REGIONAL RECURRING PATTERNS OF S AND L STRAINS OF *ASPERGILLUS FLAVUS*

M. R. Nelson, R. D. M. Bigelow, P. J. Cotty
and T. V. Orum
Department of Plant Pathology
University of Arizona, AZ
USDA/ARS/SRRC
New Orleans, LA

Abstract

The distribution of S and L strains of *Aspergillus flavus* shows a stable structure based on spatial analysis with GIS/ geostatistics, that was not previously realized. This information will be exceptionally useful to programs involved with or planning large scale treatments to reduce aflatoxin threats because it can be used to spatially focus treatments.

Introduction

The *Aspergillus flavus* community at the soil surface is genetically diverse. The community can be sub-divided into two strains (S and L) based on the morphology and growth rate of the sclerotia(Cotty 1989). Because S strains consistently produce large amounts of aflatoxin(>98 %), strain composition at the soil surface will influence the level of aflatoxin in the crop. We have found areas in Yuma County that consistently average above 89 % S strain incidence. A reduction in the S strain incidence in those areas has the potential to reduce aflatoxin contamination in cotton.

Sampling Results

Since 1994, repeated sampling of soil in Yuma County, AZ cotton growing areas has shown that S strain incidence is patchy and that patches persist overtime(Orum et.al 1997). Sampling of fields adjacent to the originally sampled fields in July 1996, October 1996 and March 1997 have demonstrated that patches of low S strain incidence extend beyond field boundaries and do not correspond in an obvious way with the crop in the field or with field crop sequence, Many locations have shown a very stable strain composition over time. For example, samples from the corner of one field in the Texas Hill area of eastern Yuma County, has had an S strain incidence between 80 and 100 % for eight consecutive sampling dates. In another field in the area stain S incidence has been under 35 per cent seven of eight times.

Mapping Strain Incidence

Because S strain incidence is relatively stable over time, strain composition maps of regions will be significant. In July 1997, we began sampling from other locations broadly distributed in the Texas Hill and North Gila areas of Yuma County so that we can better map S strain incidence. The point data can be interpolated using geostatistics to produce either grid cell maps or contour maps. Variogram analysis shows a strong spatial autocorrelation with a range of 2.5 to 3.5 kilometers. This supports the appropriateness of the geostatistical approach to the mapping and is a refinement on our previous estimate of important spatial structure between 1 and 5 km using the nested ANOVA's. Using July 1997 data, we have generated preliminary sub-regional maps of the Texas Hill area. Much of the area averages over 60 % S strain with a significant subset averaging over 80 %. However, there are three patches that average below 60 %.

Using geographic information systems(GIS) software, we can overlay S strain incidence contours onto USDA SCS soil maps. The patches of low S strain incidence are in different soil types and the highest S strain incidence areas include diverse soil types. Therefore , our analysis soil characteristics needed to go beyond the USDA SCS soil classification scheme. In collaboration with a soil scientist, Dr. Donald Post, forty six soil samples taken from the same sites as samples for analysis of strain composition have been analyzed. Preliminary results indicate a negative correlation between S strain composition and boron concentration and a positive correlation with sand content.

Discussion

Knowledge of the distribution of S strain composition and/or soil characteristics that support high populations of S strain can be very useful in focusing the application of control measures such as the atoxigenic biocompetitive L strain now being applied experimentally on over 500 acres of Arizona cotton.

References

Cotty, P. G. 1989. Virulence and cultural characteristics of two *Aspergillus flavus* strains pathogenic on cotton. Phytopathology 79:808-814.

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