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[Received April 15, 1982]

Seed Viability and Aflatoxin Production in Individual Cottonseed Naturally Contaminated with *Aspergillus flavus*

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ABSTRACT

Individual cottonseed naturally contaminated with *Aspergillus flavus* Link were tested for viability and assayed for aflatoxin B_1. Of the 55 infected seeds tested, less than half (21) germinated normally, a rate much lower than expected for uninfected cottonseed. Aflatoxin levels in the seeds varied from below 300 ng/g to over 100,000 ng/g of seed. Statistical analyses indicate that the presence of aflatoxin is correlated with poor germination in cottonseed naturally contaminated with *A. flavus*.

Aflatoxin contamination of cottonseed is associated with field invasion by *Aspergillus flavus* Link (1). Lee and Russell found that seeds containing aflatoxin were randomly distributed throughout infected locks with generally no more than 2 or 3 of the 7-10 seeds per lock affected (2). It has recently been shown that maize seeds naturally contaminated with aflatoxin germinate poorly (3). The present study was undertaken to determine whether seed viability could be correlated with *A. flavus* infection and to determine whether toxin production could influence seed viability.

Seeds from locations in seven states including Alabama, Arizona, Arkansas, New Mexico, South Carolina, Tennessee and Texas were thoroughly delinted in sulfuric acid and surface sterilized in a solution of 2% sodium hypochlorite and 0.001% Triton X 100 for 2 min, rinsed three times with sterile deionized water and placed on potato dextrose agar plates. The seeds were incubated for seven days at room temperature, and only those found to be naturally contaminated with *A. flavus* were selected for use in this study. Seed viability was determined by the presence of a normal hypocotyl. Visible external fungal growth was removed from the seed and the individual seeds were analyzed for aflatoxin (4). A small plug of agar (approximately 1 cm^2) adjacent to the seed was also analyzed for aflatoxin by the same method. The Chi Square test was used to determine the significance of the differences observed.

Of the 55 seeds examined, 21 germinated normally. This is a germination rate of only 38%, much lower than the 90% rate expected for uninfected cottonseed under the same conditions (5). Eight of the 21 (38%) viable seeds contained aflatoxin, whereas 24 of the 34 (71%) nonviable seeds contained aflatoxin. Significant differences (P=0.05) in viability exist between seeds infected with toxigenic strains and those infected with nontoxigenic strains. Aflatoxigenic isolates of *A. flavus* were more likely to be found in nonviable than viable seed. The cause-effect relationship of this correlation remains to be established.

All isolates that produced aflatoxin in the agar also produced it in the seed. If the infecting fungus was toxigenic, viability of the infected seed did not prohibit aflatoxin production. However, only five of the seeds contained aflatoxin levels above 100,000 ng/g of seed. All of these were from nonviable seeds. All other aflatoxin positive seeds contained levels below 300 ng/g. The low levels of aflatoxin found in these seed as compared with levels detected in individual cottonseed in other studies (2,4), might be explained by differences in the extent of the fungal invasion into the seed. Studies examining this possibility are currently underway.

ACKNOWLEDGMENTS

We appreciate the cooperation of T.E. Russell, University of Arizona; C.W. Smith, University of Arkansas; P.E. Hoskinson, University of Tennessee; W.C. Johnson, Auburn University, AL; J. Gannaway and G.A. Niles, Texas A&M University; T. Culp, USDA-Cotton Production Research Unit, Florence, SC; and N. Malm, New Mexico State University, in providing the samples.

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[Received June 18, 1982]