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ABSTRACT BOOK

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ID343 | Pinus pinaster In Vitro Shoot Volatiles from Genotypes with Varying Susceptibility to Pine Wilt Disease

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Background: The pinewood nematode (Bursaphelenchus xylophilus, PWN) is the causal agent of Pine Wilt Disease (PWD), a major threat to coniferous forests worldwide. Pinus pinaster (maritime pine) displays variable susceptibility to PWN, yet the biochemical mechanisms underlying resistance remain poorly understood. Understanding these mechanisms benefits the development of sustainable control strategies.

Methods: To investigate potential resistance metabolomic markers, we established in vitro shoot cultures of P. pinaster genotypes differing in susceptibility to PWD. Microshoots were inoculated with PWN and monitored over a one-month period. Progression of PWD symptom stages was detailed. Volatile organic compounds (VOCs) emitted during infection were collected using headspace extraction and analyzed by thermal desorption–gas chromatography–mass spectrometry (TD–GC/MS). Non-inoculated (control) samples were also analyzed to assess baseline VOC profiles.

Results: Both genotypes emitted comparable proportions of α- and β-pinene. However, the genotype with lower susceptibility displayed higher levels of limonene. Upon PWN infection, the highly susceptible genotype exhibited PWD symptoms earlier, while the less susceptible genotype demonstrated delayed disease progression. Additionally, the susceptible genotype exhibited a progressive increase in the proportions of α-pinene, β-pinene, and limonene, corresponding with symptom severity. In contrast, the less susceptible genotype showed a decrease in these compounds over the course of disease progression.

Conclusions: These results suggest that VOC emissions may play a role in P. pinaster defense responses, potentially serving as biochemical markers of resistance. The use of in vitro culture systems provided a reproducible platform for studying host-pathogen interactions in a controlled environment. VOC profiling emerges as a promising tool for identifying early resistance indicators, offering valuable insights for breeding and management strategies aimed at enhancing resilience to PWN.

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