

PLAIN ENGLISH SUMMARY

This project aimed to estimate the capacity of *Helicoverpa armigera* to develop resistance to INGARD™ cotton, to examine the possibility of cross-resistance to other *Bacillus thuringiensis* (Bt) toxins and to elucidate the mechanism(s) underlying that resistance. We have used several approaches to selecting *H. armigera* for resistance to Cry1Ac, the toxin expressed by INGARD™ cotton. This involved presenting the toxin in two different formulations and selecting insects for the next generation on two different criteria. By the end of the current project we were seeing the beginning of resistance in at least two distinct selection lines. The slow rate at which *H. armigera* developed resistance is encouraging for the industry but has delayed our investigation of cross-resistance and mechanisms.

In parallel with the selection experiments we investigated the potential of various factors to increase the toxicity of Cry1Ac. We have tested the interactions between Cry1Ac and different Bt toxins, some proteinase inhibitors (to reduce the degradation of the toxin), and chitinase (to provide the toxin easier access to the midgut epithelium). There was no interaction between Cry1Ac and Cry1Ab or other Bt toxins that have very slight toxicity for *H. armigera*. Surprisingly, the two most potent toxins (Cry1Ac and Cry2Aa) proved to be antagonistic, although only slightly so and this antagonism is not expected to be evident in pyramided plants. Although the proteinase inhibitors and chitinase showed some effects on growth rate of *H. armigera*, the effects were not large enough to be useful.