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Legume Root-exuded Phenolics Inhibit Development and Phytotoxin Biosynthesis in *Fusarium oxysporum* f. sp. *cubense* TR4

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Abstract

Banana Fusarium wilt (FW) is a devastating disease caused by the root-infecting fungus *Fusarium oxysporum* f. sp. *cubense* (Foc). Suppression of Foc by intercropping banana with leguminous plants has been suggested as an alternative strategy for managing FW. However, the underlying mechanisms and mode of actions of the tripartite interaction of Foc, banana and legume remain uncertain. Hence, legume root-exuded metabolites that may influence host-pathogen and root-soil-microbiome interactions need to be discovered and their mode of actions unraveled. This study, through hydroponic culture and metabolite profiling, investigated the potential of root-exuded phenolic acids and flavonoids of *Desmodium uncinatum* and *Mucuna pruriens* to inhibit the growth and biosynthesis of virulence factors in Foc tropical race 4 (Foc TR4). Out of 12 metabolites, 4 phenolic acids (benzoic, *t*-cinnamic, *p*-coumaric, *p*-hydroxybenzoic) were common in root exudates of *D. uncinatum* and *M. pruriens*, while *p*-coumaric and vanillin were only detected in *M. pruriens*. The flavonoid quercetin was only detected in *M. pruriens*. Bioassays using synthetic benzoic-, *t*-cinnamic-, or *p*-hydroxybenzoic acid, or a combination thereof, showed a concentration-dependent suppressive effect on Foc TR4. Low concentrations (0.01, 0.1 mM) of phenolic acids inhibited chlamydospore germination, production of macro- and microconidia, and synthesis of fusaric acid, whereas radial mycelial growth and synthesis of beauvericin was promoted in Foc TR4. Mycelial growth of Foc TR4 was only inhibited at high concentrations (1 mM) of benzoic acid, *t*-cinnamic acid, and their combination. Our results highlight a mechanism by which root-exuded metabolites may directly suppress Foc during the earliest stages of pathogen development.

Keywords: Benzoic, *Desmodium uncinatum*, Foc TR4, *Mucuna pruriens*, *p*-hydroxybenzoic, *t*-cinnamic