Cotton Catchment Communities CRC Ltd		
Six Monthly Report July 05 to May 06	Date Due: 31st May 2006.	
Project Number: 5.10.03.01		
Project Title: Summer Scholarship – Developing diapause induction and moth emergence tools		
Project Cash Budget: $4,000		
Project In-Kind:		
Project Team: David Murray and Sandra Deutscher		

Background

Diapause is the major mechanism in temperate production areas that allows *Helicoverpa armigera* pupae to survive the winter months when food plants are scarce and temperatures are too low for normal development. This mechanism contributes to the carry-over of resistance genes from one season to the next, and is the primary driver for the pupae busting requirement in both conventional and Bt transgenic cotton which aims to reduce survival of diapausing pupae under crops. Information about when diapause is induced is useful for identifying 'high risk' fields i.e. those fields likely to have diapausing pupae and which are essential targets for pupae busting. Knowing the timing of spring emergence from diapause identifies the latest opportunity for pupae busting operations and provides an alert of potential moth activity.

Decreasing daylength and temperature in late summer/autumn trigger the diapause response. The proportion of pupae entering diapause increases from low levels in early March to high levels (almost 100%) by late April. Increasing temperatures in late winter/spring trigger the termination of diapause and result in the subsequent emergence of moths (September to November). Both of these processes have been modeled and provide relatively accurate predictions, at least for southern Queensland and northern NSW. Despite the ability to make these predictions, the outputs are available to the broader industry in very limited circumstances. The purpose of this scholarship was to develop a tool for the Cotton Catchment Communities CRC website that makes this diapause and spring emergence information more readily accessible.

Aims

To develop tools for the Cotton Catchment Communities CRC website that

1. use long term meteorological data to predict diapause induction and spring moth emergence for *Helicoverpa armigera* in the major cotton production valleys
2. work towards developing real-time predictions (using current temperature data) of diapause induction and spring moth emergence for *Helicoverpa armigera*

Process

During the 2005 school year, DPI&F staff at Toowoomba worked with three Grade 12 IT students at Toowoomba State High School to develop a preliminary tool for the purpose outlined in this proposal. Two of these students, Ben Sticklen and Chris Dixon, were recommended by their teacher and were subsequently appointed as joint recipients of this Summer Scholarship.

Upon commencing this project, the students traveled with David Murray to ACRI Narrabri on 7 December 2005 to meet with co-supervisor Sandra Deutscher and programmer Scott Johnston to

discuss programming methodologies for the development of their project. This was a very beneficial and essential precursor to their project as it provided firm guidelines as to how they should progress.

The students took the information available to them and developed a stand-alone desktop program written in Visual Basic that predicted diapause induction and which incorporated both the long term and real-time meteorological data. The concept underlying the program was that when on-line, it would access temperature data from the SILO database. SILO provides data from a large number of weather stations which are relevant to cotton production areas. Scott Johnston provided a data set from SILO which the students used as a guide/template for the basic data format.

The diapause induction program the students developed uses current and historical temperature data from SILO to provide an output in both tabular and graphical form. The output provides daily predictions of diapause induction for a specified location up to the current date, and estimates diapause levels beyond the current date using long term temperature data. At this point this program has been provided to the programming team at the ACRI for further refinement and development in order to make it available as a web-based tool, located on the Cotton Catchment Communities CRC website.

In addition to the desktop program, the students have developed a tool that allows the user to vary the temperature inputs from the perspective of a warmer or cooler year.

The spring moth emergence function of the program was not finalized by the end of the Summer Scholarship due to some delays in translating the Fortran code to Visual Basic. The fundamental components of this function are no different to those of the diapause induction tool. At this point it is proposed that further development of the spring emergence component be undertaken by the programming team at the ACRI, as part of the web tool specifications.

The Summer Scholarship offered the two students a learning opportunity where they experienced the application of programming to a real world situation. Both students developed networking and problem solving skills in delivering a functional end product. While the students were relatively inexperienced in programming, the dispause induction tool which they developed reflected a significant achievement on their part.

Conclusion

The Summer Scholarship resulted in significant progress towards providing diapause induction and spring moth emergence tools for the Cotton Catchment Communities CRC website. Discussion with Scott Johnston suggests that transferring the Visual Basic program developed by the students across to the programming language used on the Cotton Catchment Communities CRC website will require some additional effort, but it is hoped this will be achieved in due course.