

## **Refinement of an Aflatoxin Prediction Model Using Field and Greenhouse Data to Elucidate Physiological Mechanisms of Aflatoxin Contamination in Peanut**

**S. K. McAMIS\***, D. L. ROWLAND, B. L. TILLMAN, Agronomy Department, The University of Florida, Gainesville, FL 32611; K. MIGLIACCIO, K. BOOTE, G. HOOGENBOOM, Department of Agricultural and Biological Engineering, The University of Florida, Gainesville, FL 32611; C. BUTTS, M. LAMB, National Peanut Research Lab, Dawson, GA 39842.

Weather, irrigation and aflatoxin concentration data collected over a twelve year period from a peanut irrigation experiment conducted at the USDA-ARS Multi-crop Irrigation Research Farm in Shellman, GA was used to evaluate the performance of the CROPGRO-Peanut-Aflatoxin module of the Decision Support System for Agrotechnology Transfer (DSSAT) crop model. The model's performance of yield and aflatoxin prediction was evaluated by using the Root Mean Square Error (RMSE), index of agreement (d-statistic) and the  $R^2$  of plotted simulated versus observed values. DSSAT's soil temperature module was also examined and compared to the Erosion/Productivity Impact Calculator (EPIC) soil temperature module and to the daily measured soil temperature at 5 centimeters from the field. For yield, DSSAT-CROPGRO-Peanut had an  $R^2$  value of 0.75, a RMSE of 778 kg/ha and d-statistic of 0.911. The aflatoxin model had an  $R^2$  of 0.29 and RMSE of 11 ppb. The model predicted increases in aflatoxin concentrations only during periods of drought stress when the soil temperature was in a certain range. However, aflatoxin concentration was over predicted for small values or values of zero. In comparison to DSSAT, EPIC had inferior predictions of both soil temperature and aflatoxin concentration, indicating that the DSSAT module is the preferred option for further model development.

The aflatoxin model will be further refined using the results of an ongoing fine-scale greenhouse experiment. The effect of environmental conditions on aflatoxin contamination will be examined by using direct inoculation with *Aspergillus parasiticus* within the pod zone while tagging pod cohorts weekly and simultaneously monitoring soil moisture, soil temperature and air temperature. The effect of seed age and maturity on aflatoxin contamination will thus be examined. The current findings of this experiment will be discussed.