INCREASED *HELICOVERPA ZEA* (BODDIE) LARVAL FEEDING ON AN RNAI CONSTRUCT CYP82D109 THAT BLOCKS GOSSYPOL-RELATED TERPENOID SYNTHESIS IN COTTON PLANTS

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Abstract

Glanded cotton plants, *Gossypium hirsutum* L., have long been known to be more resistant to insect pests compared to their glandless counterparts. This resistance has been mainly attributed to the presence of terpenoid aldehydes such as gossypol, hemigossypolone (HGQ), and heliocides in the glands. We previously identified a cytochrome P450 gene in cotton that regulates the gossypol pathway. When expression of this gene is reduced via RNAi, there is a 90% reduction in hemigossypolone and heliocide levels and a 70% reduction in gossypol levels in young leaves compared with its sibling wild-type plants, but these RNAi plants still contain the same numbers of glands and levels of other terpene volatiles as their sibling wild-type plants. Thus, unlike prior insect feeding studies on glandless cotton in which all terpene volatiles and oils are removed, RNAi inhibition of this gene provides a novel way to look at the actual influence of gossypol, HGQ, and heliocides on insect feeding and development. We fed bollworm larvae terminal leaves from RNAi and sibling wild-type plants for 7 or 8 days. At the end of the feeding period, larvae fed leaves from RNAi plants weighed significantly more (approximately 2.4 to 4 times) than those fed leaves from their respective wild-type plants, indicating larvae fed more vigorously in the absence of these defensive compounds. Bollworm larvae were also fed 8-12 mm squares for 7 days. Again, larvae fed squares from RNAi plants weighed significantly more (1.6 to 2.7 times) than those fed squares from the respective wild-type plants. Although this genetic modification would be detrimental from a pest management standpoint, our findings confirm the importance of these defensive compounds in protecting plants from this insect pest. More importantly, we now know which gene to target to potentially increase production of these compounds to enhance cotton resistance to insects.