COOPERATIVE RESEARCH CENTRE FOR SUSTAINABLE COTTON PRODUCTION

COTTON information sheet

Insect Pest Management

and Bunchy Top Update (June 1999)

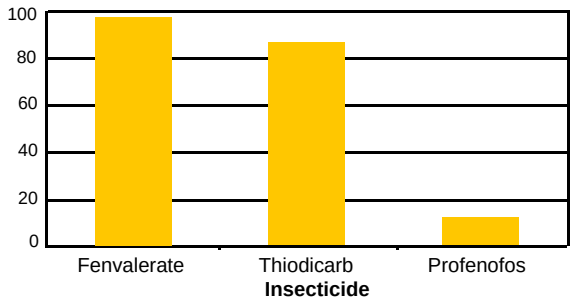
Prepared by virologists, pathologists and entomologists from the Cotton CRC in collaboration with other organisations including Cotton Seed Distributors, Deltapine, and Australian Cotton Consultants.

Given the difficult season we have just experienced it is essential that every effort is made to reduce potential problems for next season.

Helicoverpa

Top of the list is pupae control for *Helicoverpa.* Pupae in cotton fields are likely to have been highly selected for resistance to insecticides i.e. Figure. 1. This includes the 'older' chemical groups; endosulfan, pyrethroid, carbamate, and organophosphate insecticides, as well as insecticides from the newer groups, such as Abamectin, Tracer and Intrepid. Under Ingard crops, pupae may have been selected for resistance by the insecticides, but also by Bt expressed in the plants.

Figure 1. Percent resistance of *H. armigera* across all regions at the end of 1998-99



Effective control of pupae in NSW and southern Qld is an essential component to help maintain the efficacy of older products, and reduce the risk of resistance developing to newer compounds and Ingard. Growers should also sample fields where other summer crops have been grown and control pupae if they are readily detectable. Guidelines on sampling for pupae are available in "Overwintering Heliothis Control Guidelines Post Harvest 1999" (industry mailout May 1999). Preliminary results of pupal surveys from Colin Tann (CSIRO) show an average of 10,000 live pupae / ha under conventional crops in April, and about 3000 / ha under INGARD crops. While not all of these pupae are necessarily in diapause there will be sufficient numbers to warrant cultivation.

Note that the Ingard Resistance Management Strategy states that refuges that have not been treated for Heliothis (unsprayed refuges) should be left uncultivated until at least late October.

Mites

This season has seen widespread and severe problems with mites. Miticide use has been much higher than usual with 2-5 mite sprays not uncommon, compared with 1 or less in most years. This imposes heavy selection for resistance on the miticides, especially as some of them are also used to control other pests. Minimising overwinter carry-over of mites will help to reduce the extent of the problem next season.

Mites normally survive as actively feeding and reproducing colonies through winter on whatever suitable vegetation is available. This can be weeds, cotton regrowth or rotation crops. Weeds that are good winter hosts for mites include turnip weed, wireweed, sowthistle, burr medic, prickly lettuce and deadnettle. Among the rotation crops the cereals are generally poor hosts for mites but safflower and some legumes (e.g. faba beans) are good hosts.

Mites also have a diapause form that doesn't feed or reproduce, and seeks dark humid places to overwinter. Normally the prevalence of the diapause form is very low. However, in winters where harvest is significantly delayed, mites on cotton may be exposed to low enough temperatures and poor food quality (old cotton leaves) such that a higher proportion change to the diapause form and move into the soil and litter. This would certainly seem to be a risk this season. Disturbance of the soil, such as during pupae busting, will help to reduce survival of any diapause mites.

Other pests

A range of other pests including aphids and mirids will use suitable vegetation as hosts through winter.

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Bunchy Top

This season there is an additional important consideration for winter management in cotton fields – the 'Bunchy Top' syndrome that has appeared in cotton. The 'classic' symptoms of the syndrome are shortened internodes (both on the mainstem and branches), small leaves (which may be purple, mottled yellow or normal colour) and small squares, flowers and bolls. The timing of and severity of the symptoms varies. Some crops show severe symptoms from early in their growth and yield is severely affected. Others show the symptoms more mildly or only some of the symptoms. This syndrome has been found in cotton from all regions though it has been most severe in the Darling Downs region. Many crops in other regions show the symptoms but only at the top of the plant, and so yield may not have been affected to the same extent. The disorder was particularly obvious in late crops, often associated with stress and frequently more severe in unsprayed or poorly sprayed areas of the field. In some situations whole fields were affected while in other fields the symptoms were confined to patches or to crop margins only.

We don't yet know the cause but there are some measures that may be prudent to take in any case, as a means of 'hedging our bets'. It is possible that the syndrome is a pathogen that is spread by insects. The syndrome is under intense investigation to isolate the cause. Samples have been sent to virologists at the DPIQ in Brisbane and CSIRO Plant Industry at Adelaide. Other pathologists and entomologists in the industry are testing to determine whether pests such as aphids are able to transmit the syndrome to healthy plants. Seed from affected plants have been planted in the glasshouses to determine if there is any possibility of seed transmission of the disorder. A detailed survey of growers is being undertaken to try to identify common patterns that may provide a clue as to the cause.

If the problem is caused by a pathogen the wet winter could have produced the right series of circumstances for a pathogen to build up in a non-cotton host and be transmitted into cotton by potential vectors such as an insect or mite. Many pathogens are systemic – they spread throughout the plant, although the symptoms of their presence may only be visible in new growth. If this has occurred then regrowth cotton from the stubble of crops with the syndrome is potentially an important 'on-farm' source of carry-over of the pathogen to next season. This would increase the chances of the syndrome reappearing next year, perhaps more widespread and earlier than this year. Other weeds on the farm may also harbour the pathogen and/or act as a host for the vector.

What can be done?

Fortunately there are a number of measures which can be taken on farm to help deal with the carry-over or *Helicoverpa armigera*, mites, other pests and to also potentially reduce carry-over of Bunchy Top should this prove to be an infectious disease.

1. Pupal Control. Ensure that control of pupae occurs as early and as effectively as possible. Also check under other summer crops that had *Helicoverpa armigera* from February onwards and control pupae under these crops if necessary. Guidelines for the effectiveness at controlling pupae of a range of cultivation implements are given in MACHINEpak.

2. Weed Control. Stringent control of weeds on farm, especially in fields and field borders, including weeds in other crops. If Bunchy Top is caused by a pathogen then good farm hygiene may help to reduce the carry-over of the disease source and the vector. This management practice is also complementary to good IPM for mites and mirids by reducing overwinter hosts.

3. Control Regrowth. Destroy cotton stubble to ensure there is no regrowth as it may act as a host for pests such as mites or aphids. Additionally if Bunchy Top is caused by a pathogen then regrowth may act as a source of inoculum for the coming season. Ensure that no parts of the field are missed such as the last 10 m or so where the tractor turns around.

4. Control Volunteers. Control any cotton volunteers in the spring. If Bunchy Top is caused by a pathogen then volunteer cotton may act as a nursery in spring allowing levels of inoculum to build up on-farm. Control of volunteers is also good management for Ingard® to ensure that there is no contamination of Ingard® crops with conventional cotton volunteers or contamination of conventional cotton with Ingard" volunteers.

What can be done next season

This is difficult to forecast given that the cause of the syndrome is unknown. Once the cause is identified we will be able to develop appropriate management strategies to minimise its impact on future cotton production. It is likely that the weather through winter / spring in 1998 had a strong link with the occurrence of this syndrome. If so then the weather through the winter / spring of 1999 could strongly influence the likelihood of a re-occurrence of the syndrome. Nevertheless, given the unpredictability of the weather, growers should undertake the measures described above to help reduce the risk of carry-over of any pathogen on farm (these are essentially practices that should already be occurring). If it is found to be a pathogen spread by an insect or mite then appropriate IPM compatible strategies will be developed. Further information sheets will be produced, as information becomes available.

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