Studies on the resistance locus *Rpv12* against downy mildew of grapes (*Plasmopara viticola*)

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Plasmopara viticola, a heterothallic obligate biotrophic oomycete, is the causative agent of grapevine downy mildew, a widespread severe disease. In 1878 *P. viticola* was imported from North America to Europe, together with grape phylloxera resistant rootstock vines. Since then, the pathogen has caused considerable yield losses. The pathogen hibernates in leaf debris and soil as sexual oospores. In spring, oospores germinate at a temperature above 11 °C and form macrosporangia. Under wet conditions, macrosporangia liberate flagellated zoospores. With the rain, zoospores are splashed to the leaves onto the lower surface, where they can reach the stomata to cause infection. After 5-9 days yellow lesions called „oil spots“ appear on the upper site of the leaf surface. Under suitable weather conditions (high humidity and 20-25 °C) *P. viticola* sporulates and a secondary infection starts. Because *P. viticola* causes a high crop loss annually, research and breeding of resistant grape varieties is essential for sustainable viticulture. Only with precise knowledge of the resistance mechanisms and the genetic location of resistance factors a targeted breeding it is possible to reduce the annual amount of consumed pesticides. In2013 Venuti *et al.* identified the resistance locus *Rpv12* using QTL analysis of *Vitis amurensis*. *V. amurensis* is native to the cool climates of the Far East (China and Russia) and shows resistance against *P. viticola*. In the early 20th century the asiatic species *Vitis amurensis* ‘Ruprecht’ was crossed with *Vitis vinifera* ‘*Getsh’* to yield ‘Michurinets’. Other interesting cultivars are ‘Kunbarat’ and ‘Kunleany’. They possess resistance characteristics due to *Rpv12.* This locus was detected on Chromosome 14 and is inherited independently of other resistance loci. Within the locus *Rpv12* 12 NBS-LRR genes (coiled coil-nucleotide binding site – leucine rich repeats) have been identified within the reference genome (PN40024). An additive effect with *Rpv3* was detected, since *Rpv12* confers a foliar resistance to strains that are virulent on *Rpv3* cultivars. For identification of the responsible gene for the resistance, we compare susceptible grapevine with resistant cultivars by leaf disc assay and light-, fluorescence- and cryo scanning electron microscopy. The aim is to identify physiological responses of the cell. These investigations should reveal molecular mechanisms and the candidate genes involved, which shall be further evaluated by amplification, comparative sequencing and gene expression analysis.

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