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Susceptibility of Spodoptera littoralis, Field Populations in Egypt to Chlorantraniliprole and the Role of Detoxification Enzymes

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Abstract : The cotton leafworm, Spodoptera littoralis (Boisduval) is a major insect pest of vegetables and cotton crops in Egypt, and exhibits different levels of tolerance to certain insecticides. Chlorantraniliprole has been registered recently in Egypt for control this insect. The susceptibilities of three S. littoralis populations collected from El Behaira governorate, north Egypt to chlorantraniliprole were determined by leaf-dipping technique on 4th instar larvae. Obvious variation of toxicity was observed among the laboratory susceptible, and three field populations with LC₅₀ values ranged between 1.53 µg/ml and 6.22 µg/ml. However, all the three field populations were less susceptible to chlorantraniliprole than a laboratory susceptible population. The most tolerant populations were sampled from El Delengat (ED) Province where S. littoralis had been frequently challenged by insecticides. Certain enzyme activity assays were carried out to be correlated with the mechanism of the observed field population tolerance. All field populations showed significantly enhanced activities of detoxification enzymes compared with the susceptible strain. The regression analysis between chlorantraniliprole toxicities and enzyme activities revealed that the highest correlation is between α-esterase or β-esterase (α-β-EST) activity and collected field strains susceptibility, otherwise this correlation is not significant (P > 0.05). Synergism assays showed the ED and susceptible strains could be synergized by known detoxification inhibitors such as piperonyl butoxide (PBO), triphenyl phosphate (TPP) and diethyl-maleate (DEM) at different levels (1.01-8.76-fold and 1.09-2.94 fold, respectively), TPP showed the maximum synergism in both strains. The results show that there is a correlation between the enzyme activity and tolerance, and carboxylic-esterase (Car-EST) is likely the main detoxification mechanism responsible for tolerance of S. littoralis to chlorantraniliprole.

Keywords : chlorantraniliprole, detoxification enzymes, Egypt, Spodoptera littoralis
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