XYLELLA FASTIDIOSA INFECTION OF GRAPEVINES AFFECTS XYLEM LEVELS OF PHENOLIC COMPOUNDS AND PATHOGENESIS-RELATED PROTEINS

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ABSTRACT

Pierce's disease (PD), caused by the xylem-dwelling pathogen *Xylella fastidiosa* (*Xf*), is a serious threat to grape production. The effects of *Xf* infection six months post-inoculation on defense-associated proteins and phenolic compounds found in xylem sap and tissue were evaluated. Defense-associated protein (peroxidase, polyphenol oxidase, exo-chitanase, and beta-1,3-glucanase) levels from xylem sap and ground tissues were compared between non-inoculated and *Xf*-inoculated grapevine (cv. Thompson Seedless) using enzyme kinetic assays. Phenolic compound levels were compared using high performance liquid chromatography (HPLC). Peroxidase activity was greater in infected grapevines, whereas activities of polyphenol oxidase, exo-chitanase, and beta-1,3-glucanase levels were greater in non-infected grapevines. Grapevines infected with *Xf* had greater sap levels of three phenolics, including resveratol, than non-infected controls. Pooled levels of flavonoid glycoside and stilbenoid compounds also were greater in infected than in non-infected grapevine sap. In contrast, levels of phenolic acids and proanthocyanidins were lower in *Xf* infected than in non-infected grapevines. Methanol extracts of ground xylem tissue revealed that infected plants had lower levels of phenolic acids and cell wall macromolecules lignin and tannin. Previous work observed commercially available phenolic compounds found in grapevines significantly reduced *Xf* growth *in vitro* (Maddox et al. 2010). Therefore, reductions in sap and xylem tissue levels of phenolic acids/proathocyanidins observed in *Xf* infected plants may have compromised grapevine defense against *Xf*, allowing PD to proceed despite induction of anti-biotic flavonoids and stilbenoids in response to *Xf* infection. Infection of grapevine with *Xf* could have adversely impacted primary host physiology, resulting in less available host resources for phenolic acid production. Regardless, a better understanding of how *Xf* affects phenolic and defense-associated protein levels in the xylem could aid in the development of management strategies and novel chemistry-based PD detection methods.

REFERENCES CITED

Maddox, C.E., Laur, L.M., Tian, L. 2010. Antibacterial activity of phenolic compounds against the phytopathogen *Xylella fastidiosa*. Curr. Microbiol. 60:53-58.

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