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## Session 8: Grape and Wine Quality

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### Keynote lecture

#### Oenological traits as targets for grape breeding

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#### Abstract

With the exception of table grapes for direct consumption, most grapes undergo a sophisticated winemaking process to produce typical wines regarding the grape variety itself, geographic origin as well as the use of traditional oenological measures.

Achievements in molecular biology led to the identification and successful implementation of molecular markers for physiological traits such as yield, sugar graduation and improved resistance against fungal diseases in grapevine breeding. However, oenological traits for Quantitative Trait Loci (QTL) analysis representing quality aspects appreciated by consumers and wine experts are still a big challenge.

Only 15 to 20 volatiles are classified as true impact aroma compounds in wine. Among these, only isobutyl-3-methoxypyrazine and  $\beta$ -damascenon exist in their free form in grapes. They are already monitored by large producers to control grape quality. Exotic thiols, floral monoterpenes or volatile phenols however occur in grapes predominantly as odorless precursors. This poses the necessity to study a wide range of complex glycosides, glutathionyl and cysteinyl precursors to assess the aroma potential as well as carotenoids and fatty acids, from which C<sub>13</sub>-norisoprenoids or green C<sub>6</sub>-carbonyls are liberated.

Early grape breeding already addressed the mitigation of grape derived off-flavors such as hybrid related 2-APP or methylantranilate contributing to foxy scents or the petrol note of TDN in Riesling. Anthocyanins and skin tannins are targets for improved red wine quality as well as early lignification of seeds to limit extraction of bitter and harsh polyphenols.

Defining wine quality however, is not as simple as the more the better. In fact, quality requires a large pool of sensory active compounds to enhance complexity, but they have to be in an appropriate balance. For that purpose, the analysis of free and bound aroma compounds, pigments, tannins and acids are complemented by sensory analysis, using trained panels to define distinct sensory profiles and consumers, expressing their preference for the tested wines. Combining both sources allows to determine sensory drivers of preferences or rejection. Comprehensive statistical modelling relates these sensory traits to analytical figures and in a further step to genetic information which in turn will allow to identify QTLs for wine quality aspects such as varietal expression or even specific wine styles. Such advancements will add a new dimension of precision into grape vine breeding.

**Keywords:** aroma compounds, precursor, polyphenols, grape derived off-flavor, sensory analysis, drivers of preference.