Oral presentations

Grapevine *Rpv3-, Rpv10-* and *Rpv12*-mediated defense responses against *Plasmopara viticola*

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Abstract

The high susceptibility of European grapevine varieties (*Vitis vinifera*) to downy mildew (*Plasmopara viticola*) leads to intensive use of fungicides in viticulture. To reduce the use of fungicides, resistance loci from wild *Vitis* species have been crossed into *Vitis vinifera* varieties. The resulting new fungus-resistant grapevine cultivars (FRCs) represent an important tool for reducing pesticide applications in viticulture. Due to variety-specific resistance differences, little is known about the type and timing of the plant defense responses mediated by different resistance loci. Since the long-term goal of resistance breeding is to pyramidize several resistance loci, these should be based on different resistance mechanisms to increase the durability of the resistance. Therefore, detailed knowledge of the different defense mechanisms and resistance genes conferred by the respective *Rpv*-loci is essential to ensure sustainable resistance management and durable as well as stable resistance breeding.

Therefore, the resistance mechanisms mediated by the *Rpv10-*, *Rpv3-* and/or *Rpv12*-loci on downy mildew development, sporulation ability, onset of programmed cell death (PCD), production of hydrogen peroxide and stilbene levels were evaluated and compared. Furthermore, resistance-breaking isolates were used as a tool to additionally evaluate whether the resistance loci are based on different mechanisms. In order to understand the mechanistic basis of the defense responses mediated by the *Rpv12*-locus, cultivars containing this locus were examined in more detail.

The experiments revealed an early and locally precise defense response in *Rpv10-*, *Rpv12-* and *Rpv12/Rpv3*-genotypes, whereas a delayed defense response in *Rpv3*-genotypes was observed. These temporal differences correlated with an increase in the *trans*-resveratrol level and the formation of hydrogen peroxide shortly before onset of PCD. The differences in timing of onset of *Rpv*-loci specific defense reactions following downy mildew infection could be responsible for the observed differences in hyphal growth, sporulation and cultivar-specific susceptibility to this pathogen in the vineyard. Regarding the *Rpv12*-locus described first by Venuti et al. 2013, we were able to further narrow down the region, which confers resistance by new resistance markers. In this reduced region 10 putative disease resistance *R*-genes were found and are analyzed bioinformatically.

Keywords: Disease resistance, Downy mildew, Grapevine, *Rpv12*, *Rpv10*, *Rpv3*, *Vitis vinifera*, Stilbenes, *Plasmopara viticola*