January, August & Final Reports

REPORTS

Part 1 - Summary Details

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

CRDC Project Number: **CSE83C**

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

Project Title: formerly - Management of Bemisia tabaci biotype B

New title - Why is Bemisia tabaci biotype B not a problem in NSW cotton?

Project Commencement Date: 1/7/99 **Project Completion Date:** 30/6/2002

Research Program: Insect Management

Part 2 – Contact Details

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Signature of Research Provider Representative: _____

Part 3 – Final Report Format

The points below are to be used as a guideline when completing your final report.

1. Outline the background to the project.

The project initially aimed at assessing the potential of *Eretmocerus mundus* (APF) as a control agent for silverleaf whitefly (SLW). As the crops where SLW is a pest are annual, mechanisms of achieving early colonisation need to be assessed. Further, a broad range of pesticides are used in these crops and their potential impacts on the parasitoid are unknown. The capacity of *E. mundus* to control field infestations is also untested.

After the second year it was apparent that while *E. mundus* performed well under controlled conditions it lacked the ability to exert sufficient control on outbreaking populations. A decision was made to then to better understand the interaction between the native *Bemisia tabaci* and the exotic B biotype. The background to this shift was the observations that in the cotton growing areas of QLD SLW was patchily distributed and rarely found on cotton. In NSW, surveys of cotton in 1995 and 1996 found small numbers of SLW. Since then 100 leaves have been collected from more than 190 crops with no SLW being recovered. By way of contrast, in both NSW and QLD, the Eastern Australian Native (EAN) biotype of B. tabaci occurs commonly in cotton, although at densities of less than 3 individuals per leaf. The most common whitefly species in cotton remains the greenhouse whitefly (*Trialeurodes vaporororarium*). The reasons for the low numbers of SLW was unclear but there were several possibilities. The most likely of these was an interaction between the two biotypes of *Bemisia tabaci*, climatic suitability and host availability.

After year two, the increasing numbers of SLW in the Emerald Irrigation Area lead to the third redirection of the project as a decision was made to monitor numbers in the EIA and as matters unfolded, an opportunity to monitor the first outbreak in cotton in Australia.

2. List the project objectives and the extent to which these have been achieved.

1999/2000

1. Determine the effects of temperature in the laboratory on the fecundity and longevity of *Eretmocerus mundus*
2. Determine the best strategy for introducing parasitoid into crops by comparing 3 release strategies on 3 different crops at two times in the year. Use crops treated and untreated with imidacloprid.
3. Determine in the laboratory, the effect of imidacloprid, buprofezin, difenthiuron, pyriproxifen and pymetrozine on Eretmocerus P2 adult and juvenile survival, fecundity and efficacy. Also, to provide baseline data needed for registration.
4. Survey of NSW cotton for SLW
5. Whitefly biotyping of surveys for NSW and Qld

Results detailed in full “Milestone 2 report, CSE83c, Integrated pest management of the silverleaf whitefly and the geminiviruses it transmits” and “CSE83c Milestone 3 of the Siverleaf Whitefly, *Bemisia tabaci* biotype B Research Project”.

2000/2001

1. Number of generations per year around Australia.

Report "The likely threat of B biotype to cotton. A Report to the Cotton Research and Development Corporation (CRDC) May 2001".

Report "The biotic potential of *Bemisia tabaci* SLW around cotton growing regions of Australia. A Report to the Cotton Research and Development Corporation (CRDC) May 2001".

2. Inverse modelling of *B. tabaci* biotype interactions along climatic gradients around Australia.

Report "The potential interaction between *Bemisia tabaci* B biotype 'Siverleaf Whitefly' and the local Australian strain of *Bemisia tabaci* in different climatic regions of Australia. A Report to the Cotton Research and Development Corporation (CRDC) April 2000".

3. Investigation of establishment threshold for SLW.

Report indicating the threshold at which SLW establishes. 30 June 2001.

2001/2002

1. Monitor the silverleaf whitefly outbreak in Emerald.

Report"Silverleaf Whitefly in Emerald – your options for the next two months" 6 June 2001.

Report "Silverleaf whitefly in Emerald. A Report to the Cotton Research and Development Corporation (CRDC) 25 June 2001".

Report "Silverleaf whitefly in Emerald. A Report to the Cotton Research and Development Corporation (CRDC) 29 August 2001".

Report "Summary of Silverleaf whitefly numbers in the Emerald Irrigation Area, October to December 2001. A Report to the Cotton Research and Development Corporation (CRDC) 4 January 2001".

Report "Emerald, a post mortem" 26 June 2001.

2. Further investigation of the establishment threshold for silverleaf whitefly. This work is nearing completion. Analysis of the data indicated the need for one additional experiment which is underway.

3. How has your research addressed **the Corporations three outputs: Sustainability, profitability and international competitiveness, and/or people and community?**

Silverleaf whitefly has become a serious concern in the Central Highlands. The work to date and over the past six years has enabled the cotton industry to respond rapidly and appropriately to the 2001/2002 outbreak in Emerald. The strategies and responses developed have drawn extensively upon the knowledge and experience gained in the horticulture industry. Further, observations made in regard to sticky cotton have lead to a possible explanation as to why much of the cotton from the EIA was unaffected by stickiness. This has given further insights into factors governing stickiness and may provide the basis with which to better assess the risk posed by SLW to the Australian cotton industry.

4. Detail the methodology and justify the methodology used.

The methodologies are outlined in each of the reports.

5. **Detail results including the statistical analysis of results.**

The analyses used are outlined in each of the reports.

6. **Discuss the results, and include an analysis of research outcomes compared with objectives.**

The results and their implications are discussed in the various reports.

7. **Provide an assessment of the likely impact of the results and conclusions of the research project for the cotton industry. Where possible include a statement of the costs and potential benefits to the Australian cotton industry and future research needs.**

It is too early to assess the impact of SLW on the Australian cotton industry. The 2000/2001 outbreak is likely to be repeated this year, but the availability of more effective chemistry and the experience of the previous season is likely to leave growers better placed to reduce the size and extent of infestations.

8. **Describe the project technology (eg. commercially significant developments, patents applied for or granted licenses etc).**

Not applicable

9. **Provide a technical summary of any other information developed as part of the research project. Include discoveries in methodology, equipment design, etc.**

Not applicable

10. **Detail a plan for the activities or other steps that may be taken;**

(a) to further develop or to exploit the project technology.

The research in Emerald has found that the concentration of disaccharide sugars (the cause of sticky cotton) on contaminated lint declines. Work is underway to quantify this. This then opens the way for future research that will help explain what is happening to these sugars. Once determined it may then be possible to predict the risk of sticky cotton and to perhaps reduce the risk by taking steps that target the disaccharide sugars. Once the final round of analysis is complete a full report with recommendations will be forwarded to CRDC.

(b) for the future presentation and dissemination of the project outcomes.

A presentation at the forthcoming Australian Cotton Conference will continue the extensive series of presentations that have extended results to growers, cotton consultants and researchers.

11. **List the publications arising from the research project.**

Report"Silverleaf Whitefly in Emerald – your options for the next two months" 6 June 2001.

Report “Silverleaf whitefly in Emerald. A Report to the Cotton Research and Development Corporation (CRDC) 25 June 2001”.

Report “Silverleaf whitefly in Emerald. A Report to the Cotton Research and Development Corporation (CRDC) 29 August 2001”.

Report “Summary of Silverleaf whitefly numbers in the Emerald Irrigation Area, October to December 2001. A Report to the Cotton Research and Development Corporation (CRDC) 4 January 2001”.

Report “The likely threat of B biotype to cotton. A Report to the Cotton Research and Development Corporation (CRDC) May 2001”.

Report “The biotic potential of *Bemisia tabaci* SLW around cotton growing regions of Australia. A Report to the Cotton Research and Development Corporation (CRDC) May 2001”.

Report “The potential interaction between *Bemisia tabaci* B biotype ‘Siverleaf Whitefly’ and the local Australian strain of *Bemisia tabaci* in different climatic regions of Australia. A Report to the Cotton Research and Development Corporation (CRDC) April 2000”.

Report indicating the threshold at which SLW establishes. 30 June 2001.

Report “Emerald, a post mortem” 26 June 2001. Also published in the Australian Cotton Grower.

12. Are changes to the Intellectual Property register required?

No.

Part 4 – Final Report Plain English Summary

The parasitoids already present in Australia appear to be unable to cope with outbreaks of SLW. To this end we have proceeded to seek permission to import and assess three exotic parasitoids of SLW. The original intention was to import a single species, but given the state of flux that still exists, we have decided on three species that cover the full range of climates present in Australia that are well suited to this insect.

The native Bemisia tabaci has the capacity to delay the build up of SLW, but can not prevent its establishment when hosts are present that favour SLW over the native biotype. As SLW has a much broader host range, we can assume that it is inevitable that SLW will establish across its climatic range.

The key factors in SLW outbreaks are:

- Climate, especially temperature, and the duration of the longest generation time over winter are critical for an outbreak.
- Suitable hosts. Long periods of continuous availability of suitable hosts are essential for outbreaks. The discontinuity of host availability in northern NSW and the Darling Downs is a major factor in reducing the likelihood of outbreaks. In contrast, the almost continuous availability of suitable hosts in the EIA acts synergistically with climate to make further outbreaks probable.

Based on this we predict that,

- Coastal Qld and the Central Highlands (Emerald to Biloela) will experience regular outbreaks all year, the severity of which will reflect local agricultural practices.
- Lockyer Valley, Goondiwindi (Border Rivers area) & St George face summer outbreaks.
- Darling Downs and Kingaroy are likely to experience very patchy outbreaks that reflect local microclimate events.

- Further, the impact of sticky cotton in the EIA may be lessened as it appears that disaccharides, particularly trehalulose degrade under the hot, humid conditions found in the EIA may reduce the problem of sticky cotton and enable growers to tolerate higher whitefly densities. The mechanism for the degradation is unknown