Negative cross-resistance between Bt transgenic crop and bio-pesticide abamectin in *Helicoverpa armigera*

With the support by the National Natural Science Foundation of China, the research team led by Prof. Wu Kongming (**吴孔明**), at the State Key Laboratory for Biology of Plant Disease and Insect Pests, Institute of Plant Protection, Chinese Academy of Agricultural Sciences, reported recently the negative cross-resistance between a Bt toxin and abamectin mediated by an ABC transporter mutation in a global crop pest *Helicoverpa armigera*, which was published in *PLoS Pathgenes* (2016, 12(2): e1005450).

Evolution of pest resistance reduces the efficacy of insecticidal proteins from the bacterium *Bacillus thuringiensis* (Bt) used widely in sprays and transgenic crops. Recent efforts to delay pest adaptation to Bt crops focus primarily on combinations of two or more Bt toxins that kill the same pest, but this approach is often compromised because resistance to one Bt toxin causes cross-resistance to others. Thus, integration of Bt toxins with alternative controls that do not exhibit such cross-resistance is urgently needed. The team reported that selection of the global crop pest, *H. armigera*, for >1000-fold resistance to Cry1Ac increased susceptibility to the bacterial insecticides abamectin. Whereas previous work demonstrated that the resistance to Cry1Ac in the strain analyzed here is conferred by a mutation disrupting an ATP-binding cassette protein named ABCC2. The new results show that increased susceptibility to abamectin is genetically linked with the same mutation. The results imply that negative cross-resistance occurs because the wild type ABCC2 protein plays a key role in conferring susceptibility to Cry1Ac and in decreasing susceptibility to abamectin. The negative cross-resistance between a Bt toxin and other bacterial insecticides reported here may facilitate more sustainable pest control.

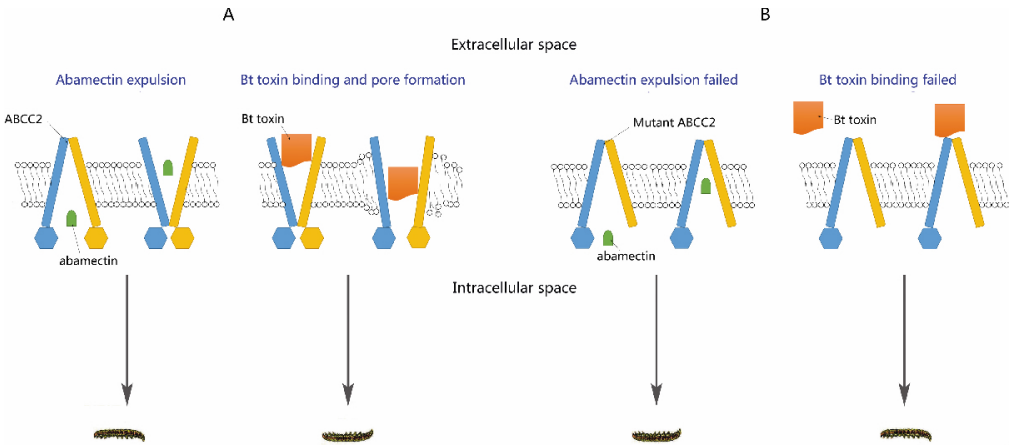

Figure Negative cross-resistance between Bt toxin and abamectin mediated by an ABC transporter mutation in *H. armigera*. A: In the Bt susceptible strain, ABCC2 expulses abamectin and decreases abamectin concentration in intracellular space, which results in the insect resistance to low-dose abamectin. In this case, Bt can kill the insect after ABCC2 binds the toxin. B: In the Bt resistant strain, ABCC2 cannot expulse abamectin and decrease abamectin concentration in intracellular space, which results in the insect susceptibility to low-dose abamectin. In this case, ABCC2 fails to bind the toxin and the insect can survive after feeding Bt.