



VIBT
Vienna Institute
of BioTechnology

13th ASAC JunganalytikerInnen-Forum

University of Natural Resources and Life Sciences

12th-13th May 2017 | BOKU Vienna



Book of Abstracts

ASAC
AUSTRIAN SOCIETY OF ANALYTICAL CHEMISTRY

13th ASAC JunganalytikerInnen-Forum – Book of Abstracts

Edited by

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Identification and activity testing of volatile organic compounds (VOCs) found in different grapevine genotypes in response to downy mildew infection

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Vitis vinifera is susceptible to several pathogens including *Plasmopara viticola*, the causal agent of downy mildew (1). American grapevine species are resistant or tolerant to *P. viticola* and breeding programs have introduced resistance traits to susceptible cultivars. Although grapevine resistance mechanisms against downy mildew have been widely characterized in resistant genotypes (1), the possible contribution of volatile organic compounds (VOCs) was not yet investigated. The aim of this work was the characterization of VOCs produced by resistant and susceptible grapevine genotypes in response to *P. viticola* inoculation, in order to identify VOCs associated to grapevine resistance against downy mildew. The susceptible *V. vinifera* cultivar Pinot noir, and the resistant genotypes Kober 5BB, SO4, BC4 and Solaris were grown under greenhouse conditions and they were subsequently inoculated with *P. viticola*. Leaves were harvested immediately before (T0) and six days (T1) after inoculation, and the lower disease severity in resistant genotypes as compared with Pinot noir was confirmed. A headspace-solid-phase microextraction-gas chromatography-mass spectrometry (HS-SPME/GC-MS) approach was used to analyze VOCs from the five studied genotypes. GC-MS chromatograms showed specific VOC emission profiles of the four resistant genotypes as compared with Pinot noir at T1. VOCs specifically found in resistant genotypes were selected, and pure compounds were tested against *P. viticola* sporangia by leaf disk assays. Particularly, four sesquiterpenes, one C5 aldehyde, one terpenoid, one alcohol and one heterocyclic compound were tested in liquid suspension with *P. viticola* sporangia and significantly reduced downy mildew symptoms on Pinot noir leaf disks. Moreover, four of these VOCs were tested in air volume and displayed significant reduction of downy mildew symptoms demonstrating that VOCs could play an important role in the resistance against downy mildew by direct toxicity against *P. viticola* sporangia.

References

1. Gessler C., Pertot I., Perazzolli M. Phytopathol. Mediterr. 50 (2011) 3-44.