Non-targeted analysis of the grapevine leaf metabolome

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Powdery mildew of grapevine (*Plasmopara viticola*) is a commonly occurring disease in the temperate climate of northern Europe. It infests leaves as well as grapes. Powdery mildew was brought to Europe in the 19th century when American grapevine species were imported to control the grapevine phylloxera in France. These species are partially tolerant to or even resistant against powdery mildew. In contrast, cultivars of the European grapevine *Vitis vinifera* are strongly affected by *P. viticola*. If untreated, it can cause severe decrease in harvest yield.

Thus, comparing the leaf metabolome of different *Vitis spp.* may give better understanding about the resistance mechanisms and may lead to new resistance biomarkers. The focus of the analysis is laid on detecting volatile organic compounds (VOCs), since interactions between plants, fungi, and animals often proceed via volatile signaling and / or defense compounds.

The determination of volatile patterns of grapevine leaves was carried out via a non-targeted analysis approach. The grapevine leaf VOCs were extracted by headspace-SPME and detected by quadrupol MS after gas chromatographic separation. The non-targeted approach ensures that all of the detected metabolites are included in the data processing. Non-targeted methods enable an unbiased processing of metabolic data and prevent inadvertent neglects of unknown or new compounds.

A total of 238 volatile compounds were detected in analyses of the metabolite profile of seven different *Vitis vinifera* varieties and interspecific hybrids at three sampling dates. More than half of these (137) are putatively annotated or identified by now. Interestingly, only a few metabolites like linalool or methyl salicylate occur in all analyzed probes with high concentration. However, most of the metabolites are specific for a certain developmental stage. They are either detected solely in one stage or show higher concentration in a certain developmental stage. For example, the concentration of beta-cyclocitral is high in the first sampling date and is decreased in the subsequent sampling dates.