SPATIAL VARIABILITY OF SEEDLING PATHOGENS AND DISEASES ON COTTON; INFLUENCE OF SOIL FACTORS AND CULTURAL PRACTICES

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Abstract

Seedling disease pathogens are common in cotton fields and affect the germination, emergence, and early season growth and development of the crop resulting in low and variable stands and reduced yields. The seedling disease complex is caused by the soilborne pathogens *Thielaviopsis basicola*, *Rhizoctonia solani*, *Fusarium* spp., and *Pythium* spp. With the increasing costs of seed from the products applied to the seed and technology fees, the reduction of planting rate would be advantageous. However, the necessity of seedling emergence is greater with this management strategy. The objective of this study was to examine the spatial distribution of these pathogens and seedling diseases to predict areas of fields with high disease potential for site- specific management. In order to accomplish this goal, 4 row plots 15.24 meter long were planted in 5 passes 10 plots deep to represent the field examined. Each 4-row plot had a row treated with one of the four fungicide seed treatments (1) Vortex + Spera + Allegiance + Evergol Prime + Evergol Energy (0.08+1.8+1.5+0.32+2.0 oz/cwt), (2) Allegiance FL (1.5 oz/cwt), (3) RTU-PCNB (14.5 oz/cwt), and (4) no fungicide treatment. All 4 seed treatments were treated with $CaCO_3$ + Secure + Color + Gaucho 600 (7.0 + 10. + 12.78 oz/cwt). For each plot, soil temperature and soil moisture was recorded 1 and 5 days after planting. Disease data included *T. basicola* soil population, black root rot incidence, and hypocotyl and root discoloration ratings. Plant data included stand counts, skip index, and yield data for each treatment in a plot. Exploratory spatial data analysis techniques were used to observe spatial distributions of sets of data and then use spatial regression models to determine correlation between aggregated sets of data. The data for 2014 found *T. basicola* inoculum to be spatially aggregated in the cotton field in Northeast Arkansas and significantly associated with areas of the field with lower soil temperatures (P= 0.018). Increased black root rot disease incidence caused by *T. basicola* was also significantly associated with areas of the field with lower soil temperatures (P= 0.012). Rows in the field planted without a fungicide treatment were found to have lower stand in areas with lower soil temperature (P< 0.0001), and rows planted with seed with a complete fungicide seed treatment were also found to have lower stand counts in areas of the field with lower soil temperature (P< 0.0001). Minimal soil temperature over the study site 1 day after planting ranged from 20.2°C to 21.5°C, and 5 days after planting ranged from 21.7°C to 22.5°C. This study suggests that seedling disease pressure varies within a field. Seedling disease severity increased in areas of the field with lower minimal soil temperatures as indicated by black root rot disease incidence, hypocotyl and root discoloration, and plant stand among different seed treatments. This research suggests that environment is an important component for prediction of seedling disease pressure and could be used to predict disease among and within cotton fields.