COMPARATIVE ANALYSIS OF INFECTION PROCESS IN COTTON DIFFERING IN RESISTANCE TO FUSARIUM WILT CAUSED BY *FUSARIUM OXYSPORUM* F. SP. *VASINFECTUM* RACE 4

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Abstract

Fusarium wilt, caused by the soil- and seed- borne fungal pathogen *Fusarium oxysporum* f. sp. *vasinfectum* (FOV), is one of the most destructive diseases of cotton. FOV race 4 (FOV4) is a highly virulent pathogen and causes an early season disease including seedling death, threatening cotton production in the US. Understanding the infection mechanism of FOV4 in cotton roots is of both basic and practical importance for disease control. Two Pima cotton cultivars (susceptible Pima S-7 and resistant Pima PHY 841 RF) differing in responses to FOV4 were used to investigate differences in the infection and colonization process of FOV4. Seedlings were germinated and grown in a hydroponic system and artificially inoculated with a local virulent FOV4 isolate. Roots were collected at different timepoints and examined under a confocal and a scanning electron microscope (SEM). Results showed that conidia rapidly attached and germinated on the root surface of the susceptible Pima S-7, forming a dense network of hyphae within 24 hours post inoculation (hpi). However, the resistant Pima PHY 841 RF had significantly fewer conidia attached and germinated on the root surface and less hyphae growth outside of the root. The FOV4 pathogen penetrated into the epidermis of the root at 8 hpi in Pima S-7, whereas this process was delayed in that hyphae were present inside of the root at 24 hpi in PHY 841 RF. At 3 days post inoculation (dpi), hyphae progressed through the cortex intercellularly and intracellularly and then reached the xylem vessels at 7 dpi in Pima S-7, whereas hyphae grew slower and less hyphae were observed in the cortex in PHY 841 RF. The infective hyphae colonized the xylem vessels at 9 dpi in Pima S-7, when wilt symptoms began to appear. However, the growth of hyphae was restricted in the cortex and no apparent hyphae were observed in the xylem system of the root in PHY 841 RF. Moreover, FOV4 re-isolation from the root, stem and junction between root and stem and FOV4-specific PCR detection were performed. Results confirmed that FOV4 moved upward to the stem in Pima S-7; however, they were rarely detected in the stem of PHY 841 RF. These results provided the first glimpse into the infection process of FOV4 with solid evidence that PHY 841 RF and its source of resistance (Pima S-6) is resistant to FOV4, not tolerant as suggested by others without evidence. The results will facilitate our understanding of the resistance mechanism underlying interactions between FOV4 and resistant Pima cotton.