FOV4 AND FUSARIA CAUSING SYMPTOMS IN COTTON

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Abstract

Pima cotton is widely grown in the El Paso valley in Texas while Upland cotton is more common in the rest of the state. Fusarium wilt is a disease caused by the fungus *Fusarium oxysporum* f. sp. *vasinfectum* (FOV). Races of FOV possess different infection mechanisms. Race 1 and 2 (FOV1 and 2) share an interaction with nematodes such as the southern root knot nematode *Meloidogyne incognita*. In contrast, FOV4 does not require any interaction and is able to infect the host plant directly. Fusarium wilt causes seedling damping off followed by vascular necrosis, leaf chlorosis and wilting. FOV4 was reported in Hudspeth and El Paso counties. Since then, breeding efforts seek to identify, develop, and release pima and upland cotton resistant varieties. This research project seeks to evaluate the influence of variety selection on fungal density in the soil, and how the fungal density impacts the varieties. Four varieties were selected with different reactions to FOV4, two pima DP 357 (susceptible), and PHY 881 RF (resistant); and two upland FM 2334GLT (fair response), and DP 1522 B2XF (moderately susceptible). Vascular necrosis in the roots and stem was scored using a scale 0 (healthy) to 5 (continuous necrosis widely spread). Stand counts were collected at 21 and 56 days after planting (DAP). Soil samples were taken at 0, 56 and 144 DAP. Soil was used for DNA extraction and quantitative PCR using QS3 by Fisher to quantify the fungal DNA. Primer *Tfo* on *PHO* gene developed by Davis and Chappell (2019), were used to amplify FOV4 specifically. Th susceptible pima variety DP 357 had the lowest plant survival rate (17% at 56 DAP), highest root necrosis (2.53) and highest FOV4 quantity (39.59 pg DNA/g soil at 56 DAP). The resistant Pima PHY 881 RF had a high percent survival (72.07 %), lowest vascular root necrosis (0.60) and lowest FOV4 DNA (1.50 pg DNA/g soil at 56 DAP). Intermediate susceptible FM 2334GLT and moderately susceptible DP 1522 B2XF upland had 86.54% and 74.38% plant survival at 56 DAP, respectively. Likewise, root vascular necrosis of 1.11 and 1.71 score, and FOV4 DNA quantity of 2.59 and 9.73 pg DNA/ g soil at 56 DAP, respectively. Overall fungal DNA at planting had no significant differences between varieties, then increased at 56 DAP and decreased by 144 DAP. Plant death was highest at 21 DAP, however a second plant mortality wave was recorded at 56 DAP. PHY 881 RF was the top yielding variety (1739 lint lbs/acre) not significantly different from FM 2334GLT (1734 lbs/acre). Upland variety DP 1522 B2XF yield averaged 1446 lbs/acre. Susceptible pima DP 357 had the lowest yield of 294 lint lbs/ acre. Correlation analysis between stand counts and yield weight resulted in R^2= 0.661. Other *Fusarium* species had been observed to cause vascular necrosis and wilting symptoms. Symptomatic cotton plants were used to isolate *Fusarium*. DNA extraction was conducted followed by PCR using primers for five genes, ITS, calmodulin (CAM), α-EF-1α, RPB2 and LSU (Wang et al., 2011). Phylogenetic analysis was performed using single genes and concatenated. *Fusarium solani* was found in cotton near El Paso county, where both fields are in rotation with peanuts. *F. solani* was reported previously causing cotton wilt in New Mexico. Finally, *Fusarium brachygibbosum* was isolated from infected cotton stems at Dawson county in 2019 and 2020. Pathogenicity tests were inconclusive which suggests that other parameters influence the symptom development. Variety selection is the primary management practice for Fusarium wilt.

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