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Biological Control of Aflatoxin Contamination in Maize in Africa

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Abstract

Aflatoxin contamination of maize, the major cereal in African diets, is a major risk for health and well being of African people, primarily children. Aflatoxin-producing fungi *Aspergillus flavus* and *A. parasiticus* can infect grains from pre-harvest stages in the field through to post-harvest stages in the stores. Based on past work by IITA and our collaborators, several pre- and post-harvest strategies are being tested to reduce risk of aflatoxin contamination. One of the management strategies being developed is biological control using the competitive exclusion mechanism, which has been successfully implemented on cottonseed in Arizona. Natural population of *A. flavus* consists of toxigenic strains that produce copious amount of aflatoxin and atoxigenic strains that lack the capacity to produce aflatoxin. In the competitive exclusion mechanism, introduced atoxigenic strains out compete and exclude toxigenic strains from colonizing grains thereby reducing aflatoxin production in contaminated grains. We have collected more than 4200 isolates of A. flavus from different agroecozones in Nigeria to identify atoxigenic strains. Until now, we have identified about 50 candidate atoxigenic strains out of 1500 strains screened so far. Twenty-four of these atoxigenic isolates have been tested under field conditions in Ibadan, Nigeria to identify a few effective strains that can exclude toxigenic strains. These atoxigenic strains are being evaluated for a set of selection criteria to further narrow down the numbers to a few for further use in biocontrol field experiments. One of the important selection criteria will ensure that the candidate atoxigenic strains belong to unique vegetative compatibility groups (for which testers have been developed) that are unable to produce toxigenic progenies in the natural environment. Propensity to multiply, colonize and survive are other selection criteria to make sure that few reapplications will be required once the atoxigenic strains are introduced in the environment. Environmental safety of most promising atoxigenics would be also evaluated. Research to develop atoxigenic strains is resource intensive and will further require downstream development activities. Nevertheless, biological control holds promise of offering a long-term solution for reducing aflatoxin contamination in maize.

Keywords: Aflatoxin, biocontrol, competitive exclusion, maize, Nigeria

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