Getting the lowdown on whitefly

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Australia's first major outbreak of silverleaf whitefly (SLW) in a cotton production system — at Emerald in 2001–02 — was managed as well as possible with existing products. And while there is no indication that the quality of Central Highlands cotton was diminished, the industry realised that advances needed to be made for the effective management of this pest in the future.

Two key factors that made management difficult in 2001-02 were a lack of suitable insecticides and knowledge of the pest and how it would react in cotton in the Australian environment.

To address the second issue, the CRDC, CSD and central Queensland cotton grower associations sponsored 12 people involved in the cotton industry in central Queensland to visit regions in the US that had experienced and managed serious SLW populations.

The 12 day tour covered three distinct areas that shared similarities with the cotton production system of central Queensland in terms of crop dynamics and climate:

- Rio Grande Valley of Texas;
- Low desert areas of Arizona; and,
- Imperial Valley of California.

In each of these areas the tour group spoke to producers, consultants, researchers, extension staff, and aerial operators to gain an understanding of the pest and its management.

RIO GRANDE VALLEY, TEXAS

The problem

The cropping system of the Rio Grande Valley comprises spring melons, summer cotton, fall melons and brassica crops during winter. This pattern of crop succession has been conducive to the build up of SLW populations.

SLW was probably introduced in the mid 1980s and gradually became the dominant whitefly species. The first major outbreak occurred in 1991 with growers spending up to $250 per hectare on control and losing up to one bale per acre in yield.

Despite crops appearing to be heavily affected, very little cotton was classed as sticky from either major outbreak.

Discussing management with consultant Dr Webb Wallace in Texas.

Management

After the 1991 outbreak, the cotton industry formed a collective taskforce including; growers, consultants, extension agents and researchers. This group produced extension material for the cotton industry but also engaged the local community to understand the ecology of the pest including the role played by ornamental host plants within the urban environment.

In keeping with their low input production system, great emphasis was placed on cultural control in the Rio Grande Valley. Insect Growth Regulators (IGRs) were not widely used due to their expense.

In both the cotton and rockmelon industries there has been a rapid move to smooth leafed crop cultivars. From 1991 to 1992, the use of smooth leafed cotton varieties increased from 55 to 91 per cent.

In Texas there was an emphasis on spatial distribution of alternate host crops. The placement of cotton near adjacent late spring melons was avoided due to a high risk of cross-infestation.

Insecticide control was directed towards the knockdown of adults in a two-stage approach — mid and late season. The standard control measure is a mixture of the pyrethroid Danitol (fenpropathrin) and organophosphate Orthene (acephate). The insect growth regulator (IGR) Applaud (buprofezin) is registered in Texas but not routinely used due to the generally late season nature of SLW infestations and the cost constraints.

Aerial application was the accepted method for insecticide use with an emphasis on good coverage. The optimum timing of sprays was from dawn to mid-morning when adult SLW are typically exposed. All applications included cottonseed oil, which is thought to supplement control by smothering insects.

The primary chemical control in cucurbit and cole crops is imidacloprid (Admire or Confidor), which is applied as a soil drench for seedlings or in-furrow at transplanting and then via the drip irrigation system.

After the devastating SLW outbreak of 1995, there was an intensive exotic parasitoid introduction program as well as a collaborative development (with industry) of bio-pesticides at a cost of approximately $US3 million. The most effective parasitoids are a number of Eretmocerus and Encarsia species although equal importance was placed on predators such as lacewings and ladybird species.

Work had been conducted on the use of several bio-pesticides including Mycotrol (*Beauveria bassiana*). This was found to provide effective SLW control under laboratory and green house situations. But under field conditions, fungal biopesticides were found to be largely ineffective.

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Summary

A common attitude from growers in the lower Rio Grande regarding whitefly was; "we haven't seen many of them since '96". It appears that a number of strategic changes in cultural and insecticide management practices, and other outside influences has led to a situation where they are now able to co-exist with this pest.

LOW DESERT AREAS (MARICOPA), ARIZONA

The problem

SLW was probably introduced on ornamental nursery plants from Florida around 1985. The rapid development of a resistant population across Arizona suggests the introduced insects were already highly resistant to pyrethroids and carbamates used in Florida production greenhouses at that time.

By 1995, resistance reached a level where control could no longer be achieved. In that season growers spent as much as $US500 per hectare on insecticides. The situation was serious enough to potentially cripple the cotton industry in Arizona and resulted in EPA emergency use permits for the new Insect Growth Regulators (IGRs) Applaud and Knack.

In 1995 about 11 per cent of the Arizona crop was downgraded for stickiness. Following the successful introduction of IGRs in 1996, this figure fell to one per cent. Despite this change, Arizona growers are still burdened with the reputation of producing sticky cotton and receive on average 3–7 cents per pound less than growers in neighbouring California. As one grower put it; "facts are negotiable but perceptions are rock solid."

The whitefly problem has also led to the demise of the bean crops from the farming system.

Management

A cooperative effort developed a well researched sampling method and a control and resistance management strategy.

The resistance management strategy is based on three stages, promoting the use of IGRs early, followed by other compounds. The stages are not governed by dates, but in most situations, the threshold for IGR application will be reached in the period between first and peak flower. It takes time for the effect of the IGR products to be seen but they have strong residual activity. This is enhanced by ensuring these products are applied early while there are still plenty of natural enemies.

The Australian group takes a break in Texas.

The combined effect of these two forces was termed 'bio residual'.

The full effects of IGR products are only realised when they are applied across a large area, so only treating the field edges was discouraged. Knack was the more popular of the two IGR products and was used in approximately 75 per cent of first treatments.

The use of pyrethroids is still necessary in some situations. But since the introduction of the IGR products, the efficacy of the pyrethroids and their mixes has begun to improve.

Although the introduction of the IGRs seems to be the centrepiece of the Arizona whitefly management strategy, a number of cultural and biological practices are also very important. For example, the adoption of smooth leaf cotton varieties has been widespread.

Biocontrol plays an important role but the pest generally overwhelms the predators by peak season.

The vast majority of insecticide applications using both IGR and knockdown products are undertaken using aircraft fitted with CP nozzles. A general comment was that higher water rates can give better results. Aerial applications were generally done using 30–100 litres per hectare while ground rig applications were done at 50–150 litres per hectare.

Summary

Whitefly seems to have moved from the status as a major to medium level pest in the past five years. Central to the Arizona management strategy is the use of the IGR products supported by a rigorous sampling and cultural control program.

IMPERIAL VALLEY, CALIFORNIA

The area and problem

The cotton area in the Imperial Valley has declined from 350,000 hectares in 1980 to 3,500 hectares in 2002 — mainly due to pink bollworm, SLW and low cotton prices. Pyrethroid resistant SLW caused a $US250 million crop loss in 1991, mainly due to the 98 per cent annihilation of the melon crop.

Severe yield loss and sticky cotton resulted from infestations in cotton in 1991, 1992 and 1995.

Management

Most chemical control in the area remains adult knockdown with synthetic pyrethroid and organophosphate mixtures. The high proportion of lucerne in the cropping system that is unsprayed for whitefly seems to help maintain susceptibility in the SLW population.

As in the other areas, the effective use of neonicatinoid products in melons has reduced the problem in cotton.

CONSIDERATIONS FOR CENTRAL QUEENSLAND

Each of the areas visited had experienced a problem equal to or worse than that experienced in the Central Highlands and has since managed it to some degree.

The fundamental key to each strategy was the development of a management plan that was widely adopted. Fragmented strategies or adoption do not work. The strategy needs to be developed at a 'grass roots' level with all affected stakeholders included at the onset.

Silverleaf whitefly is a pest that attacks many crops, and poor control in one crop only creates a problem in another. A link of communication regarding whitefly needs to be forged between the cotton, horticulture and grain industries of central Queensland. These groups will have to work together in developing cultural management protocols (planting windows and crop residue destruction) and insecticide resistance management strategies.

Given that the silverleaf whitefly population in central Queensland is already resistant to pyrethroids, the availability of the IGR products will be extremely important to the management of the pest in cotton. Already this pest has shown an amazing ability to rapidly develop resistance and the use strategy for these and other products across all crops will be essential. This will be especially applicable to the neonicatinoid chemical group, which will be available for use on both melons and cotton.

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