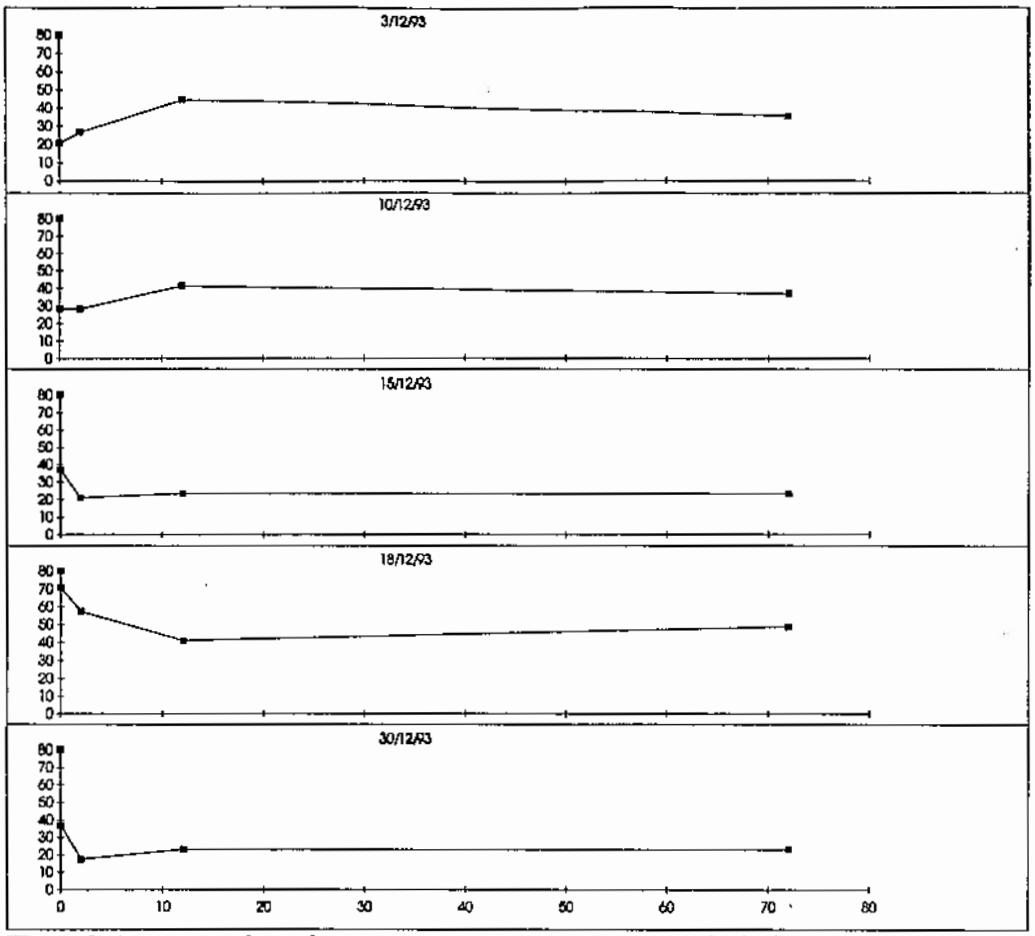

Figure 2. Average numbers of total predators per 20m D-vac sample in the lucerne strips (0m) and at various distances (m) from them, on 5 occasions.

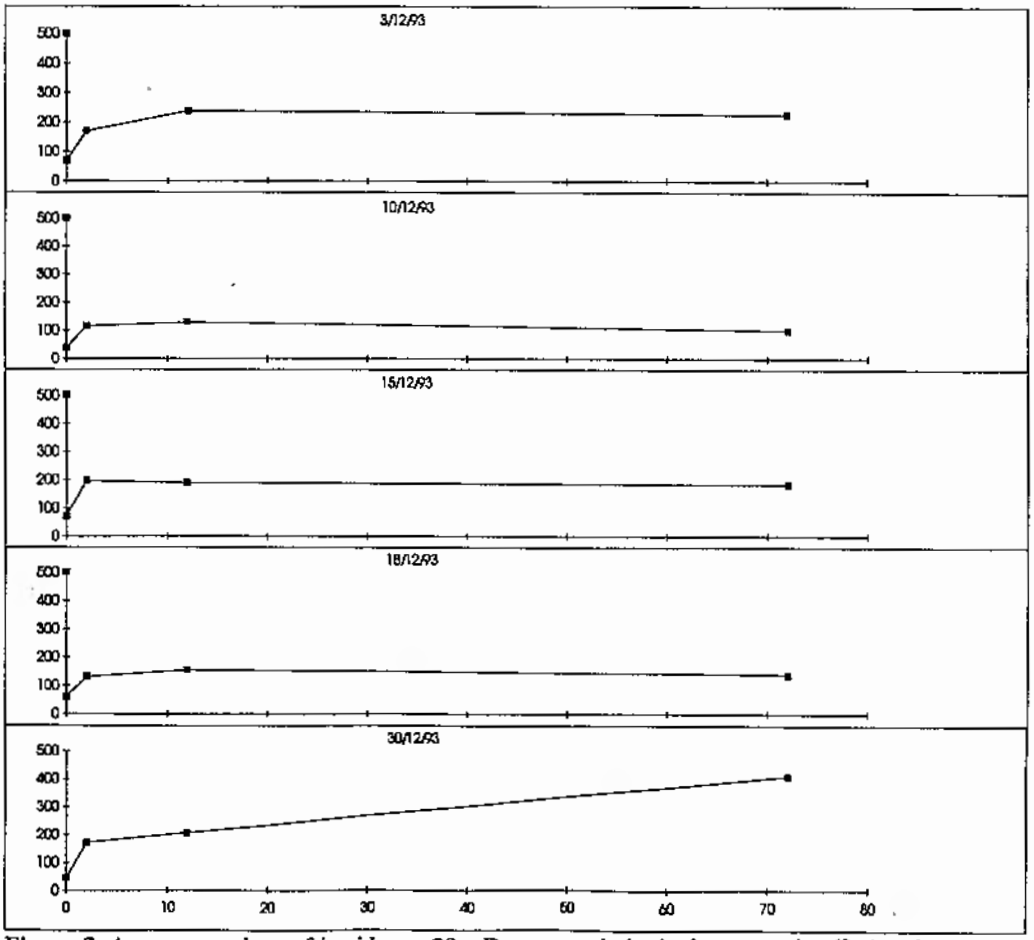

Figure 3. Average numbers of jassids per 20m D-vac sample in the lucerne strips (0m) and at various distances (m) from them, on 5 occasions.

Conclusions

Growing lucerne in association with cotton appeared to affect the spatial and temporal distribution of some pest and predator species. Other species, however, appeared not to be attracted to or affected by the lucerne. Having found an effect of strip cropping lucerne on the pest/predator complex within an Australian cotton field we should now investigate the relevance of this information to practical pest management. As this experiment, for commercial reasons, did not include a strict control (i.e. a solid-planted field subjected only to Bt sprays), it is unable to provide definitive answers. Fewer insecticide sprays were applied to this field in comparison to a nearby solid planted field of the same variety, but this may have been due in part to higher tolerance for early season damage in this field by the growers. Results are therefore encouraging regarding the potential use of lucerne, preferably in larger strips than used here, as both a trap crop for pests and a nursery for beneficial arthropods. Further research would be required to investigate the optimum size and placement of strips (bearing in mind the significant cost of lost cotton production), while also discovering the niche for this management technique within the integrated pest management profile.

References

DeLoach, C.J. & Peters J.C. (1972) Effect of strip-planting vs. solid-planting on predators of cotton insects in southeastern Missouri, 1969. *Environmental Entomology* 1, 94-103.

Robinson, R.R., Young, J.H. & Morrison, R.D. (1972) Strip cropping effects on abundance of predatory and harmful cotton insects in Okalahoma. *Environmental Entomology* 1, 145-149.

Sevacherian, V. & Stern, V.M. (1974) Host preferences of *Lygus* bugs in alfalfa-interplanted cotton fields. *Environmental Entomology* 3, 761-766.