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Abstract

Vine age and its relation to the quality of the wine are topics of recurring interest, both scientific and economic. Consumers and actors in the wine sector seem to agree on the ability of old vines to produce wines of superior character. Despite ongoing research, the validity of this point of view remains debated and questions about the mechanisms through which old vines would end up with superior quality wines remain numerous. To try to answer them, the impact vine age on physiology, tolerance to water stress, and berry and wine quality were studied in an experimental vineyard planted with *Vitis vinifera* L. cv. of identical genetic material (Riesling Gm 239 grafted on 5C Teleki) but planted in different years.

In 2014 and 2015, the vines planted in 2012 had not yet reached their full potential and had a significantly lower vegetative productivity and yield than the vines planted in 1995 and 1971. Moreover, the vines planted in 2012 were not subjected to the same grass treatment as older vines during this period to prevent excessive competition during establishment. The lower capacity of these vines and the absence of cover crop led to greater exposure of clusters to light and greater nitrogen accumulation, which resulted in a higher concentration of amino acids, monoterpenes, norisoprenoids, and flavonols in 2014 and 2015. In the following years (2016 and 2017), the yield and pruning weight of these vines, as well as their berry composition, were comparable to those of the older vines. The parameters of technological maturity (° Brix, total acidity and must pH) were not significantly affected by vine age.

Vines planted in 1995 and 1971 showed similar physiological characteristics throughout the study with the exception of a higher incidence of esca syndrome in the older group. This disease was responsible for the decline in the total yield of vines planted in 1971, but individual yield per vine was equivalent for both groups.

Sensory and chemical analyzes were conducted in 2017 on wines from previous vintages. The wines of the youngest vines were associated with aromas of ripe fruit and the kerosene aroma that is typical of Riesling. These wines were also identified by higher concentrations of potential monoterpenes and norisoprenoids and volatile sulfur compounds in 2014 and 2015 only. The sensory and chemical profiles of wines from vineyards planted in 1995 and 1971 were dependent on the vintage but not on the age of the vines. The wine profiles produced in 2016 were overlapping for the three age groups.

The works described in this thesis manuscript are unique, particularly because the vineyard in which they were conducted was designed specifically to study the effect of the age of the vine under comparable environmental conditions. Once the youngest vines reached their fruiting potential and were conducted in the same way as the older vines, their productivity, the composition of their berries and the quality of the wines they produce converged with those of the two other groups. More interestingly, vines aged 19 and 43 years behaved similarly throughout the study and resulted in wines comparable in terms of sensory analysis, which goes against the an idea that the older vines produce wines of a different profile.

Previous studies have shown that the productivity of the vines, whatever their age, could be explained by the wood reserves and the size of the trunk. To have a better idea of differences linked to reserves, the structure-from-motion with multi-view stereo-photogrammetry (SfM-MVS) method was tested to measure trunk thickness and volume. The technique, which allows the creation of scaled, georeferenced 3D models based on photographs, was able to produce accurate models of field-grown grapevine trunks.

Keywords: old vine, water deficit, berry composition, wine quality, sensory analysis.