DEVELOPMENTS IN THE USE OF ATOXIGENIC STRAINS OF ASPERGILLUS FLAVUS TO PREVENT AFLATOXIN CONTAMINATION

Peter J. Cotty
Southern Regional Research Center
A.R.S., U.S.D.A.
New Orleans, LA

Abstract

Applications of atoxigenic strains of Aspergillus flavus have been shown to be very effective in preventing aflatoxin contamination of cottonseed in field plot experiments. This has stimulated interest in large scale applications of atoxigenic strains to the commercial crop in Arizona. Losses resulting from unacceptable aflatoxin levels differ over the cotton belt. In Arizona, losses due to aflatoxin contamination have been particularly severe in the 1994 and 1995 crop years. With the help of Dr. Christina Hartman of the IR-4 Biopesticide Program, we have submitted applications (1378 pages) to the U.S. Environmental Protection Agency for an Exemption from Tolerance and an Experimental Use Permit. If granted, the permit will allow treatment of limited commercial acreage in Arizona during the 1996 cotton season.

Economics of aflatoxin contamination will probably dictate the regions in which atoxigenic strains are utilized. We hope to produce materials for atoxigenic strain applications for $5.00 per acre or less. If treatments are 70% effective and an average of 40% to 70% of seed is above 20 PPB and the benefit of having aflatoxin free seed is $20 to $40 a ton then growers will gain an average return above an initial $5/acre investment of $0.60/acre to $14.60/acre. Economics may be improved by both long-term and cumulative benefits resulting from strain ability to remain in fields until the next crops are planted. Benefits may also arise from the applied atoxigenic strains remaining with the crop until use and thus preventing increased contamination during transit and in storage at dairies.

Just as dust doesnt stay in the field in which it is raised, fungi do not stay in the field to which they are applied. Thus, over time, applications may reduce contamination in an area as a whole. This may facilitate the development of either gin wide or community wide management programs. In areas where multiple crops are affected by contamination (i.e. corn, cotton, and peanuts), treatments to one crop may benefit all crops. The economics of applications in such areas may be complex.

Development of a product based on atoxigenic strains and sold as an agrochemical would probably be the simplest course to producing an aflatoxin control product. However, the initial market for atoxigenic strain products may be too small to warrant significant investment by an agrochemical company. Alternatives to development by an agrochemical company may include development of Pest Control Districts. Advantages of such programs may include tailoring tailoring the atoxigenic strains and formulations to specific regions, increased cost effectiveness, and development of mechanisms for funding the monitoring of fungal populations.

Regardless of the means of intervention employed, there will be fungi associated with crops. Dead, weakened, and partially decayed plant tissues are readily available in agricultural environments, and it is not feasible to prevent utilization of these resources by fungi. A level of control over which fungi become associated with crops may be permitted by seeding select fungal strains into agricultural fields. This selection of fungal strains may allow us to alter the vulnerability of all crops grown in a treated area to aflatoxin contamination.

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