EFFECT OF SUB-LETHAL BT STRESS ON BIOASSAY OF CONVENTIONAL INSECTICIDES IN AUSTRALIAN *HELICOVERPA* SPP.

N.W. FORRESTER, L.J. BIRD & L. FORSELL.

NSW Agriculture, Australian Cotton Research Institute, Narrabri, NSW 2390 Australia.

Larvae of one *Helicoverpa punctigera* and three *Helicoverpa armigera* strains were stressed by feeding early 3rd instars on artificial diet containing 0.015 mg DiPel 2X (32,000 IU/mg) per ml of diet. The percentage of larvae reaching testing size (that is early 4th instars weighing 30-40 mg) by 10 days from the early 3rd instar (weighing < 5 mg) was 65-75% & 90% for *H. armigera* & *H. punctigera* respectively, compared to 99% for the control diet. In addition, those larvae that did survive were about twice as slow to develop from the early 3rd instar to testing size (2.9 & 5.7 days for control and Bt diet, respectively). When larvae reached testing size, they were placed on fresh untreated diet and bioassayed with either fenvalerate, endosulfan or profenofos representing the three major classes of conventional insecticides used against *Helicoverpa* spp. in Australia.

The one *H. punctigera* strain tested was fully susceptible to all three insecticides and there were no significant differences in LC50s for any of the insecticides for larvae fed on Bt or untreated diet. Of the three *H. armigera* strains tested, two were moderately resistant to pyrethroids with low resistance to endosulfan and no resistance to profenofos while the third had moderate resistance to both pyrethroids and endosulfan and low resistance to profenofos. For fenvalerate, the LC50s of the Bt stressed larvae were the same as for larvae on the control diet for one strain, 2.2x higher for another & 2.9x lower for the third. For endosulfan on the two low endosulfan resistance strains, the LC50s of the Bt stressed larvae were 2.5x higher for one and 1.6x lower for the other. For endosulfan on the moderately endosulfan resistant strain, the LC50 for the Bt stressed larvae was

2.4x lower. For profenofos, the LC50s of the Bt stressed larvae were the same for two strains and 1.4x higher for the third.

In most cases, the LC50s of Bt stressed larvae were the same as those for larvae fed on normal untreated diet (six out of twelve possibilities). In the other cases, there were three instances where Bt stressed larvae were more susceptible and another three where they were more tolerant. These relatively minor and inconsistent differences are well within the expected range of variability for bioassay of segregating heterogenous populations with mixed resistance mechanisms (note the lack of variability in the fully susceptible *H. punctigera* strain and for the relatively resistance naive profenofos on *H. armigera*).

These results would seem to indicate that when the effect of Bt inhibition on weight gain is allowed for, that Bt stressed larvae are not more physiologically susceptible to conventional insecticides. Any predisposition to greater mortality to conventional insecticides in Bt stressed larvae is probably through smaller, starved larvae simply requiring lower doses of conventional insecticides to achieve similar mortality levels.

Effect of Bt stress on conventional chemistry assays on *Helicoverpa armigera* and *Helicoverpa punctigera*

		Resistance factors		Bt stressed larvae		
		Control diet	Bt diet	more susceptible	no different	more tolerant
FENVALERATE	*H. punctigera*	1.0	1.0		✓	
	H. armigera colony 1	8.2	18.3			2.2
	H. armigera colony 2	17.0	20.8		✓	
	H. armigera colony 3	54.9	19.2	2.9		
ENDOSULFAN	*H. punctigera*	1.0	1.3		✓	
	H. armigera colony 1	3.0	1.8	1.7		
	H. armigera colony 2	1.4	3.5			2.5
	H. armigera colony 3	122	51.0	2.4		
PROFENOFOS	*H. punctigera*	1.0	1.1		✓	
	H. armigera colony 1	0.8	0.8		✓	
	H. armigera colony 2	0.7	1.0			1.4
	H. armigera colony 3	3.6	3.1		✓	
		TOTAL		**3**	**6**	**3**