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VITICULTURE & ENOLOGY
UNIVERSITY OF CALIFORNIA DAVIS

Effect of vertical shoot-positioned, Smart-Dyson, and Geneva double-curtain training systems on Viognier grape and wine composition

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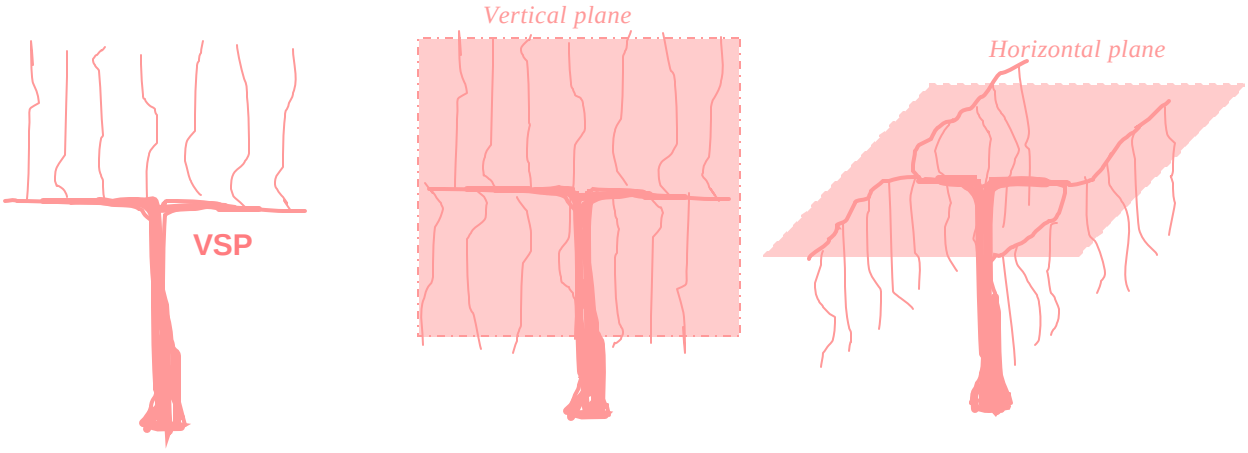
In: American Journal of Enology and Viticulture. 59(1):11-21. 2008

• Viognier has a distinct aroma profile that has been described as apricot, peach, mango, melon and tangerine. The compounds responsible for these descriptors are, among others, *monoterpene alcohols*, such as linalool and terpineol. The quality and quantity of these volatile compounds are influenced by 1) the degree of fruit ripeness, 2) the level of solar exposure, and 3) the temperature in the environment of the grapes as they ripen, which in turn, is greatly influenced by the training system.

• These authors studied the influence of 3 different training systems on Viognier yield, wine composition, and sensory characteristics in the challenging, humid environment of Northern Virginia (mean rainfall of 81 mm; 1900 accumulated heat units). All the systems compared used bilateral-cordon training and spur pruning, deferring only in the positioning of the shoots, as follows:

1) **Vertical Shoot Positioning (VSP):** standard, non-divided canopy
2) **Smart-Dyson (SD):** vertically-divided shoots with both lower and upper shoots originating from the same cordon
3) **Geneva Double Curtain (GDC):** horizontally-divided shoots, oriented downwards.



• In all training systems compared, shoots were thinned after bloom to 12 shoots per meter of cordon for the VSP, GDC, and upper SD canopy, while the lower SD canopy was thinned to 9 shoots/m. The crop load was further regulated in all systems by shoot hedging, shoot tipping, and leaf and lateral-shoot removal. All treatments were harvested within 1°Brix of each other, even if that meant harvesting on different dates, and was mostly based on juice aroma and flavor development. The trial ran for 3 years (2003-2005) and was analyzed as a randomized complete block design, with 3 replicates consisting of one vine row each. Let's see the results.

• **Yield**. 1) **SD vines consistently had the greatest yield** per meter of cordon; with GDC and VSP vines showing much lower yields but comparable to each other. (Yield per vine was similar for both GDC and SD, and much greater than VSP). 2) Crop loads (defined as kilograms of crop per kilogram of pruning weights) ranged from 4-13 for VSP and SD to close to 20 for GDC. As a reference, quality crop loads are usually defined in the 5 to 10 range.

• **Canopy characteristics**. 1) All three training systems had an excess leaf area to crop ratio, with GDC showing the lowest –most normal- values (1.9 m^2/kg of fruit). 2) Regarding leaf area across training systems, GDC had less than VSP, and the lower SD canopy had even less – evidence of the devigorating effect of the downward shoot training. Interestingly, all 3 systems had a greater *secondary leaf area* than they did *primary leaf area* –a reflection of a wet environment. 3) Finally, the greatest light measurements in the fruiting zone were those of GDC and the lower canopy of SD.

• **Fruit chemistry**. The authors measured 2 types of compounds that contribute to a wine aroma/flavor: *glycosides* and selected *volatile compounds* (linalool, a-terpineol, ß-damascenone). 1) **The greatest glycosides levels in berry skins were found in the SD-upper canopy and in the GDC**. Since all treatments were harvested at the same Brix, the authors believe that the greater light interception of the divided canopies (SD, GDC) may have favored glycoside production. This increased glycoside content was also positively correlated with fruit yield per vine. 2) **The greatest levels of volatiles were found in the upper canopy of SD.** The authors emphasize that, in this study, and unlike what others have found, the treatments with the greatest fruit-zone light were not the systems with the greatest juice volatiles. (They do admit they measured light only once). This agrees with the fact that in regions with warm ripening periods, maximal levels of volatiles tend to occur in fruit that receives moderate exposure, rather than full sun.

• **Wine chemistry**. The authors made wine (10 liter) from each treatment in duplicate. The upper and lower canopies of the SD were vinified separately. For each wine, the authors measured basic wine parameters (alcohol, pH, TA, malic acid and tartaric acid) and wine volatile compounds. 1) Differences in basic wine parameters across training systems were small. Still, "SD-lower canopy" did show higher alcohol and lower malic acid than the remaining treatments. 2) Wines produced from the "SD-upper canopy" fruit had, in general, higher levels of the most common volatile compounds.

• **Wine sensory**. The authors performed both *difference tests* (triangles) and *descriptive tests* of the wines. Panelists were regular wine consumers who had attended at least 3 orientation sessions. 1) Wines of vintages 2001 and 2003 showed differences across training systems, whereas 2002 wines did not. Generally, GDC wines differed from SD wines in aroma and flavor. 2) Aroma descriptors tended to be highly influenced by vintage (for instance, the wet, cool 2003 exhibited vegetative aromas, whereas the dry, warm 2004 exhibited more fruity descriptors). In general, GDC wines could be distinguished by their overall aroma intensity, and fruity, sweet vanilla aromas.

(Cont.)

To summarize, I'll reproduce the last sentence by the authors, "Despite the increased yields, GDC and SD-trained vines produced wines of comparable, if not superior, sensory attributes to VSP-trained vines." Once again, VSP failed to be the panacea we once thought. Let's just keep in mind that these types of results are greatly influenced by climate which, in this particular case, was warm, humid, and continental –not the ideal grapegrowing climate.

	Training system with:	**Is:**
VINE	Highest yield/meter	SD
	Highest yield/vine	SD= GDC
	Lowest leaf area	SD(lower) < GDC < VSP
	Lowest leaf area/crop ratio	GDC
JUICE	Highest juice glycosides	SD(upper) = GDC
	Highest juice volatiles	SD(upper)
WINE	Highest wine volatiles	SD(upper)
	Highest aroma intensity, fruit/sweet aroma	GDC

Author: Bibiana Guerra, Editor: Kay Bogart. This summary series funded by J. Lohr Vineyards & Wines.