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Transgenic approaches to control aflatoxin contamination in maize and cottonseed

The fungus *Aspergillus flavus* infects maize, cottonseed, peanut and tree nut crops and produces aflatoxin, a highly toxic and carcinogenic secondary metabolite. Development of transgenic crops that resist fungal infection is difficult because of the complexity of the host-plant-pathogen interactions and it is more difficult to control saprophytic/opportunistic pathogenic fungi such as *A. flavus*. We have demonstrated in our laboratory, several means of controlling the fungal growth and toxin production in transgenic cotton and maize. These include expression of a heterologous antifungal protein or synthetic peptides. For example, maize transformed with the α-amylase inhibitor protein from hyacinth bean showed reduced fungal growth and aflatoxin levels in kernel screening assays. We have also demonstrated significant anti-flavus activity with several synthetic, lytic peptides such as cecropin-based D4E1 or tachyplesin-based AGM peptides. Transgenic maize lines expressing one of these synthetic peptides AGM 182 showed significant reduction in fungal growth and toxin production (>65%). Transgenic cotton expressing D4E1 also showed antifungal properties and several field tests are being conducted for evaluation. We are currently employing host-induced gene silencing (HIGS) in which the pathogen (*A. flavus*) is directed by the host plant to down regulate the expression of its own gene(s) affecting its growth, invasion and/or toxin production. Significant reduction in both fungal growth and aflatoxin levels was observed in several transgenic maize lines compared to control. In this presentation, examples of various transgenic approaches to control *A. flavus* growth and aflatoxin contamination in food and feed crops will be summarized.

Biography

Kanniah Rajasekaran is a Senior Research Biologist at USDA-ARS. He completed his BS and MS from Tamil Nadu Agricultural University, India. After completing his PhD from The University of Sydney, he has continuously worked on "The application of recombinant DNA technology towards genetic improvement of food, feed and fiber crops". He has published 135 full length publications plus 12 U.S. patents, 50 international patents and 168 national/international conference abstracts. He serves as an Adjunct Professor in five universities. Currently, his research focuses on "Effective control or elimination of preharvest aflatoxin contamination caused by *Aspergillus* spp. through biotechnological means in cotton and maize".

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