INDUCTION OF PHYTOALEXINS IN SEABROOK SEA ISLAND, PIMA S-7 AND PIMA S-6 COTTONS AFTER INOCULATION WITH *FUSARIUM OXYSPORUM* F. SP. *VASINFECTUM* RACE-4

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Abstract

In 2002, a strain of *Fusarium oxysporum* f. sp. *vasinfectum* was found in California cotton fields and identified as race 4. Stem inoculations with isolates of the California strain (CA Fov-4) do not elicit symptoms in controlled-environmental chamber experiments, while stem inoculations with Fov race 1 (Fov-1) cause foliar wilt symptoms. In contrast, soil inoculation with CA Fov-4 results in extensive root rotting, which is not true for soil inoculation with Fov-1. Thus, we term CA Fov-4 a root rot pathotype, while Fov-1 maybe called a vascular-competent pathotype.

Stem inoculation with a vascular competent defoliating strain of *Verticillium dahliae* initiates a series of physiological/biological events in the cotton plant including an increase in the biosynthesis of protective compounds called phytoalexins. In cotton, these induced compounds include the sesquiterpenoids desoxyhemigossypol (dHG), hemigossypol (HG), and their 6-methylated derivatives desoxyhemigossypol-6-methyl ether (dMHG) and hemigossypol-6-methyl ether (MHG). When the resistant cotton Seabrook Sea Island (SBSI) (*Gossypium barbadense*) is stem inoculated with *V. dahliae*, the concentrations of these terpenoids increase more rapidly than they do in a susceptible cotton. While both resistant and susceptible plants produce phytoalexins in response to infection, the resistant plants respond to the pathogen more quickly than do susceptible plants, as evidenced by a rapid increase in the concentration of phytoalexins.

Soil inoculation with CA Fov-4 in controlled-environmental chambers has established that SBSI has resistance similar to that of *G. barbadense* resistance standard, PhytoGen 800. *G. barbadense* Pima S-6 also shows good resistance to CA Fov-4. It is not known if the resistance in Pima S-6 and that in SBSI are due to the same genes; the phytoalexin response of Pima S-6 to pathogen inoculation has not been reported. To determine if both SBSI and Pima S-6 resistance to Fov-4 is due to rapid response to the infection, SBSI, Pima S-6 and susceptible *G. barbadense* Pima S-7 were stem inoculated with CA Fov-4 and the levels of phytoalexin sesquiterpenoids in the stem stele were determined. The concentration of individual phytoalexins and total phytoalexins in SBSI plants were significantly higher after 24 and 48 hr than in either resistant Pima S-6 or susceptible Pima S-7. After 24 hr, the concentration of HG and total terpenoids was significantly higher in the more resistant Pima S-6 compared to the susceptible Pima S-7. Notably, the concentration of phytoalexins in resistant Pima S-6 and susceptible Pima S-7 were not significantly different 48 hr after inoculation.

These preliminary results support the hypothesis that the early response to the pathogen and the resulting induced phytoalexin biosynthesis is different in SBSI than that in Pima S-6 and Pima S-7. If, SBSI expresses a different response, additional or other resistance inducing genes could be combined with resistance genes in Pima S-6 or with other sources of resistance to this pathogen.