# Tomato Leaves Under Biotic Stress: Can We Detect Specific VOC Blends in the Greenhouse?

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**Abstract**

Plants emit specific blends of organic volatile compounds when attacked by herbivores (herbivory-induced plant volatiles; HIPV) or pathogenous fungi (pathogen-induced plant volatiles, PIPV). The majority of previous studies has been conducted under laboratory conditions. Hence, we conducted two greenhouse experiments to investigate specificity and resilience of volatile blends in a more challenging environment. In a comprehensive approach, using solid-phase microextraction (SPME) to collect samples, we detected a total of 89 compounds and gathered very detailed information on constitutively emitted volatiles, HIPV associated with two sap-feeding insect herbivores, Macrosiphum euphorbiae and Bemisia tabaci, and PIPV associated with the biotrophic fungus Oidium neolycopersici. Using orthogonal projection on latent structures discriminant analysis (oPLS-DA), we could distinguish the various blends. This was partly due to absence and presence of certain biomarker compounds, partly due to changed ratios. Our greenhouse experiments confirmed results from laboratory studies regarding species-specificity: distinct B. tabaci-HIPV were emitted from infested plants and their composition changed over time, correlating with the presence of different developmental stages of the herbivore. O. neolycopersici-infection lead to the emission of PIPV distinct from the sap feeder HIPV and from constitutively emitted blends, although they share the majority of compounds. Between the two experiments, HIPV were more similar than constitutive blends, indicating a high resilience of HIPV and high phenotypic plasticity regarding constitutive blends. The latter may be more sensitive to biotic and abiotic changes. Ecologically, a variable constitutive blend may impede detection by herbivores while resilient HIPV blends should support indirect defense by natural enemies.

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