

Close off Report on CSE36C

**Project Title: DNA Probes for Key Insecticide Resistance Genes -
Maintaining a Sustainable Resistance Management Strategy**

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Summary and Conclusions

The project was terminated by CRDC after two years and therefore could not meet its final objectives. Good technical progress was made and the resources and information that were obtained remain available for the future.

One particular benefit of the project was seen by the CRDC review, held in January 1994, as being that the knowledge gained would assist in resistance management for Bt. In an unexpected way it did this by highlighting the need for us to create a genetic map of *Heliothis armigera*. In the case of CSE36C, the pre-existence of a genetic map of the related American species, *Heliothis virescens*, allowed us rapidly and cost-effectively to decide whether endosulfan resistance was due to a mutation in the GABA_A gene. Our ability to use information from the American species relied on the happy and unusual coincidence that endosulfan resistance is sex-linked (i.e. its chromosomal location in *H. armigera* is known). This is a rare, if not unique, situation and almost certainly we will not have this advantage when we are faced with *H. armigera* resistant to Bt cotton. Creating a genetic map of *H. armigera* before Bt resistance appears in the field would eliminate reliance on luck and greatly facilitate characterisation and detection of resistance genes when they appear. It would do this by providing markers which could be used to determine the chromosomal location of any resistance genes. Even at the crudest level this would be a very valuable tool. It is therefore one of the most cost-effective steps that the cotton industry can take as insurance against Bt resistance.

From my discussions with CRDC on the reasons for the termination of the project it is clear that the industry believes that managing insecticide resistance for existing chemical insecticides is a lost cause. One of the major problems facing the industry is the lack of a range of good alternative modes of action on which to build a best-case management strategy. Whilst development of Bt cotton may assist with pest control generally, it does not of itself address this situation, since it relies on a mode of action that is already in use. Genetically engineered NPVs will add a new mode of action as would stunt virus-cotton. Redirection of some molecular genetic resources previously devoted to research on insecticide resistance to the new technologies of receptor-based high throughput screening for new chemical insecticides is appropriate and the Division is pursuing this option with other parts of CSIRO and potential commercial partners. The likely commercial partners are likely to be multinational companies with little direct interest in Australian markets of *H. armigera* *per se*. CRDC may therefore wish to consider whether it should invest in this type of research with *H. armigera* and/or *H. punctigera* as target species.

Background

Controlling heliothis is an ongoing challenge in cotton. *Helicoverpa armigera* is a particular problem because it is multiply resistant to chemical insecticides and has the propensity to