Effect of row direction in the upper part of the hillside vineyard of Somló, Hungary

Effet de l'orientation des rangs dans le haut coteau du vignoble de Somló, Hongrie

Laszlo KOCSIS[1]*, Péter VARGA[2], Péter PODMANICZKY[1], Erik TARCZAL[1], Sándor BARAT[3], Attila CSASZAR[3], János MAJER[2],

[1]University of Pannonia, Georgikon Faculty of Agriculture; 8360 Keszthely, Deák F. u. 16, e-mail: ;
[2]Ministry of Agriculture and Rural Development, Research Institute for Viticulture and Enology, Badacsony; 8261 Badacsonytomaj, Római út 165;
[3]Kreinbacher Estate Wine, Trading and Hospitality Limited, 8481 Somlóvásárhely P.O.Box 3.

***Corresponding author**: kocsis-l@georgikon.hu

Summary

Hillside vineyards have a great potential to produce world class wines. The unique microclimate lead to the production of rich, flavory wines. However site development needs land clearing, rock removal, terracing, engineered water collecting drainage system. Because of the very high cost of establishment every part of the plantation needs to be very carefully planned, designed and established. Row direction has a pronounced effect on sunlight interception. The amounts of direct light are absorbed by the canopy is influenced by the row direction. Commonly known that greater amounts of light absorbed by the canopy the mid-morning and mid-afternoon in rows directed north-south compared to east –west. But information on the effects of row direction on the fruit quality of grapevines are limited. Therefore we established an experiment on hill Somló to determine if row direction has role to improve the quality or not. We have 24 % less yield, higher sugar content, lower acid content in row direction east-west compared to the north-south in 2006. Similar results were obtained in 2007 as well. The catechin contents differed statistically only among other poliphenols between the row directions. The wine analysis and organoleptical evaluation showed that the east-west oriented rows produced better quality of wine in 2006. We have very extreme weather conditions in 2007 in July and August therefore we have not got the same picture in 2007 like in 2006. Even if we have only two year results the clear influence of row direction pictured on the quality of the yield.

Keywords: row direction, quality, grape production, upper hill vineyard

Introduction

Site evaluation and selection is one of the most important goal of viticulturists in point of view quality wine production. Establishing a new vineyard requires considerable investigative work and planning. The most important part of planning is determining whether the project will be economically viable. Hillside vineyards have long been recognized for their potential to produce world class wines. Hillside wines usually lower in vigour and produce clusters with smaller berries. Small berries combined with special microclimate often lead to the production of rich, intensely flavored wines. According to Iacono et al. (2000) the vineyard system is composed of permanent (soil topography, macro climate, natural soil fertility and structure) and changeable factors (variety, training systems, cultivation practices) that can be managed to optimize the production target and therefore the site conditions. Terroir is one of the keyword of site evaluation. The concept of terroir is the basis of the law guarantees the origin of wines in viticulture and it is based on natural environmental conditions and winegrower capability to adopt viticulture to site specificity. Jacquet et al. (1995) characterized the terroirs for three different levels, viticultural terroir as a smallest unit, denomination terroir as meso climate, and generic denomination terroir which represents a complex system of the region. Branas et al. (1980) consider that a vineyard is characterized with the most favorable natural and human conditions for quality. Quality buildup in grapevine production in northern European viticultural areas is strongly dominated by the solar radiation income and temperature regime (Iacono et al. (2000). The

negative effect on sugars in grapes with every 100 m increase in altitude is compensated by an increase of about 1.5 hours of sun availability during ripening period (Bertamini et al. 1996).

In very dry years water may become important also under cool climate conditions, particularly in shallow soils as those found on the top of hills (Iacono et al. 1994). Slope, sun exposure and soil physical properties can be responsible for different vine physiological responses and of vine and wine quantitative, qualitative performances as well. Iacono (1999) verified that air temperature at the canopy level effects very strongly the vine physiology and therefore grape quality.

In our experiment we determined whether the row direction in the upper part of the hill, with fertile soil conditions could effect the quality of the grapes. We have not measured the physiological parameters, nor the microclimatic conditions on the canopy level. However we measured as many parameters on yield and on the obtained wines as it was possible.

Material and methods

Hill of Somlo is a volcanic cones, located on the small flatland in western part of Hungary. Vineyards on steep slopes along the hill Somló make beutiful pictures and they need to be economically feasible also. An experiment was established in 2006 to determine the effect of the row direction on the quality of the grapes and wine in the upper part of the hill. The plantation was established in the fall of 2003 with V. vinifera cv "Furmint" on southern slopes of the hill. The vinespacing is 1.4 x 0.8 m. The row direction is north-south and east-west. In each block we have marked 4 rows and four times 20 vinestocks are sampled. The bud load was equal on the vinestocks and all the cultivation was same in both row directions. The soil conditions are also equal. The underwater level is more than 2 meters, the fertile soil layer is more than 1 m, rich in humus. The pH of the soil is little above 7.00, low level of active calc characterized, salt is present in trace. The soil is rich in Phosphor , Potassium and Magnesium, while poor in mineral Nitrogen. Phenological phases were recorded during the vegetation. Date of harvest was determined according to the winery capacity and requirements. Yield (kg/m2), number of cluster per vine, must degree (Kl^o), titratable acid content (g/l), pH were measured at the time of harvest, and percentage of Botrytis rotting was recorded in both years. The amount of phenolic compounds were measured from the juice before fermentation. Wine was made with standardized methods in micrvinification level (10 liters per treatment). Basic wine analyses were run on the experimental wines and the wines were evaluated organoleptically as well.

Results and Discussion

Row direction has effect on the physiological stage of the vines as it shows in table 1. The rows directed east to west earlier turn into the next physiological stage then the rows directed north to south. Light and temperature are difficult to manage in the field and cause differences on the developmnet of the vine during the year. East-west row direction significantly shortened the vegetation. It has great importance in a cool climatic condition, like Somló.

Stages	**Date of the change of physiological stages**	
	North-South	**East-West**
Budbreak	04.18.	04.18.
3 leaves stage	04.26.	04.24.
Beginning of flowering	06.14.	06.12.
End of flowering	06.22.	06.20.
Small, dark green berries	06.28.	06.24.
Berry size like peas	07.04.	06.30.
Beginning of cluster closing	07.22.	07.18.
Beginning of ripen	08.15.	08.15.
Full ripen	10.10.	10.01.

Table 1 Effect of row direction on phenological stages of the vines in Somló.

We have 24 % less yield, higher sugar content, lower acid content in row direction east-west compared to the north-south in 2006 (table 2.). Similar results were obtained in 2007 as well. The must degree was lower in both year in north to south directed rows. The titratable acid content differed so much between 2006 and 2007. We had higher acid content in 2006 in N-S rows, while there were no differences between them in 2007. The berries in the rows E-W got severe Botrytis infection in both years.

	North -South		**East – West**	
	2006	**2007**	**2006**	**2007**
Date of harvest	09. October	03. October	09. October	03. October
Yield (kg/m2)	0.17	1.21	0.13	0.55
Number of cluster/vinestock	59.3	144.8	54.3	110.3
Must degree (Kl°)	18.2	17.9	18.9	20.3
Titratable acid content (g/l)	8.33	5.75	7.21	5.80
pH	3.12	3.06	3.21	3.30
Percentage of Botrytis rotting	20	5	30	20

Table 2 Quantitative and qualitative parameters of the yield form the vineyard of Somló.

Poliphenols were evenly produced in the juices independently of the row directions. However the catechin contents differed statistically among other poliphenols between the row directions (table 3.).

Treatment	**Caffeic acid**	**Epicatechin**	**Catechin**	**Coumaric acid**
	mg/l			
North-South	9,3	3,7	**8,5**	2,4
East-West	9,1	3,8	**8,3**	2,5

Table 3 Polyphenols contents of the juices

The wine analysis and organoleptical evaluation showed that the east-west oriented rows produced better quality of wine in 2006. The remained sugar content in the wine is higher in 2007 in both treatment compared to 2006. However it is 6 fold higher in the wine made from E-W oriented rows, while the alcohol content is very similar in both treatment. We have very extreme weather conditions in 2007 in July and in August (daily temperature was above 30 Celsius degree in 48 days) therefore we have not got the same picture in 2007 like in 2006. It is quite strange for us that the wine from E-W oriented rows swallow less amount of Sulfur even the pH, the acid content and the sugar free extract content are similar. One of the biggest differences were obtained in the sugar free extract content in 2007. Organoleptically the wine from E-W oriented rows got higher scores in 2006. The organoleptical evaluation of the wines from 2007 was not accomplished till the date of deadline the fulltext sending.

	North -South		East - West	
	2006	**2007**	**2006**	**2007**
Alcohol content v/v %	12.87	12.25	12.96	12.16
pH	3.38	3.13	3.28	3.27
Specific gravity weight	0.9905	0.9926	0.9922	1.0051
SO_2 mg/l	35/72	38/182	7/44	7/142
Sugar content g/l	1.66	6.82	4.54	38.45
Volatile acid mg/l	0.64	0.80	0.47	0.93

Table 4 Wine parameters.

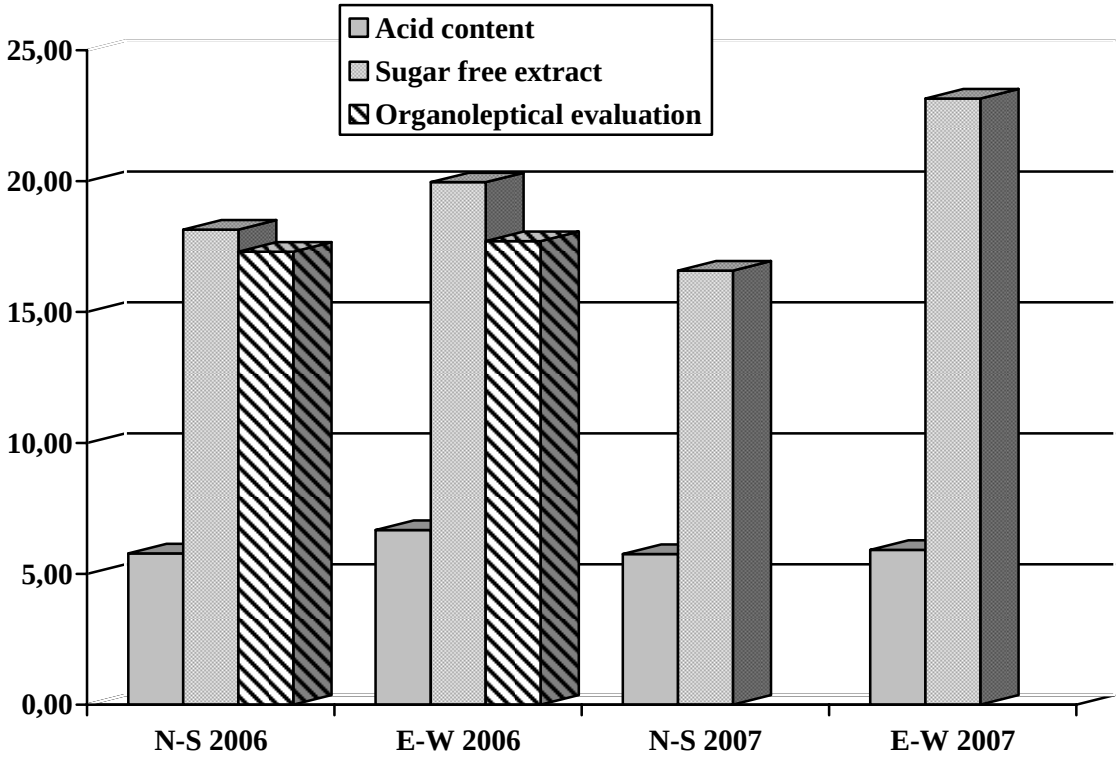

Figure 1 Acid content, the sugar free extracts and the scores (min. 0 - max. 20) of organoleptical evaluation of the wines from North-South (N-S) and East – West (E-W) oriented rows in 2006 and in 2007, Somló, Hungary

Conclusion

In the region of Somló the influence of soil, climate and cultural management characteristics in general determine that quality grape production. If we climb up to higher elevation of the slopes we need to choose what type of terraces will be built for vineyard establishment. Our study help to decide in case to choose row direction whic is strongly correlated to the size of the terraces. The length of the vegetation period is shortened by the East-West row direction. It could be positive effect in a year with cooler climatic conditions, or negative in very hot summer. The yield quantity is less, however the

quality is better in case of wine parameters in both of the examined years. Organoleptical evaluation of the wine from 2006 resulted higher scores of wine from E-W oriented rows. Quality depends on microclimatic conditions. According to Gladstones (1992) the day and night temperature of the fruit zone in connection with the respiration is critical in the case of high quality grape production. It means in case of our study that row orientation has influence on day and night temperature in the fruit zone (we have not measured) we assume it caused the differences of the two choosen row orientations.

In case of our situation it means better to build micro terraces and getting east –west rowdirection in the upper part of the hill of Somló. Quality will pay for the investment. Even if we have only two year results the clear influence of row direction pictured on the quality of the yield.

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