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Understanding of grapevine mechanisms mediated by volatile organic compounds against downy mildew using a metabolomics approach

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Plants can produce a wide variety of volatile organic compounds (VOCs), which can play a crucial role in the regulation of plant responses against stress. Different modes of action against phytopathogens have been attributed to VOCs, such as induction of plant resistance and direct inhibition of pathogen growth. In particular, the amount of some VOCs was higher in resistant than in susceptible grapevine genotypes upon *Plasmopara viticola* inoculation, indicating their possible involvement in resistance mechanisms against this pathogen. This work aims at identifying the metabolic response of VOC-treated grapevine leaves and the potential activation of VOC-mediated resistance mechanisms using a metabolomics approach. Functional analysis confirmed that a sesquiterpene reduced downy mildew severity on susceptible grapevine leaf disks. An untargeted metabolomics approach was applied using ultra-high pressure liquid chromatography-high resolution-quadrupole-time of flight-mass spectrometry (UHPLC-Q-TOF-MS) analysis of leaf disks at one and six days post inoculation. Principal component analysis applied on the features (specified by retention time and mass to charge ratio), discriminated samples according to VOC treatment and time point, indicating global metabolite changes after VOC treatment. Features with significant changes in abundance were identified according to the Kruskal-Wallis test ($P \leq 0.05$) and a fold-change higher than two in at least one comparison. The selected features will be annotated comparing retention times and mass spectra accuracy with different databases. These results will help to improve the knowledge on plant defence mechanisms activated by VOCs, in order to identify active compounds for plant protection against pathogens.