Is there cross-resistance between Bt toxins and conventional insecticides?

Lisa Bird[1], Sharon Downes[2]
1. NSW Dept. Primary Industries, Narrabri NSW lisa.bird@industry.nsw.gov.au
2. CSIRO Sustainable Ecosystems, Narrabri NSW sharon.downes@csiro.au

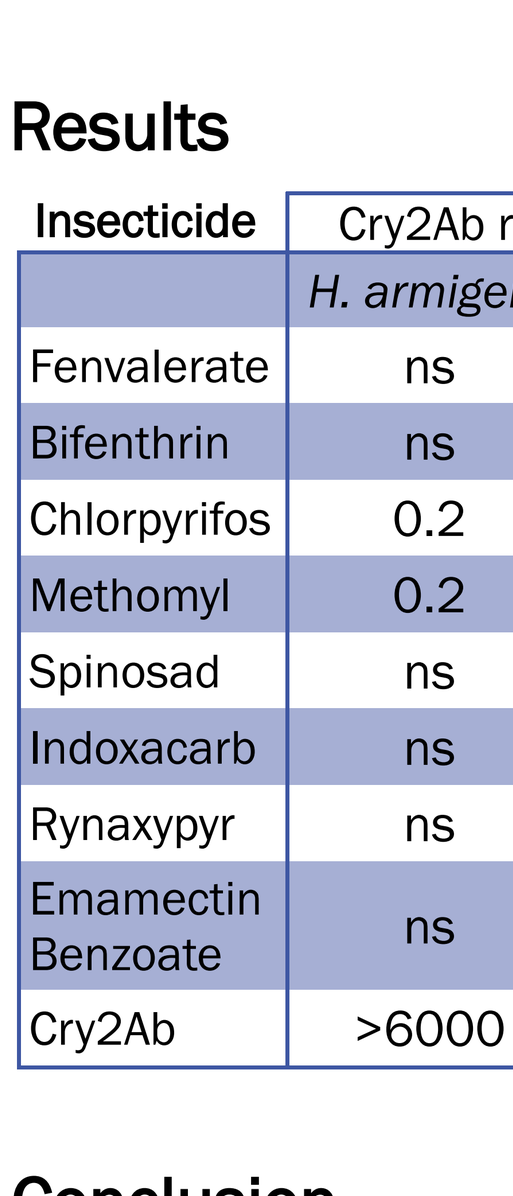
Background

Since the introduction of transgenic cotton in 1996 a robust resistance management plan (RMP) has been in place which works in consort with an insecticide resistance management strategy (IRMS). A key element to the success of this strategy is that insecticidal agents that are deployed together (in stacked Bt varieties) or sequentially (in chemical rotations) are sufficiently different to make it unlikely that resistance to one insecticide will confer cross-resistance to other insecticidal products.

The Issue

A key assumption of Helicoverpa management using conventional sprays and transgenic technology is that insects resistant to Bt toxins will be susceptible to insecticidal sprays, particularly those to which resistance has not developed and are presumably rare in the general population.

A **cross-resistance** study was conducted to determine the response of Bt resistant strains to insecticides currently registered for use on cotton to target Helicoverpa species.



Methods

The responses of Cry2Ab resistant strains of *Helicoverpa armigera* and *Helicoverpa punctigera* that were isolated from field populations using F_2 screens was determined for a range of synthetic insecticides used to target these species.

Results

Insecticide	Cry2Ab resistant strains	
	H. armigera	*H. punctigera*
Fenvalerate	ns	ns
Bifenthrin	ns	ns
Chlorpyrifos	0.2	0.6
Methomyl	0.2	0.4
Spinosad	ns	ns
Indoxacarb	ns	ns
Rynaxypyr	ns	ns
Emamectin Benzoate	ns	ns
Cry2Ab	>6000	>6000

Table 1: Degree of cross-resistance was calculated using a resistance ratio (RR) which compares the response of the Cry2Ab resistant strain with a susceptible strain. Samples for which the 95% confidence intervals did not overlap were considered to be significantly different and the RR is shown. Otherwise the RR is replaced with ns (not significant).

Conclusion

There is no significant cross-resistance between Bt toxins and conventional insecticides. Strains of Cry2Ab resistant *Helicoverpa* spp. were not more resistant to insecticidal sprays than a susceptible strain. In both species Cry2Ab resistant strains were slightly less resistant than a susceptible strain to organophosphate (chlorpyrifos) and carbamate (methomyl).

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