A RAPID SCREENING METHOD FOR EVALUATING RESISTANCE TO FUSARIUM WILT IN COTTON CAUSED BY *FUSARIUM OXYSPORUM* F. SP. *VASINFECTUM* RACE 4

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Abstract

Fusarium oxysporum f. sp. *vasinfectum* race 4 (FOV4) is an emerging soil- and seed-borne pathogen that causes early season disease including severe root rot and seedling wilt and death. To accelerate breeding and selection for disease resistance to FOV4, it is important to develop an accurate and efficient method for disease resistance evaluation. In this study, seeds from eight cotton cultivars with different levels of disease resistance to FOV4 were germinated on moistened germination paper towels and inoculated with a conidial suspension of a highly virulent local FOV4 isolate using four different inoculation methods, i.e., root dipping, root wounding, paper towel drenching, and seed soaking. Root rot, germination percentage and plant fresh weight were measured one week after inoculation. The results showed that the root dipping method was the ideal method to clearly distinguish the resistant and susceptible cotton genotypes within 2 weeks of seed germination. This early screening method is less costly and requires less time and space and has lower experimental error than field or the greenhouse screenings. Among the eight cotton cultivars tested, DP 359 RF and PHY 881 RF were the most resistant with the lowest root rot; PHY 725 RF, Acala 1517-08 and Acala Daytona were the most susceptible; and Pima DP 357, FM2334 GLT and Acala 1517-18 GLS were intermediate in responses to FOV4. An inoculation test of stems and leaves showed that the leaf and stem were also infected by FOV4 with DSR ranged from 0.52 – 2.70 for the leaf and 0.69 – 2.35 for the stem. It appeared that DSR among roots stems and leaves were not significantly correlated. In another test, 62 commercial cotton cultivars and advanced breeding lines were divided into two replicated trials and screened for FOV4 resistance using the root dipping method. ANOVA detected significant genotypic variation in the two trials for the DSR ($P < 0.001$) and DI ($P < 0.05$ or $P < 0.01$). All cotton lines were infected by FOV4 but showed differential reactions to FOV4 infection, TAM 14B-72, TAMLBB17206 and MS 2010-28-27 in one trial, and Pima PHY 881 RF, Pima PHY 807 RF and NMSI 20-01 in another trial were found to be the most resistant to FOV4. In conclusion, the root dipping method at the seed germination stage is a reliable, fast and effective method for large-scale screening of cotton germplasm for FOV4 resistance.
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