11th Young Scientists Meeting 2018, Braunschweig, Germany, November 14-16

Müllner et al.

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

<u>Sophia Müllner</u>, Reinhard Töpfer and Eva Zyprian Julius Kühn Institute, Institute for Grapevine Breeding, Siebeldingen E-mail of corresponding author: eva.zyprian@julius-kuehn.de

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.