

SYNERGISTIC INTERACTION OF BIO-ACTIVE REAGENTS WITH BT AGAINST COTTON WORMS

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Abstract

Bt cotton acreage has been increased dramatically since 1996 when the first Bt cotton was introduced. Widespread implementation of Bt cotton applied heavy selection pressure on target insects. Potential evolution of Bt resistance in lepidopteran cotton pests could rapidly decrease the value of this biotechnology. Another potential risk is the shift of pest status. Those originally secondary pests, such as the tarnished plant bug *Lygus lineolaris*, have become major problem in recent years. To prolong the benefit of this biotechnology, alternative control measures should be developed to relieve selection pressure and slow down resistance development among many lepidopteran insects. Another consideration is to make Bt cotton more versatile not only resistant to the lepidopterans but also non-lepidopterans, including those emerging sucking insects.

Many bio-reagents are potent bio-insecticides against wide range of insects, including sucking insects. Several of these reagents directly or indirectly mediate Bt toxicity or specificity. Midgut proteinases are reportedly responsible for Bt resistance development in the Indianmeal moth and the European corn borer. To enhance Bt toxicity and slow down resistance development in target insects, we examined interaction of proteinase inhibitors with Cry1Ac in the tobacco budworm. Our results indicated that applications of Bt with benzamidine, soybean trypsin inhibitor, PMSF, and TLCK could significantly suppress midgut general, tryptic, and chymotryptic activities than Bt-only or inhibitor-only. The combination of Bt and proteinase inhibitor treatment also significantly reduced larval growth. Potential synergism or additive effect of proteinase inhibitor with Bt might be associated with reduction of excessive Bt degradation in the midgut.