

## INFLUENCE OF TRELLIS SYSTEM AND SHOOT DENSITY IN YIELD AND GRAPE COMPOSITION OF A VINEYARD OF CABERNET SAUVIGNON, IN WARM CLIMATE

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### Abstract:

**Context and purpose of the study** - In vineyards grown in warm areas, it is usual that the stage of maturity of the grapes is fast and easily reach a high concentration of sugar and low acidity, but not a adequate phenolic maturation. The geometry of the trellis system and the shoot density can modify the microclimate of the cluster and, therefore, the maturation process.

**Material and methods** - In order to know whether, in warm areas, free or semi-free foliage systems are most appropriate to achieve a maturity more balanced than systems with guided foliage, such as the vertical shoot positioned, during 2013 and 2014 developed a test in a vineyard of Cabernet Sauvignon in Albacete (Spain). Comparing two trellis systems – vertical shoot positioned and sprawl -, each of them with three shoot densities - 35000, 55000 and 70000 shoots per hectare-. During maturation were determined the weight of the grape and the basic composition of the must (° Brix, pH and total acidity). Yield components and the grape phenolic components were determined at harvest.

**Results** - In both trellis systems the increased of crop load generated a proporcional increase in yield respect number of shoot, in addition to a delay in maturation, with lower concentrations of sugar and total phenols, and higher acidity. The vineyard in sprawl reached, usually, higher concentrations of sugar, but with equal or lower levels of acidity on vertical shoot positioned, which means a better sugar/acidity balance. The effect of the trellis system on the grape phenolic components was not consistent for the two years of study.

**Key words:** trellis systems, shoot density, yield, berry composition.

### 1. Introduction



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### Introduction & Objective

In vineyards grown in warm areas, it is usual that the stage of maturity of the grapes is fast and easily reach a high concentration of sugar and low acidity, but not a adequate phenolic maturation. The geometry of the trellis system and the shoot density can modify the microclimate of the cluster and, therefore, the maturation process. In warm regions, a large number of exposed clusters result in musts with a high concentration of sugar and lower titratable acidity (Bergqvist et al., 2001). The opposite effect, shaded clusters result in musts with lower concentration of sugar, reduction of anthocyanin concentration and an increase in potassium concentration (Crippen and Morrison, 1986).

The aim of this study was to evaluate the agronomic response of cultivar Cabernet Sauvignon grown in warm areas, after modify the microclimate of the plant by the trellis system (positioned and non-positioned) and shoot density.

### Materials & Methods

The trial were performed in 2013 and 2014 in a vineyard of Cabernet Sauvignon in Albacete (Spain). Comparing two trellis systems – vertical shoot positioned and sprawl –, each of them with three shoot densities – 35000, 55000 and 70000 shoots per hectare.

During maturation were determined the weight of the grape and the basic composition of the must (\* Brix, pH and total acidity). Yield components and the grape phenolic components were determined at harvest.

Statistical analysis was performed using SPSS (SPSS Inc, Chicago, Illinois). All yield data were analyzed by analysis of variance for each of the field treatments. Multiple comparisons were also performed on all data using Duncan's multiple range test at  $p \leq 0.05$ .

Table 1. Experiment design

Training system	Vine spacing	N° Shoots			
		Units	Tto 1	Tto 2	Tto 3
VSP (E)	2x1	aria 1	7	11	14
		aria 3	35.000	55.000	70.000
Sprawl (S)	3x1,2	aria 1	10,5	16	21
		aria 3	35.000	55.000	70.000



Figure 1. Positioned training system - VSP -



Figure 2. Non-positioned training system - Sprawl -

### Results

➤ Yield components: In both trellis systems the increased of crop load generated a proportional increase in yield respect number of shoot. Between trellis systems, higher yields were obtained in Sprawl system, as Reynolds et al. (2004) in different trellis systems with the same load.

➤ Must composition: The increased of crop load resulted with lower concentrations of sugar (\*Brix) and higher acidity (AT) in both trellis systems. Sprawl reached higher \*Brix, but with equal or lower levels of AT on vertical shoot positioned, which means a better \*Brix/AT balance. Kliewer et al. (1997), didn't found different in AT between trellis systems.

### Conclusions

The non-positioned trellis systems improve the microclimatic conditions of the plant in warm zones and allow to reach higher yields and a more desirable grape composition, lower relation \*Brix / AT in harvest, which a priori is desirable in warm areas.

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Table 2. Yield (kg/ha) and cluster weight (g) of Sprawl (S) and VSP (E) with different crop load.

	Yield (kg/ha)		Cluster (g)	
	2013	2014	2013	2014
S1	9.000	8.600	113	134
E1	7.000	5.500	90	87
Sig.	**	**	**	**
S2	16.000	13.600	133	141
E2	13.000	9.700	108	107
Sig.	**	**	**	**
S3	18.000	16.600	130	148
E3	17.000	11.600	115	100
Sig.	ns	*	**	*

Table 3. AT (g/ha), \*Brix and \*Brix/AT of Sprawl (S) and VSP (E) with different crop load.

	AT (g/l)		*Brix		*Brix/AT	
	2013	2014	2013	2014	2013	2014
S1	6,8	7,0	26,0	25,8	3,8	3,7
E1	6,1	7,9	25,6	24,5	4,2	3,1
Sig.	**	ns	ns	ns	*	*
S2	7,0	7,3	25,1	25,2	3,6	3,5
E2	6,0	7,3	24,9	25,4	4,1	3,5
Sig.	***	ns	ns	ns	ns	ns
S3	7,0	7,4	25,1	25,2	3,6	3,4
E3	6,9	7,6	24,7	24,9	3,6	3,3
Sig.	ns	ns	*	ns	ns	ns

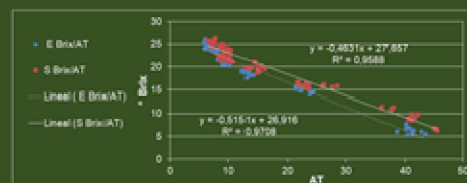


Figure 3. Relation between \*Brix and AT in Sprawl (S) and VSP (E)