RESPONSE OF COTTON VARIETIES TO INOCULATION WITH XANTHOMONAS AXONOPODIS PV. MALVACEARUM IN MISSISSIPPI B.R. Golden T.W. Allen Delta Research and Extension Center Mississippi State University Stoneville, MS S. Lu Mississippi State University Mississippi State, MS P. Thaxton G.L. Sciumbato Delta Research and Extension Center Mississippi State University Stoneville, MS

Introduction

Bacterial blight (angular leaf spot) of cotton, caused by *Xanthomonas axonopodis* pv. *malvacearum (Xam)*, has historically been a devastating foliar disease. The disease has been reported to occur in most cotton producing areas throughout the world (Bird, 1986; Verma, 1986) and is the primary reason for widespread adoption of acid-delinted seed. In general, *Xam* can cause a seedling blight, leaf spot, lesions on stems, petioles, and bolls, as well as a boll rot. In severe cases, bacterial blight infection in susceptible varieties results in defoliation and a reduction in plant height. During elongated periods of environmentally conducive conditions, large yield reductions in addition to poor fiber quality can be observed. Depending upon the level and timing of infection and prevailing environmental conditions, secondary spread of the pathogen can occur either naturally or mechanically. Bacterial blight inoculation trials of commercially available varieties have been conducted in the field for the past five years in Stoneville, MS. However, in an attempt to further our knowledge regarding the pathosystem, yield and cotton quality variables in addition to field-level disease ratings were considered important in 2011. The main objective of the project was to determine the reaction of 22 commercially available cotton varieties to bacterial blight inoculation in field challenge trials.

Materials and Methods

The experiment was established at the Delta Research and Experiment Station near Stoneville, MS on May 24, 2011 in a conventionally tilled seedbed. The trial was arranged as a split-plot design. Whole plots were defined by inoculation strategy (inoculated vs. non-inoclulated). Each whole plot was separated by a 12 row border for isolation purposes. Sub-plots consisted of varieties arranged in a randomized complete block with four replications. Sub-plots consisted of two 40 in rows of cotton approximately 40 ft long. The inoculated whole plot was inoculated with four isolates of race 18 of the bacterial blight pathogen mixed in sterile distilled water and included 1.25% of a silicon-based adjuvant applied as Dyne-Amic (Helena, Inc.). The inoculum was applied to the abaxial side of leaves using a tractor mounted layby sprayer at 150 PSI pressure to force the inoculum through the leaf stomata. Fourteen days post-inoculation, plots were visually examined for disease symptoms. Ratings were based on a modified 0 to 9 scale where 0 was indicative of plants not exhibiting disease symptoms or defoliation as a result of bacterial blight, 5 was indicative of mid to upper-canopy infection and some defoliation, and 9 was indicative of total defoliation. Final plant height was collected immediately prior to harvest. Lint yields were determined by mechanical harvest and hand-picked boll samples. Twenty-five bolls were harvested from each plot for fiber determination and HVI analysis; thereafter all plots were harvested mechanically. Fiber quality parameters were evaluated by Starlab, Inc.

Results and Discussion

Symptoms of bacterial blight were rampant throughout inoculated plots and aided in determining if varieties were potentially susceptible to the bacterium or resistant. The variety \times inoculation interaction was significant for visual rating 14 d after inoculation (p=<0.0001). Non-inoculated plots never showed visual symptoms of infection with the bacterium. Based on the modified visual rating scale, 17 of the 22 varieties were determined to be susceptible to the bacterium with occasional symptoms present on leaves of the resistant varieties but no complete defoliation. Seed

index, or the weight of 100 fuzzy cotton seed was also influenced by the significant variety \times inoculation interaction (p=0.0147). In general, plots that received inoculation produced a seed index weighing less than the plots that did not receive inoculant. Averaged over varieties, seeds from inoculated plants weighed 0.6 g less than seed from non-inoculated plots.

The variety × inoculation interaction was not significant for plant height, lint yield, individual boll weight, or fiber micronaire (p values >0.10). However, each measurement was significantly influenced by the main effect of inoculation and variety. For practical purposes, differences influenced by the main effect of variety will not be discussed. Final plant height was dramatically reduced when comparing plots that received or did not receive inoculation. Averaged across inoculated varieties, final plant height was reduced approximately 23% when compared with non-inoculated varieties. Plant height averaged 41 and 52-inches across varieties for inoculated and non-inoculated plots, respectively. Lint yields were consistently reduced when plots received inoculation. Averaged across varieties, plots receiving inoculation with *Xam* yielded approximately 26% less lint than non-inoculated plots resulting in 214 lb lint/acre lint yield decrease. Individual boll weight was marginally influenced by inoculation, with a 9.3% reduction observed between inoculated and non-inoculated plots, which resulted in approximately 0.5 g difference between non-inoculated and inoculated plots. Micronaire was increased by 0.19 (g/tex) or 4% when comparing non-inoculated vs. inoculated varieties, respectively.

Conclusions

Overall, preliminary data suggest that bacterial blight infection could potentially impact both lint yield and fiber quality to a great extent. Yield reduction in complement with poor fiber quality caused by bacterial blight infection could reduce producer profit margins substantially. Visual ratings positively identified 5 of 22 commercially available varieties that expressed little to no recognizable symptoms of bacterial blight infection. Further research is needed to quantify the tolerance of varieties producing no visual symptoms, and validate reductions in yield parameters for susceptible varieties.

References

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