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Vine vigor components and its variability - relationship to wine composition

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It was pointed out that a high spatial variability for canopy size and yield would exist within a vineyard but a high temporal stability over the years was observed. Furthermore, a greater variability in grape phenolics than in sugars and pH was detected within a vineyard. But the link between remote sensing indices and quality parameters of grapes is still unclear. Indeed, though in red grape varieties anthocyanins content was spatially negatively correlated to vigor parameters, it seemed that yield, Normalized Difference Vegetation Index (NDVI) and Plant Cell Density (PCD) indices were poorly correlated. Moreover, the link to quality parameters of wines remains uncertain. It was shown that more vigorous vines would lead to wines with less tannins while anthocyanins in wines would be highest when the vines were balanced but the question is if vine size or architecture, yield or nitrogen assimilation would play major contribution to those differences. The general scope of our project was to provide further knowledge on the relationship between vigor parameters and wine composition and relate these to the information gained by remote sensing.
Variability in a 0.15 ha vineyard of Pinot noir planted in 2003 and grafted on SO4 rootstock at Geisenheim (Germany) was followed. Vine vigor was assessed manually for each of the 400 vines (cane number, pruning weight, trunk diameter) together with yield parameters (number of bunches per vine, crop yield). Leaf composition was assessed with a hand-held optical sensor (Multiplex3® [Mx3] (Force-A, Orsay, France) based on chlorophyll fluorescence screening providing information on leaf chlorophyll (SFR_G) and nitrogen (NBI_G) content. A microscale winemaking of single vines with a 3 factorial design on yield (L low, M middle, H high), SFR_G (L, M, H) and canopy size (pruning weight, trunk diameter) (L, M, H) was performed for 2013 and 2014 to completely reflect variability.
Wine tannin concentration represented the highest variability with a 11 fold concentration range (50-550 mg CE L-1) while variability of anthocyanins was lower with a 3 fold concentration range (90-250 mg M3OG L-1). The results showed that differences in leaf chlorophyll (SFR_G) would represent the most important factor influencing wine phenolic composition. Measurements of soil resistivity based on ARP technique (Geocarta, Paris, France), leaf composition with a mounted Multiplex providing information on porosity (NFI), biomass (BIOMASS) and chlorophyll (BISFR) together with NDVI assessed by geo-X8000 (geo-konzept-Gesellschaft für Umweltplanungssysteme mbH, Adelschlag, Germany) were performed. Grapes and berry composition was also assessed with Mx3 providing information on anthocyanins (ANTH, FERARI) and sugar (SFR_R) variability. In a second step, vines similar in size (trunk diameter and cane number) and similar yield (number of bunches per vines) were divided in 3 groups differing in leaf SFR_G. A larger scale winemaking (150kg) showed that with increasing SFR_G, Pinot noir wine typicity decreased together with anthocyanin concentration while tannin concentration increased. A better understanding of vineyard variability for targeted management or harvest would allow better understanding to produce and select fruit to a favored wine style.