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DISEASE RESISTANCE CONFERRED BY THE EXPRESSION OF A GENE ENCODING A SYNTHETIC PEPTIDE IN TRANSGENIC COTTON PLANTS

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Abstract

The average annual cotton production loss due to diseases in the United States is about 12% and it is higher in other cotton growing areas of the world. The seedling disease complex, fungal wilt pathogens and boll rots are the major cotton diseases worldwide. Cottonseed is also attacked by the saprophytic fungus, *Aspergillus flavus* that produces aflatoxin. Aflatoxin, one of the deadliest mycotoxins known, is produced by the fungus on other crops as well such as corn, peanuts and tree nuts. The presence of aflatoxin in cottonseed endangers the health of livestock consuming cottonseed meal used in animal feeds and the health of humans consuming milk products from the affected livestock. The objective of our research is to transform cotton with a gene encoding a synthetic antimicrobial peptide (D4E1) in order to prevent or minimize preharvest contamination of cottonseed by the aflatoxigenic fungus, *A. flavus* and provide resistance or tolerance to other phytopathogens. We chose this antimicrobial peptide because synthetic analogs such as D4E1, compared to naturally occurring antimicrobial peptides, offer more target specificity and increased efficacy at lower concentrations. This synthetic peptide has also been shown to inhibit further development of pre-germinated conidia of *A. flavus*, *Fusarium* and other phytopathogens, including bacterial pathogens at low concentrations and to be fairly resistant to degradation by fungal and plant proteases. Moreover, we have demonstrated that crude protein extracts from leaf tissue of transgenic tobacco plants expressing the synthetic peptide D4E1 significantly reduced *in vitro* the number of fungal colonies arising from germinated conidia of *A. flavus* and *Verticillium dahliae* and showed greater levels of disease resistance *in planta* to the fungal pathogen, *Colletotrichum destructivum*, which causes anthracnose. In this study, we report on the development of transgenic cotton lines expressing the synthetic peptide D4E1 with enhanced resistance *in vitro* and *in planta* to several fungal pathogens including *A. flavus*.