



January, August & Final Reports

REPORTS

Part 1 - Summary Details

Please use your TAB key to complete part 1 & 2.

CRDC Project Number: **DAQ119C**

January Report: Due 29-Jan-01
August Report: Due 03-Aug-01
Final Report: Due within 3 months of project completion

Project Title: Aphid biocontrol in cotton

Project Commencement Date: 1 Sep 2001 **Project Completion Date:** 30 Jun 2002

Research Program: Insect Management

Part 2 - Contact Details

Administrator: Mrs Vicki Battaglia, Snr Planning Officer.
Organisation: Queensland Department of Primary Industries
Postal Address: PO Box 2282, Toowoomba 4350
Ph: 07 46398883 **Fx:** 07 46398881 **E-mail:** Vicki.Battaglia@dpi.qld.gov.au

Principal Researcher: Mr BA Franzmann, Principal Entomologist
Organisation: Queensland Department of Primary Industries
Postal Address: PO Box 102 Toowoomba 4350
Ph: 07 46881313 **Fx:** 07 46881199 **E-mail:** Bernie.Franzmann@dpi.qld.gov.au

Supervisor: Mr BA Franzmann, Principal Entomologist.
Organisation: Queensland Department of Primary Industries
Postal Address: PO Box 102 Toowoomba 4350
Ph: 07 46881313 **Fx:** 07 46881199 **E-mail:** Bernie.Franzmann@dpi.qld.gov.au

Researcher 2 Dr L Wilson
Organisation: CSIRO, Plant industry
Postal Address: Locked Bag 59 Narrabri 2390
Ph: (02) 67991500 **Fx:** (02) 67931186 **E-mail:** Lewis.Wilson@csiro.au

Signature of Research Provider Representative: _____

Part 3 – Final Report Format

1. Project background.

The cotton aphid, *Aphis gossypii* is a pest of escalating concern in Australia. With increasing utilisation of Bt cotton and consequent reduction in insecticide applications, coupled with emerging insecticide resistance, cotton aphids appear to be more of a problem than previously. The cotton aphid also has been shown to carry, or cause, a new major problem for the Australian cotton industry, cotton bunchy top. Fundamental to the development of IPM systems for cotton aphid is the knowledge of what biological control agents are active and their relative importance.

The cotton aphid parasitoid, *Lysiphlebus testaceipes* released in Australia in 1984 has recently (2000) been found attacking corn aphids on sorghum in cotton areas in Australia. The parasitoid more recently (2001) has been recorded from the cotton aphid in Australia. However no systematic survey to determine its abundance and importance has been carried out. This parasitoid was recently rated by USA cotton IPM specialists as the most important parasitoid of all those attacking pest insects in cotton in the USA.

Two other aphids (the green peach aphid and the cowpea aphid) also occur in cotton. Nothing is known about how the natural enemies of the different aphids interact and influence the biological control of each aphid species.

Trap crops are an important part of cotton production. Other aphids in trap crops including the cowpea aphid, soybean aphid and corn aphid may also play an important role in providing a refuge for biocontrol agents of aphids in cotton. Trap crops may be able to be manipulated and managed to provide beneficials for aphid control in cotton.

Aphid parasitoids in other agroecosystems have provided effective biological control of aphids (eg. lucerne in Australia and wheat in South America). The new parasitoid, *L. testaceipes* may be able to provide effective biocontrol of cotton aphid in Australian cotton.

2. Project objectives.

1. Document aphid biocontrol agents in cotton in Queensland.

Ten cotton crops on the Darling Downs were monitored every 10 days for aphid biocontrol agents. Sampling for aphids and biocontrol agents was carried out in five crops each at Biloela and Emerald during December and February.

2. Evaluate the role of biocontrol agents in influencing aphid populations.

Four predator/parasitoid exclusion cage trials were carried out. Feeding studies were carried out on the ladybird *Hippodamia variegata*.

3. Evaluate alternative hosts in the population dynamics of cotton aphid in Queensland.

Monthly sampling of aphids and their natural enemies were carried out on weeds at four sites on the Darling Downs and on non-cotton crops at two sites.

3. How has your research addressed The Corporations three outputs: Sustainability of natural resources, profitability and competitiveness, and/or people and communities?

The development of sustainable Integrated Pest Management (IPM) systems is a fundamental plank in the CRDC's platform for the sustainability of natural resources. Outcomes of this project will assist in the progressive development of IPM in cotton.

If the cotton aphid can be controlled by biological methods then this will lessen the insecticide load in cotton production and thus lead to increased profitability and competitiveness and reduce concern of cotton communities.

4. Methodology

Aphid biocontrol agents in cotton were sampled by visual methods. The role of biocontrol agents were assessed by using open and exclusion caging techniques. Alternative hosts were sampled using visual techniques.

5. Results

Very few aphids and natural enemies were found in cotton crops that were regularly sprayed. The biggest aphid populations occurred late in the season after defoliation sprays were applied. The parasitoid *L. testaceipes* controlled cotton aphids in an unsprayed crop late in the season.

The predator/parasitoid exclusion trials results suggest that predators significantly reduced aphid numbers.

The feeding studies on the ladybird *H. variegata* showed that larvae consume about 600-800 aphids during their 9-10 day larval development period. Adults consume about 200 aphids per day for the 8-9 weeks of their life. Larvae can also fully develop to adult on a diet of heliothis eggs but die within a few days on a diet consisting only of newly hatched heliothis larvae.

During sampling of weeds and non-cotton crops, cotton aphids were not found on other crops but were found on the weeds, bladder ketmia, caustic creeper, and paddy s lucerne.

6. Discussion

As the project has encompassed less than one year s research there is little to be discussed. We have learnt a considerable amount about techniques and procedures to further develop information on the biological control of aphids in cotton.

The ladybird feeding data suggest that this insect has the potential to be an important bio-control agent for cotton aphids, and may also have some impact on other pests, including heliothis.

7. Impact of the results

The short project period was insufficient time to make an impact.

8. Publications

Franzmann B, Wilson L and Smith T (2002) Two new bio-control agents for cotton aphid. Proceedings of 11th Australian Cotton Conference. Pp 329-333

Part 4 – Final Report Plain English Summary

Provide a half to one page Plain English Summary of your research that is not commercial in confidence, and that can be published on the World Wide Web.

One year s research into aphid bio-control in cotton has documented the agents attacking cotton aphid in southern and central Queensland.

When protected from attack by predators, cotton aphid populations built up indicating that predators have a significant impact on cotton aphid. Results of regular sampling of cotton crops indicate, that when crops are not sprayed with insecticides detrimental to parasitoids, then these natural enemies also may wipe out cotton aphid.

Cotton aphids have been shown to breed on a number of weeds, which may be important in maintaining populations during the period when cotton crops are unavailable.

Feeding studies of the ladybird *Hippodamia variegata* which is new to Australia showed that larvae consume about 600-800 aphids during their 9-10 day larval development period. Adults consume about 200 aphids per day for the 8-9 weeks of their life. These data suggest that this insect has the potential to be an important bio-control agent for cotton aphids.