



FINAL REPORT 2016

For Public Release

Part 1 - Summary Details

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

CRDC Project Number: CCA1401

Project Title: Helicoverpa Egg Collecting in cotton regions to support Bt & insecticide resistance monitoring

Project Commencement Date: 01/10/2013 Project Completion Date: 30/06/2016

CRDC Research Program: 2 Industry

Part 2 – Contact Details

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Supervisor: (Name & position of senior scientist overseeing the project.)

Organisation:

Postal Address:

Ph: **Fax:** **E-mail:**

Signature of Research Provider Representative: _____

Date Submitted: 28/09/2016

Part 3 – Final Report

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

Background

1. Outline the background to the project.

Egg collecting has been critical to the success of the Helicoverpa resistance monitoring programs. Since 2007/08, the industry has engaged the services of the CCA in coordinating the regular collection of eggs by CCA members across a number of cotton growing regions. The partnership with CCA has assisted greatly in ensuring the monitoring programs have a reliable and quality supply of eggs from across more of the cotton industry.

The CCA developed a framework for engaging members from Emerald Queensland, to southern New South Wales, to make collections using a protocol provided by the NSW DPI and CSIRO monitoring programs. Researchers from the monitoring programs provide basic training for the participating members to ensure thorough knowledge and understanding of the tasks to be performed. CCA appointed a dedicated Project Manager to coordinate and administer the project as well as satisfy CRDC's reporting requirements.

Objectives

2. List the project objectives and the extent to which these have been achieved, with reference to the Milestones and Performance indicators.

1	Recruit CCA members to undertake collections	
1.1	Collection schedules in place across cotton regions	Completed for 2013/14 season to 2015/16 season - agreed schedule with CSIRO & NSW DPI and collectors
1.2	Participants familiar with collection protocols	Completed for 2013/14 season to 2015/16 season - protocols sent to collectors prior to commencement of collections
1.3	Participants advised of payment arrangements	Completed for 2013/14 season to 2015/16 season - collectors advised of payment amount and to invoice at end of season
2	Collections undertaken and process reviewed	
2.1	Collection schedules monitored during the season	Completed for 2013/14 season to 2015/16 season. Collectors and researchers contacted through the season on progress.
2.2	Collection data summarised	Completed for 2013/14 season to 2015/16 season. Summary report provided by laboratory each season on number of collections.
2.3	Collection process reviewed	End of season survey and evaluation report finalised for 2013/14 season to 2015/16.
2.4	Participants paid	Completed for 2013/14 season to 2015/16 season.
	Performance Indicator	Annual Report provided to CRDC for 2013/14 season to 2015/16 season.

Methods

3. Detail the methodology and justify the methodology used. Include any discoveries in methods that may benefit other related research.

The methodology adopted by the CCA egg collection team for collecting *Helicoverpa* material from the field and arranging for the dispatch of material to the laboratory was provided by the Australian Cotton Research Institute.

Project management methodology involved engaging collectors prior to the start of the cotton season to confirm number of collections, methodology and payments. Throughout the season the laboratory was contacted to ensure collections were of the quality and quantity expected from each of the regions. Collectors were contacted to identify any problems with the process. At the end of the season, collectors and the laboratory were contacted to provide feedback on the project activities for improvements and reporting purposes.

Results

4. Detail and discuss the results for each objective including the statistical analysis of results.

1. Recruit CCA members to undertake collections - Nine collection teams from seven regions/valleys conducted collections for each cotton season.
2. Collections undertaken and process reviewed - The number of collections from each team has generally met expectations and overall participation and performance has been good.

CCA contracted collectors in each cotton growing region to deliver an expected number of collections per season. There were a number of reasons such as wet weather limiting access, freight and quality problems, and pressure that influenced the actual number of collections. Each season these issues were reviewed and reported to identify improvements if needed for the following season.

Overall 244 actual collection activities occurred for the 2013/14, 2014/15, 2015/16 contracted cotton seasons. Each season CSIRO prepared a mid-season and end of season report on the results from the collections provided.

Valley/Region	Expected 15/16	Actual 15/16	Expected 14/15	Actual 14/15	Expected 13/14	Actual 13/14
St George	18	18	18	18	18	16
Emerald	18	12	18	15	18	13
Eastern Darling Downs	12	13	12	12	12	8
Western Darling Downs	12	10	12	5	12	1
Mungindi	8	4	8	4	8	7
Mungindi - CSIRO/DPI	4	11	5	4	4	5
Murrumbidgee	12	11	12	11	12	10
Macquarie	12	13	5	4	12	5
Macintyre	18	5	5	4	18	5
TOTAL	114	97	95	77	114	70

Outcomes

3. Describe how the project's outputs will contribute to the planned outcomes identified in the project application. Describe the planned outcomes achieved to date.

As a result of this project, the industry has a more accurate understanding of the resistance status of *Helicoverpa* species. Information representative of each region has been made available to make decisions affecting the whole industry, such as amendments to the Resistance Management Plan for Bollgard II and the Insecticide Resistance Management Strategy. The evolution of resistance to Bt toxins and/or insecticides is a significant threat to the sustainability of Australian cotton production, and thus high quality information for decision making is of high value to the industry.

Each season the CSIRO researchers have produced a mid-season and end of season report based on the data collected by the Bt resistance and insecticide resistance monitoring programs. These reports detail key information regarding frequency in *Helicoverpa* spp. over time and management implications based on season results.

4. Please describe any:-

- a) technical advances achieved (eg commercially significant developments, patents applied for or granted licenses, etc.);**
- b) other information developed from research (eg discoveries in methodology, equipment design, etc.); and**
- c) required changes to the Intellectual Property register.**

Conclusion

5. Provide an assessment of the likely impact of the results and conclusions of the research project for the cotton industry. What are the take home messages?

The partnership with CCA has assisted greatly in ensuring the monitoring programs had a reliable and quality supply of eggs from across each cotton growing region. The project has contributed to a whole of industry understanding of *Helicoverpa* spp. resistance and informed management responses accordingly.

The project has affirmed the commitment and role of crop consultants in crop protection and evolution of the Australian cotton industry.

Extension Opportunities

6. Detail a plan for the activities or other steps that may be taken:

- (a) to further develop or to exploit the project technology.**
- (b) for the future presentation and dissemination of the project outcomes.**

Research reports produced from the broader project are distributed to CCA members via the CCA Consultants Catchup e-newsletter. CCA Cropping Solutions Seminars have provided an opportunity for Dr Sharon Downes (CSIRO) to present the research findings and its application regarding insect management and understanding resistance.

- (c) for future research.**

9. A. List the publications arising from the research project and/or a publication plan. (NB: Where possible, please provide a copy of any publication/s)

- **Bt Resistance in Helicoverpa spp.**, Agriculture Production Flagship CSIRO, Sharon Downes, Senior Research Scientist CCA Cropping Seminar 13 May 2015
- https://gallery.mailchimp.com/e4a366f9f1a91e0442e70db08/files/Sharon_Downes_CSIRO_Bt_Monitoring_Update_v2.pdf
- Seminar Proceedings - paper publication page 61
- https://gallery.mailchimp.com/e4a366f9f1a91e0442e70db08/files/CCA_Seminar_Proceedings_May_2015_low_res.pdf
- **Mid-season preliminary results from CSIRO Bt resistance monitoring 2014/15** published in CCA Consultants Catchup E-newsletter 12 February 2015, ranking as the #1 most clicked item in that edition of the newsletter.

https://gallery.mailchimp.com/e4a366f9f1a91e0442e70db08/files/2014_30_1_15_MID_SEASON_Resistance_monitoring_results.pdf

- **End of 2014/15 season report for Bt and Conventional insecticide resistance monitoring** prepared by CSIRO and NSW DPI published in CCA Consultants Catchup E-newsletter 17 July 2015, ranking as the #2 most clicked item in that edition of the newsletter.

https://gallery.mailchimp.com/e4a366f9f1a91e0442e70db08/files/2014_3_7_15_END_OF_SEASON_Resistance_monitoring_results_v5.pdf

B. Have you developed any online resources and what is the website address?

Publications posted as outlined above.

Part 4 – Final Report Executive Summary

Egg collecting has been critical to the success of the Helicoverpa resistance monitoring programs conducted through the Australian Cotton Research Institute. Since 2007/08, the industry has engaged the services of Crop Consultants Australia (CCA) in coordinating the regular collection of eggs by CCA members across seven cotton growing regions. The partnership with CCA has assisted greatly in ensuring the monitoring programs have a reliable and quality supply of eggs from across the cotton industry.

CCA contracted collectors in each cotton growing region to deliver an expected number of collections per season. There were a number of reasons such as wet weather limiting access, freight and quality problems, and pressure, that influenced the actual number of collections. Overall 244 actual collection activities occurred for the 2013/14 to 2015/16 contracted cotton seasons. Each season CSIRO prepared a mid-season and end of season report on the results from the collections provided. CSIRO has presented the results at a number of CCA Cropping Solutions Seminars and reports have been circulated to CCA members.

As a result of this project, the industry has a more accurate understanding of the resistance status of Helicoverpa species. Information representative of each region has been made available to make decisions affecting the whole industry, such as amendments to the Resistance Management Plan for Bollgard II and the Insecticide Resistance Management Strategy. The evolution of resistance to Bt toxins and/or insecticides is a significant threat to the sustainability of Australian cotton production, and thus high quality information for decision making is of high value to the industry.