Seasonal phenology, hosts and natural enemies of the silverleaf whitefly in cotton areas of Queensland

Final Report

Cotton Research and Development Corporation

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Summary

The silverleaf whitefly (SLW), *Bemisia tabaci* B-biotype, was first discovered in Australia in 1994. SLW is a major pest of cotton in many overseas countries and poses a considerable threat to cotton in Australia.

Consequently a monitoring system using surveys has been run over the past two years to:

- Monitor the distribution and abundance of the whitefly,
- Record its hosts, and
- Assess the degree of natural biological control provided by indigenous parasitoids.

SLW was first found at Biloela in July 96; St. George, Goondiwindi and Warra in January 98; St. George irrigation area in April 98 and Emerald and Comet in May 98

Rates of parasitism were variable and in the different areas averaged: Central Highlands 43%, Dawson/Callide 36%, St. George 67%, Goondiwindi 45%, Darling Downs weeds 45%, Darling Downs cotton 72%. The parasitoids belonged to several species of *Encarsia* and *Eretmocerus* spp. and were common in all cotton growing regions.

SLW was found breeding on six different plant species.

Populations of SLW have undergone an incremental increase in distribution and abundance across the cotton growing regions. It would appear that SLW has gained a foothold on weeds in all cotton growing districts. Whether populations build up from here to threaten cotton is unknown.

The relatively slow spread of detectable populations of the SLW in the cotton areas of Queensland may be attributed, at least in part, to the activities of its parasitoids.

Background

The silverleaf whitefly (SLW), *Bemisia tabaci* B-biotype, was first discovered in Australia in 1994. SLW is a major pest of cotton and other crops in many overseas countries and poses a considerable threat to cotton in Australia. SLW is the second biotype of *B. tabaci* to be found in Australia. A closely related indigenous biotype (IBW) was first recorded from Australia in 1959. IBW breeds on cotton but is not of pest status.

Since its detection, SLW has spread widely in New South Wales and Queensland. However, its spread into the cotton growing regions of both states has been relatively slow in comparison with some other areas in Australia and other countries overseas.

Objectives

Given the threat posed by SLW to cotton in Queensland a monitoring system using surveys was established and has been run over the past two years to:

- Monitor the distribution and abundance of the whitefly,
- Record its hosts, and
- Assess the degree of natural biological control provided by indigenous parasitoids.

All these objectives were achieved.

Methodology

All major Queensland cotton growing areas have been sampled since the winter of 1996. The Central Highlands, Dawson/Callide, St. George and Goondiwindi were sampled four times per year (once per season), whereas the Darling Downs was sampled approximately once each month.

Sampling focussed on the towns of Emerald, Biloela, St. George and Goondiwindi as SLW had previously been found in plant nurseries in these towns in 1995. On the Darling Downs sampling was centred on the towns of Oakey, Dalby and Warra.

At least one hour was spent searching for *B. tabaci* on host plants in and around each town. In addition, nearby rural areas were also sampled. Where whiteflies were found, adults and 'pupae' were collected. Pupae were held in vials at 25°C to allow parasitoids to emergence.

During the 96/97 cotton season, unsprayed areas of cotton were regularly sampled at Dalby and Warra. Adult *B. tabaci* were counted on 100 terminals and pupae were collected.

In the 97/98 cotton season, commercial cotton fields were sampled. Cotton leaves from around the fifth node were taken from various farms in the Emerald (400 leaves), Biloela (200 leaves), St. George (200 leaves) and Darling Downs (1800 leaves) areas.

B. tabaci were identified as SLW or IBW using RAPD PCR.

Results

SLW was first found at:

- Biloela in July 96 on ornamental plants and weeds, breeding throughout the year,
- St. George in January 98 on wild sunflower,
- Goondiwindi in January 98 on cobblers peg and sowthistle,
- Warra in January 98 on sowthistle,
- St. George irrigation area in April 98 on wild gooseberry.
- Emerald in May 98 on weeds and ornamental plants,
- Comet in May 98 on roadside volunteer cotton,

IBW was found readily in all areas throughout the two years and to date only IBW has been recovered from commercial cotton.

Rates of parasitism were variable and in the different areas averaged: Central Highlands 43%, Dawson/Callide 36%, St. George 67%, Goondiwindi 45%, Darling Downs weeds 45%, Darling Downs cotton 72%. The parasitoids belonged to several species of *Encarsia* and *Eretmocerus* spp. and were common in all cotton growing regions.

Host plants recorded during the study were:
ASTERACEAE
Bidens sp., *Dimorphotheca* sp., *Helianthus annuus*, *Sonchus oleraceus*
EUPHORBIACEAE
Euphorbia pulcherrima
SOLANACEAE
Physalis sp.

Sowthistle, *S. oleraceus* seems to be a key weed, in cotton growing regions for SLW population maintenance and development.

Discussion

Soon after the detection of SLW in Australia, it was found in nurseries in several major towns across the Queensland cotton growing regions.
However, the results from the past two years show an incremental increase in distribution and abundance of SLW across the cotton growing regions. It would appear that SLW has gained a foothold on weeds in all cotton growing districts. Whether populations build up from here to threaten cotton is unknown.

The relatively slow spread of detectable populations of the SLW in the cotton areas of Queensland may be attributed, at least in part, to the activities of its parasitoids.

Work by CSIRO on the biology of two species of *Eretmocerus* show that they provide levels of parasitism equivalent to those being introduced into the USA from Pakistan and the United Arab Emirates. It was found in this survey that one of these is particularly common, parasitising IBW in Queensland cotton growing regions. This together with the high rates of parasitism already being observed on weeds suggest that biological control could be a significant factor in future IPM programs for this pest in cotton in Australia.

Assessment of Impact

Impact

The cotton industry is being kept abreast of the situation with respect of SLW populations and can therefore make decisions and respond accordingly.

Preliminary data generated from this survey indicate that parasitoids play an important role in mimimising SLW populations. These data provide early insights into a number of issues. It seems there would be little expected value in importing parasitoids from overseas to add to existing biological control. If SLW was to become a pest in cotton then parasitoids will probably play an important part of IPM.

Costs

Project costs to CRDC were $25 000.

Future research needs

Surveying needs to be continued as the evidence suggests that SLW will probably begin to be found in cotton crops in 98/99.

The role of alternative hosts (particularly weeds and lucerne strips) should be investigated for their effects on population development and pest status of SLW.

If the SLW reaches pest status in cotton then research to develop IPM would become an urgent priority.

Publications

Franzmann, B., Lea, D., and De Barro P. (1998) Silverleaf whitefly on the march. The Australian Cottongrower 19(4): 18-19.

Franzmann, B.A., Lea, D.R, and De Barro P.J. (1998) The distribution and parasitism of biotypes of the whitefly *Bemisia tabaci* in cotton areas of Queensland. Proceedings 9th. Australian Cotton Conference. pp 461-463.