Spraying for mirids and benchmarking the triggers: what's working and what needs more development.

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Summary

- Pest managers were surveyed to benchmark mirid management practices
- Many mirid sprays were applied when mirids were below threshold and fruit retention was high (>85%).
- This is largely because pest managers were not allowing for differences between thresholds for visual and beat sheet sampling
- Spraying for mirids at below threshold levels provided no yield advantage, but increased costs and the risk of flaring secondary pests
- The results therefore validate the recommended thresholds. Emphasis needs to be placed on giving pest managers confidence in mirid thresholds so that they will adjust their interpretation of their counts according to sampling technique.

Introduction

As *Helicoverpa* damage has been drastically reduced in Bollgard II® cotton, there is a greater awareness of damage caused by sucking pests such as the green mirid *Creontiades dilutus*. Mirids are a difficult pest to manage because pest managers report no clear-cut relationship between yield loss and mirid numbers, which makes it harder to know when, or indeed if, it is appropriate to apply insecticides. In addition, controlling mirids in Bollgard II® cotton may require broad spectrum insecticides which could disrupt the beneficial population and thereby increase the risk of secondary pest outbreaks such as mites, aphids and whitefly.

In order to manage this real risk, I have been benchmarking the industry's response to the mirid threat by conducting two season-long surveys in 2005/06 and 2006/07. The aims of the surveys were to find out what is working well in mirid pest management and where changes might be made to improve management. In order to address these aims, this article is an initial report on: 1) The spray triggers (or the factors influencing the decision to spray for mirids). 2) Ramifications of mirid management decisions (how mirid management decisions impacted on yield or cost to growing cotton).

1) The Spray Triggers.

Mirid Thresholds

The mirid thresholds give a guide as to when growers should spray for mirids to avoid a yield penalty. These thresholds are based on mirid numbers, crop development state and retention levels (Khan et al 2006). The thresholds vary according to region and sampling technique. During the peak control period, they vary 6-fold, from 0.5 mirids/m in the cold region (upper Namoi, Macquarie, Lachlan/Murrumbidgee) using visual searches, to 3 mirids/m in the warm region (Emerald, Theodore, Darling Downs, St George, McIntyre, Gwydir and lower Namoi) using beatsheets.

Did pest managers stick to these guidelines and adjust their threshold 6-fold to accommodate sampling technique and regional differences? Fig. 1 shows the responses (all standardized to the number of mirids in a beatsheet in a warm region) of the participants in relation to the number of mirids seen and the percentage fruit retention. The shaded areas on the graph indicate the mirid threshold. In both seasons, many sprays for mirids fell within the shaded area. Based on the industry guidelines, these sprays could have been avoided.

One reason for the high number of sprays before threshold was management constraints ("insurance sprays" Fig. 1b). Some pest managers identified constraints (eg: last opportunity to use a ground rig, or spray plane going over anyway) to explain spray applications below threshold. This highlights awareness of the thresholds and a desire to implement them being balanced against the realities of costs and timing of farm operations.

Many sprays occurred below threshold because pest managers did not adjust the threshold according to sampling strategy. Table 2 shows that in the cool and warm regions, visual sampling threshold was the same as or higher than the recommended threshold. In contrast, for the beatsheets, the threshold used was well below the recommended threshold suggesting that many pest managers are reluctant to accept the higher thresholds recommended for beatsheets.

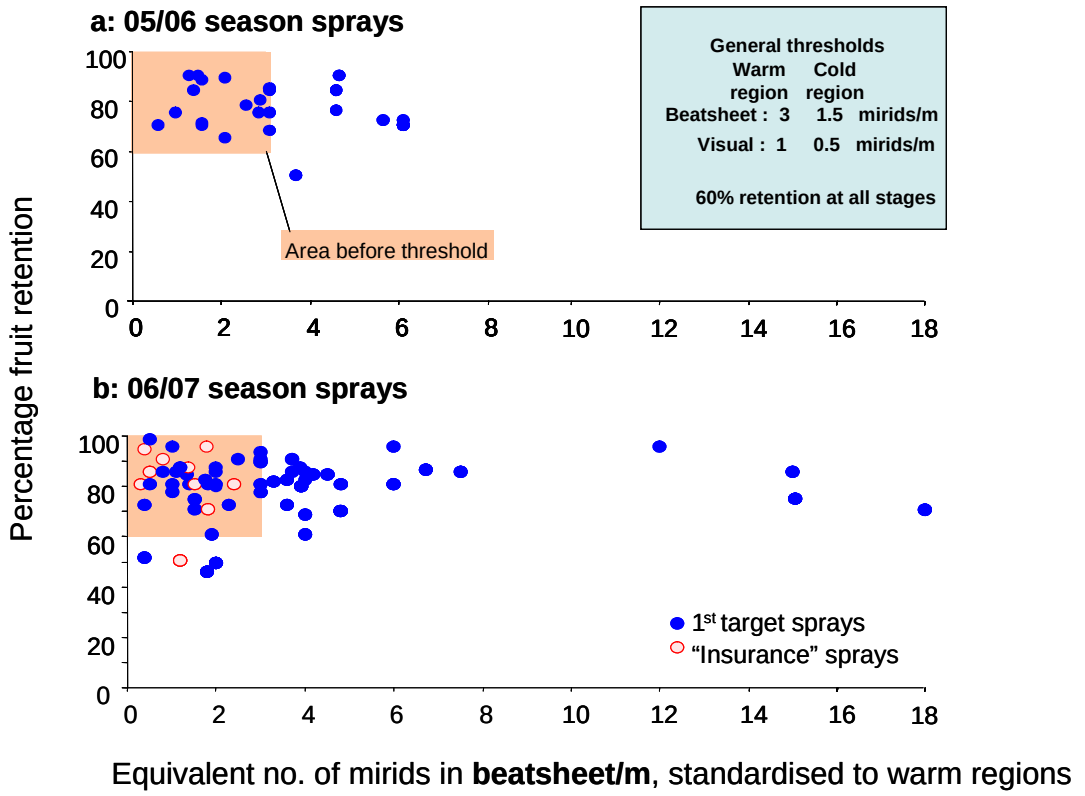

Fig. 1 Graphs showing when participants sprayed for mirids in relation to the mirid threshold. All mirid numbers were standardized to the equivalent number in beatsheets in the warm region. "Insurance sprays" occurred because of management constraints (see text).

Retention thresholds

The percentage retention of the crop was higher when pest managers didn't spray than when they did spray. The reports from participants on the importance placed on retention indicated that pest managers varied the importance they placed on the amount of retention only when mirid numbers were low. When mirid numbers were high there was no relationship between the amount of retention and how important it was perceived to be. This indicates that retention levels were only used to decide when to spray for mirids, not as justification not to spray for mirids.

This approach probably contributed to the large number of sprays applied to low mirid numbers and high retention. While nearly half of these sprays could be explained by managerial constraints in the form of "insurance sprays", it was unclear why the rest of the cases occurred. Installing greater confidence in the 60% threshold would probably reduce the amount of unnecessary sprays, even in the light of managerial constraints.

Table 2. The recommended threshold, and the density at which fields were sprayed for mirids (in mirids/m), in warm and cool regions using visual and beatsheet sampling methods. It is clear that thresholds for visual sampling were adhered to, but with beatsheet sampling mirids were sprayed well below threshold.

Region	Visual sampling		Beatsheet sampling	
	Recommended threshold	Threshold actually used	Recommended threshold	Threshold actually used
Warm	1	1	3	1.5
Cool	0.5	1.2	1.5	0.5

2. Ramifications

A potential way to reduce costs is to avoid re-spraying a field for mirids. The data suggest that if a field was first sprayed [mah066 1]for mirids at rates below 40ml/ha, then the field was more likely to be resprayed, suggesting that we need to establish whether it is more expedient to control mirids by spraying 'harder' once, or less disruptively twice. In addition, if the first mirid spray was applied only once mirids were above threshold, then the field was less likely to be resprayed. Thus spraying for mirids once they were above threshold reduced costs by avoiding resprays[mah066 2].

Given that mirids have the potential to reduce yield, is there a cost to only controlling them once they reach threshold? To answer this question I compared the yield of fields that had received any mirid spray when mirids were below threshold with the yield of those that were only sprayed once mirids were over threshold (Fig. 2). The 2006/07 season was strongly affected by drought, so I took this into account by asking pest managers if their field had been drought affected (0 = no stress, 1 = slight stress, 2 = stressed, 3 = very stressed). I found that while water stress had a strong affect on yield, the number of sprays a field received for mirids had no affect on yield. Critically, whether growers sprayed for mirids before they reached threshold, or only after they were over threshold, had no effect on yield.

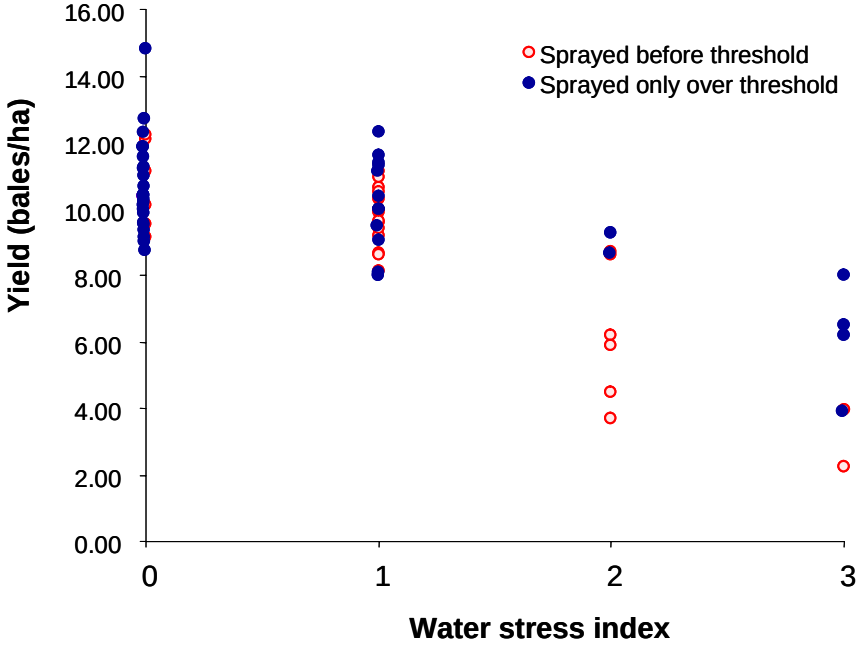

Fig. 2 The relationship between yield, water stress, and spraying mirids before or over threshold. Spraying on low mirid numbers before threshold gave no yield advantage.

Conclusions

Pest managers in this survey generally followed the guidelines recommended for mirid management. Both mirid numbers and retention were seen as important, and thresholds were used, but in a conservative manner. Pest managers accepted the mirid numbers threshold for visual surveys, but did not do so when they sampled using beatsheets. They seemed to be reluctant to accept that three times the number of mirids are found in beatsheets than in visual surveys and that thresholds should be adjusted accordingly. This may have led to a number of unnecessary sprays and associated costs. To overcome this, pest managers either need to use visual surveys to sample for mirids, or need to develop greater confidence in the higher beatsheet thresholds.

The results from the survey vindicate the thresholds, and indicate that if adhered to, there is no cost to yield. It even appears that only spraying once mirids are over threshold may reduce the need to respray a field, which has economic and resistance management advantages.

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