IECE 2021
The 1st International Electronic Conference on Entomology
01–15 JULY 2021 | ONLINE
insects MDPI

Comparative susceptibility and sublethal response of a Bt-resistant *Spodoptera frugiperda* population to chlorantraniliprole

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Introduction

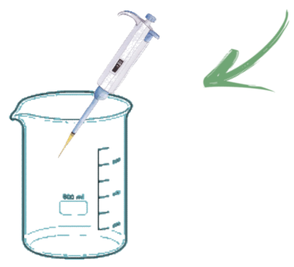
Spodoptera frugiperda larva

The fall armyworm (FAW), *Spodoptera frugiperda* (Lepidoptera: Noctuidae), is an important pest of maize nowadays spread worldwide. In some regions there are FAW populations resistant to some *Bacillus thuringiensis* (Bt) toxins used in transgenic crops. This populations may have altered susceptibilities and post-exposure responses to some insecticides useful for pest management, like chlorantraniliprole.

We determined the lethal toxicity and sublethal effects of chlorantraniliprole to a susceptible (LabSS) and Cry1F-Bt-resistant (RHX11) population of FAW.

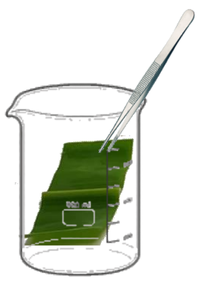
Materials and Methods

Chlorantraniliprole label rate



Serial concentrations

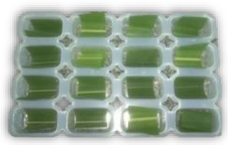
Leaves of non-Bt maize in V4–V9 growth stage



Leaf-dip method

A third instar larva

n= 32 replications



Mortality assessed after 96h

Survivors were weighted and reared on artificial diet

Survival rate to pupation
Development time

Fitness index

Results and Discussion

The LC_{50} value of chlorantraniliprole for the susceptible and resistant population was 0.04 and 0.17 mg/l a.i., respectively. The resistance ratio of the RHX11 population was 4.5, indicating a low level (<10 fold) of resistance to chlorantraniliprole.

Table 1. Comparative susceptibility of a Bt-resistant *Spodoptera frugiperda* population to chlorantraniliprole

Insecticide	Population	N	Slope ± EP	LC_{50} (95% CL)	X^2	P	RR_{50} [1] (95% CL)
Chlorantraniliprole	RHX11	268	6.96 ± 1.93	0.17 (0.14 - 0.19)	5.8	0.88	4.5 (2.8 - 7.3)
	LabSS	284	1.87 ± 0.28	0.04 (0.02 - 0.06)	7.9	0.79	-

Concentration values are in mg/l a.i. in water.
[1]RR_{50}, resistance ratio and its 95% confidence limits using the standard susceptible population (LabSS) as the reference.

The resistant insects had larval weight and fitness index values higher than the susceptible ones at low insecticide concentrations, with a similar decline in the values as the concentration increased. The insects of both populations were all killed at the label-rate concentration.

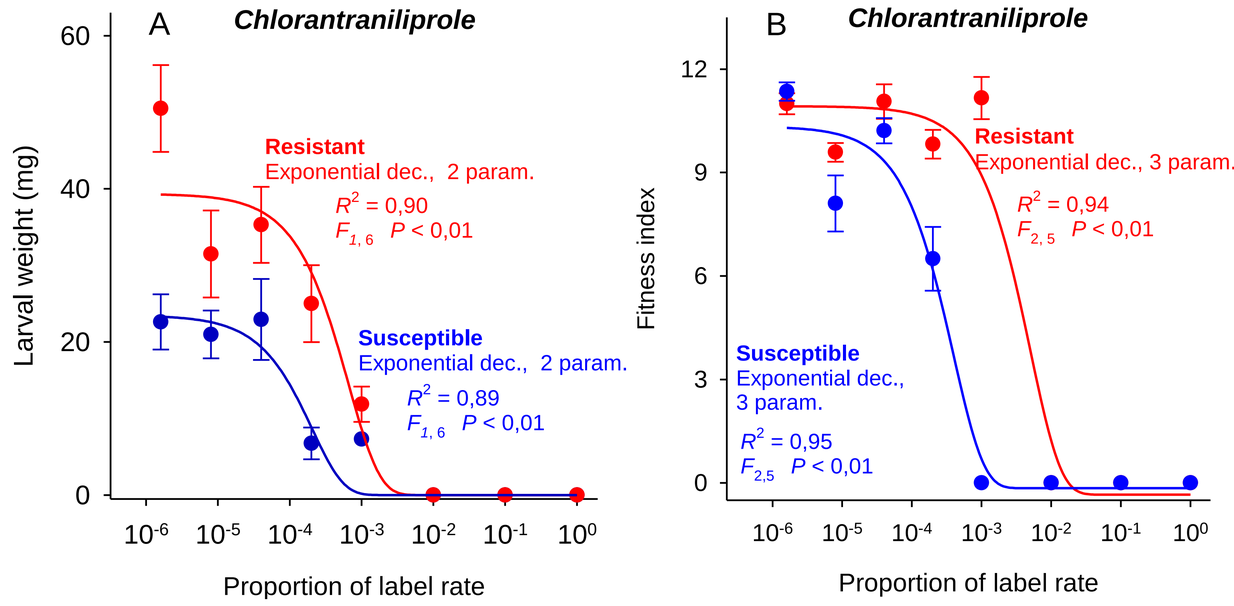


Fig 1. A) Larval weight of larvae exposed to several concentrations of chlorantraniliprole. B) Fitness index as a function of chlorantraniliprole concentration. Data are means ± standard error.

Conclusion

The Bt-resistant insects had lower susceptibility to chlorantraniliprole and a higher post-exposure performance compared to the susceptible ones, but they are likely to be killed when applying the label rate of the insecticide. These results are useful to understand the changes in FAW performance associated with Bt-resistance development.

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