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## **Abstract**

Fusarium oxysporum f. sp. vasinfectum (Fov) is a genetically diverse group of soilborne fungi that causes Fusarium wilt, a widespread and economically important disease of cotton. The discoveries of race 4 of Fov in Texas and new genotypes of Fov in Georgia are serious concern for cotton production in the U.S. Pathogenicity assays based on infested-soil inoculation, infested-soil inoculation with interaction of nematodes, stem-puncture inoculation, and root-dip inoculation assays enabled distinction of two major pathotypes among the U.S. Foy: vascular competent vs. root rot pathotypes. Genetic diversity among all Fov isolates were assessed utilizing vegetative compatibility (VCG) tests and DNA sequence analysis of EF, PHO, BT genes nearing 6kb in combined length. Fifteen VCGs were found among vascular competent pathotype isolates, with the VCG 2 (race 2), 17, and 9 (race 8) as the most widely distributed groups. No VCG 6 (race 6) was found in the U.S. However, VCG 15 and 16 shared identical sequences with VCG 6. In a survey in Georgia, a total of 8 VCGs were found and belonged to vascular competent pathotype, with the VCG17B, 17C and 21 being the most prevalent ones. The vascular competent isolates caused disease in stem puncture assays, but failed to cause disease in the infested-soil assay. When root-knot nematodes were added to the infested-soil assay, these isolates caused severe wilt in 'Rowden'. In contrast, root-rot pathotype isolates caused disease in infested-soil assay in the absence of nematodes, but failed to cause disease in stem-puncture assay, VCG 3 (race 3), 4 (race 4 and 7), and 11 (Australian Biotype) belong to this root-rot pathotype, but VCG 3 and 11 were not found in the U.S. Unlike original Indian race 4 isolates, most of the California race 4 isolates harbored transposable element Tfo1 in the PHO gene. About 46% of Texas race 4 isolates also have this insertion. The remaining 54% Texas isolates contained a further insertion of a mutator-like element MuDR in this Tfo1, as found in 2 China race 7 isolates. Only VCG 4 was found among the collected diseased plants from Texas race 4 fields. These Texas VCG 4 isolates are highly pathogenic to Pima S-7. The presence of two pathotypes in the U.S. requires breeding for nematode resistance for control of vascular competent pathotype and breeding for resistance for Fov 4. Stacking these resistances may enable control of both pathotypes of Fov.