STABILITY OF MODIFIED *ASPERGILLUS FLAVUS* COMMUNITIES: NEED FOR AREA-WIDE MANAGEMENT

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Abstract

Aspergillus flavus, the causal agent of aflatoxin contamination of cottonseed, is a complex species composed of many distinct vegetative compatibility groups. Isolates belonging to different vegetative compatibility groups may produce widely different quantities of aflatoxins. Some naturally occurring isolates of *A. flavus* produce no aflatoxins. Some of these atoxigenic strains have the ability to competitively exclude aflatoxin-producing strains during crop infection and thereby reduce aflatoxin contamination. In both greenhouse and field-plot tests atoxigenic strain efficacy has repeatedly been demonstrated. *A. flavus* communities resident in soils vary among agricultural fields in aflatoxin producing capacity. Field-plot tests suggested that applications of atoxigenic strains may provide long-term reductions in the aflatoxin producing potential of fungi resident in treated fields. Tests to evaluate the longevity of changes to *A. flavus* communities induced by atoxigenic strain applications were initiated in 1996 under an Experimental Use Permit (EUP) issued by the EPA. The experimental program outlined in the EUP called for treatments over a three year period (1120 acres total) and for monitoring the *A. flavus* community from 1996 through 1999. Different treatment regimes were applied to different fields with some fields receiving treatment only in a single year and others receiving treatments in multiple years.

Sterile wheat seed colonized by an atoxigenic strain was applied to 22 fields ranging in size from 10 to 160 acres from 1996 to 1998. The material was applied either by air or ground at the rate of 10 lb. per acre. Crops were treated only once. In order to monitor changes to the composition of *A. flavus* communities, soil samples were collected prior to application each year. From 1996 through 1999 over 8,000 isolates of *A. flavus* were cultivated from soil samples taken from the treatment areas. Isolates were characterized by strain and those assigned to the L strain of *A. flavus* were further characterized by vegetative compatibility analysis in order to determine applied strain distribution.

One year after application, atoxigenic strain incidence was greatly increased and incidence of the highly toxigenic S strain was greatly decreased in all treated and many adjacent fields. The applied strain incidence gradually declined by the second year after application. However, even with this decline, the atoxigenic strain remained in treated fields at levels significantly higher than prior to treatment. The incidence of the applied strain in fields adjacent to treated fields was variable indicating possible directional movement of the strain from treated to untreated fields. In some locations crop and crop stage were apparently important determinants of influences beyond treated fields.

One of three fields treated in 1996 was not subsequently treated. Incidence of the atoxigenic strain went from 1.8% prior to treatment to 96% one year after, 52% two years after, and 47% three years after treatment. Long-term influences on the incidence of the S strain also occurred with a 52% incidence pretreatment and only a 2% incidence three years after application. Overall, the results suggest that long-term useful reductions in the aflatoxin-producing potential of fungal communities can be achieved by atoxigenic strain application.

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