Mites - Lessons from the 1993/94 Season

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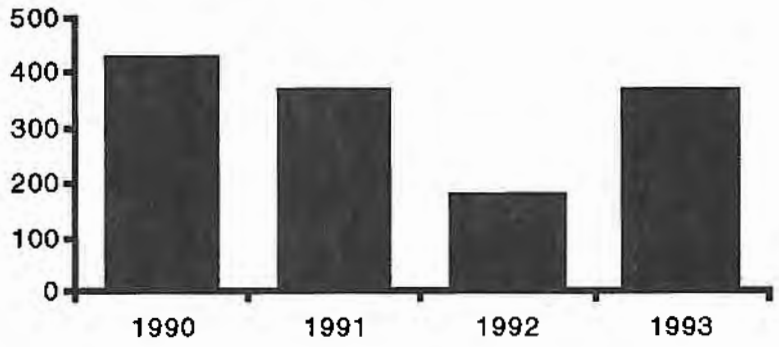
Why was 1993/94 such a bad mite year?

After 2 light mite years (1991/92 and 1992/93) the cotton industry experienced a season in which outbreaks of mites were widespread. In most regions mites were reported from seedling cotton and mite populations began to increase in mid-December to early-January, about a month earlier than usual. A number of factors contributed to produce the potential for such outbreaks to occur and other factors made management of outbreaks very difficult. The key factors involved, as I see them, are detailed below.

Overwinter survival - Winter carry-over was higher in 1993, which was marked by a return to more normal rainfall during the fallow period (Fig. 1) and hence an abundance of weeds which are hosts for mites. Weeds were abundant and lush in Spring 1993, compared with spring 1992 when weed growth was sparse. The higher winter carry-over in 1993 resulted in higher levels of infestation of seeding cotton this season. A number of agronomists/consultants reported finding mites on seedling cotton, sometimes at quite high levels (40% infested).

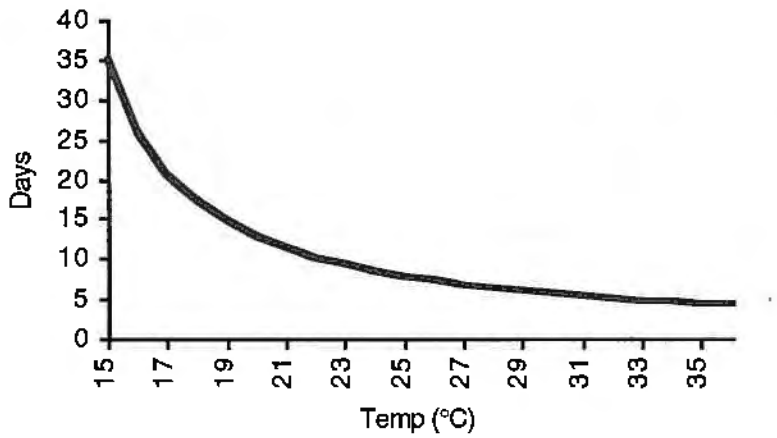
Fig. 1. Fallow rainfall (March-Sept) Namoi Valley (mm)



Early spraying and early use of pyrethroids - Heavier than normal early season spraying with a range of insecticides, most of which substantially reduce the abundance of mite predators, lead to greater early season survival of mites. This situation was exacerbated in some regions where hot conditions reduced the effectiveness of endosulfan for *Helicoverpa* control resulting in early use of pyrethroids which are notorious for their impact on beneficial insects and for causing mite outbreaks.

Conditions favouring mite development - Environmental conditions through most of the season favoured growth and development of mites. Hot conditions in early January, in particular, meant that mites could develop from egg through to adult in about 6 days, sometimes slightly less (Fig. 2). These conditions, coupled with a lack of natural controls, such as predators, lead to widespread, rapidly increasing mite populations.

Fig. 2. Developmental time of twospotted spider mite (egg to adult) (data from Carey & Bradley 1982)



Two light mite seasons previously and sampling problems - The low mite abundance in the previous two seasons meant that mites were probably not strongly in the minds of many growers/consultants. As a result sampling for mites was probably inadequate in some cases, both in frequency and in sample size. Despite the fact that many agronomists/consultants found mites on seedling cotton this does not appear to have lead to extra vigilance in mite sampling later on. In many cases the opportunity to control mites earlier with an application of a selective miticide such as Kelthane may have been missed.

Lack of key miticide - The difficulty in controlling mite outbreaks was further compounded because stocks of Comite, one of the key miticides, ran out in Stage II of the Resistance Management Strategy.

Will mites be a recurrent, worsening problem?

The interaction between weather (rainfall and temperature), and the growth and abundance of weed hosts for mites will largely determine the potential for a particular season to be 'light' or 'heavy' for mites. Early season survival of mites on cotton can be greatly reduced by predation. However, the potential for predation will be affected by the type and quantity of insecticides used early season. The continued trend toward earlier use of pyrethroids and other 'hard' insecticides is very disruptive of natural enemies, and of IPM in general, and could lead to more frequent bad mite seasons, whatever the level of winter carry-over. This potential problem is the main reason for restricting pyrethroid use to 1 application in Stage 1 of the 1994-95 Resistance Management Strategy.

What can we learn about managing mites and other pests?

1. *Weed management and cultivation* - Management of cotton stubble and weeds to reduce winter carry-over of mites is essential. This is particularly important if winter rainfall leads to abundant weed growth and greater mite carry-over. With late cotton crops there is a chance that mites will change to the diapause form, before the crop is defoliated, and move into crop residues (litter) to overwinter. Diapausing mites are bright orange and can usually be seen in the litter if abundant. Cultivation of crop residues will substantially decrease survival of any diapausing mites. This should normally occur when cultivating to control diapause *Helicoverpa* pupae in the soil.

2. *Predator disruption* - Disruption of natural enemies by the use of broad spectrum insecticides early in the season can lead to outbreaks of mites. This is especially important when mid-summer brings hot, dry conditions conducive to spectacular rates of mite population increase. Perhaps the greatest deficiency in IPM at the moment is our inability

to effectively incorporate predation in decision making. Using a 'soft approach' early in the season helps to preserve beneficials, which in turn assists in controlling outbreaks of secondary pests such as mites and aphids. However, for key pests, *Helicoverpa* sp. and mites, there is no way to estimate likely mortality due to beneficials. Thus, the benefit gained from preserving predators it often intangible. In addition the grower often finds this approach more costly as 'soft options' are generally more expensive. This problem is currently being addressed by a number of research projects and hopefully we will be able to build predation into our pest management strategies more effectively in the future.

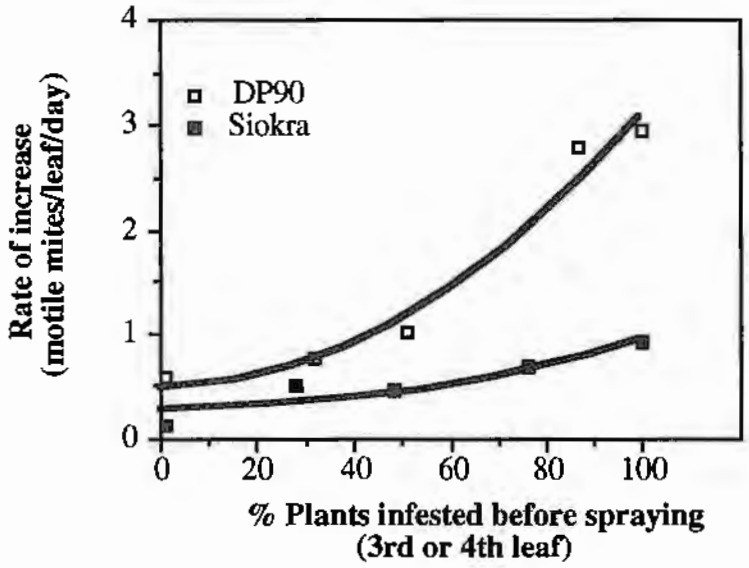
3. *Sampling* - The importance of sampling for mites regularly from seedling emergence onwards cannot be emphasised strongly enough. Our pest management system is in a state of flux. *Helicoverpa* resistance and changes in the Resistance Management Strategy are leading to altered chemical use patterns. This is resulting in changed pest problems. Old notions that mite sampling can begin in January are increasingly outmoded and risky. Sampling is the cornerstone of pest management and underpins the value of every spray decision. This is stating the obvious, yet sampling continues to be a weak point in management of mites.

4. *Thresholds* - Some consultants and chemical company representatives have suggested that the threshold for mites (30% of leaves infested with mites) should be lowered. The reason given was that agronomists/consultants do not have time to look closely enough for the presence of mites on leaves and as a result may underestimate the true level of infestation (ie an estimate of 30% of leaves infested with mites may really be 60%). This could lead to application of miticides to mite populations that are too high for optimum control. I do not support changing the threshold. The emphasis should be on improving sampling, rather than attempting to introduce a fudge factor to accommodate poor sampling.

The threshold of 30 % of leaves infested satisfies two conflicting aims which must be balanced in making a management decision. Firstly, it allows sufficient sampling to occur so that rates of increase can be used to evaluate the potential yield loss a mite

population would cause if not controlled. This ensures that control is economically justified (important late season or if predators are active). Tables to estimate yield loss from mites have been published (Aust. Cottongrower 12 (5): 51-55) and this information is included in EntomoLOGIC (see paper by L. McKewen and colleagues). Secondly, it allows control to occur at a level where efficacious control is achieved and where the rate of resurgence of mites, and hence the need to control again, is generally low (Fig. 3).

Fig. 3. relationship between % of plants infested before spraying and the rate of increase of mite populations between 13 and 20 days after application of Comite 600 EC for Deltapine 90 (DP90) and Siokra 1-4, NARS, 1990.



Conclusions

A number of factors contributed to increased difficulty in managing mites effectively in the 1993-94 season. Nevertheless, the information needed for effective management of mites is available. In, particular I would urge that more effort be put into mite sampling, especially early in the season, and that consultants/agronomists utilize the published tables of mite effects on yield loss or EntomoLOGIC to better decide when to control mites .

Acknowledgments

I would like to thank the many agronomists, consultants and chemical company representatives that have provided information on their experiences in managing mites.