

A ZONING STUDY OF THE VITICULTURAL TERRITORY OF A COOPERATIVE WINERY IN VALPOLICELLA

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ABSTRACT

The Valpolicella hilly area, north of Verona, is highly vocationed for viticulture but its vineyards are sometimes characterized by very different soil and microclimate conditions which can greatly affect their oenological potential. A zoning study promoted by the Cooperative Winery Valpolicella (Negrar, Verona, Italy) was carried out with the aim of evaluating the oenological potential of the vineyards of the Winery associated growers. The final objective is to improve in general the quality of the wines and in particular to increase the production of premium wines (Amarone and Recioto).

On the basis of the results obtained from 12 reference vineyards spread on a wine territory of about 500 ha, it was possible to distinguish zones with different performances with regard to yield and technological quality of the grapes, which in turn was reflected in the quality of the corresponding wines.

KEY WORDS

zoning, grapevine, valpolicella, Corvina, soil

INTRODUCTION

Within a wine territory exist a number of more or less slight variations of micro-climate and soils that may create recognizable differences in grape quality and yield not dependent on the viticultural variables.

A zoning study promoted by the Cooperative Winery Valpolicella was carried out with the aim of evaluating the oenological potential of the vineyards of the Winery associated growers. The Cooperative Winery of Valpolicella has about 200 associates with a total of 500 hectares of vineyards, most of them located on the hillsides of the Valpolicella Classico region near Verona (Italy). The climate is Mediterranean, annual rainfall averages from 850 mm on the plains (100 m above sea level), to approximately 1200 mm in the hillside zone (from 500 to 700 m a.s.l.), minimum average temperature for the grapevine vegetative period (April to September) is between 12 and 15°C, and the average maximum between 23 and 30°C.

This zoning will be used by the Winery to better differentiate the price of the grapes to be paid to the associated growers on the basis of the oenological potential of their vineyards. The aim of the Winery is to individuate also single vineyards to produce special selections and even individual “cru” wines. The final objective is to improve in general the quality of the wines and in particular to increase the production of premium wines (Amarone and Recioto).

MATERIALS AND METHODS

A network of 12 commercial vineyards where the local red variety “Corvina” was trained as “Pergola” was chosen in 12 different localities and their cropping and oenological performances were monitored from 2007 to 2009. All the vineyards have the same clone of Corvina (ISV-CV 48) and similar planting density; as it was impossible to find vineyards with the same rootstock, eight are on Kober 5BB, two on SO4 and two on 41B (Tab.1). Vine performances were determined in two selected row of each plots. Samples of grapes of 150 kg were collected in each plot for microvinification. Musts and wines were analysed and sensorial analysis was performed after some months. Data were analysed by ANOVA and PCA multivariate analysis (Statsoft, vs 7.0).

RESULTS AND DISCUSSION

Main features of the 12 vineyards spread in as many localities of the Valpolicella wine territory are reported in Tab. 1. Vineyards are mainly South-oriented, spanning from an altitude of ~120 msl (plain: Vignega, Cariano, Castelrotto) to an altitude of ~450 msl (top hillside: Mazzurega, Torbe). Unfortunately it was impossible to find vineyards with the same rootstock. Eight are on Kober 5BB, two on 41B and two on SO4. Only few sites were provided with emergency drop irrigation.

Table 1 – Characteristics of the vineyards selected in the indicated sites.

Site	Altitude m s l	Exposition	Rootstock	Planting Density vine/ha	Irrigation
CARIANO	130	South	Kober 5BB	2500	drop
CASTELROTTO	130	South	Kober 5BB	3571	no
CROSARA	200	South	41B	3571	drop
LA SORTE	260	South-West	Kober 5BB	3788	no
MAZZUREGA	460	South-West	Kober 5BB	3289	no
MONTERICCO	200	South-East	Kober 5BB	2083	drop
PALAZZO	260	South-West	41B	3571	no
PREPERCHIUSA	380	South-East	Kober 5BB	3788	no
QUENA	340	South-East	Kober 5BB	2500	no
SAN VITO	150	South-East	Kober 5BB	3861	no
TORBE	440	South-West	SO4	3788	no
VIGNEGA	119	South	SO4	3759	no

The PCA analysis of physical and chemical characteristics of the soils explained 48 % of the variability with 2 factors (Fig. 1). Factor 1, explaining 30 % of variability represents Mg, pH, sand and loam, while it is negatively related to Ca, clay and K/Mg. Factor 2 explaining 19 % of the variability represents K, K/Mg and Fe, while is negatively related to gravel, active lime and loam.

The three years mean cropping performances of each plot show that parameters like yield/vine and cluster/vine were very variable among sites. Preperchiusa and Mazzurega were the lowest yielding sites (<4 kg/vine) while in some plots (Quena and Montericco) more than three-fold yield values were recorded. In most of the sites yield/plant was around 4.5-8.5 kg/vine. Drying suitability, an important parameter which estimates the aptitude of producing premium wines (Amarone, Recioto) from post-harvest dried grapes, was in all cases above 50% of the whole production. Preperchiusa and Palazzo were the sites where the higher grape drying suitability (>80%) was found. This parameter seem not related to the other cropping

parameters analyzed and may be affected by other vineyard management practices, including pest control.

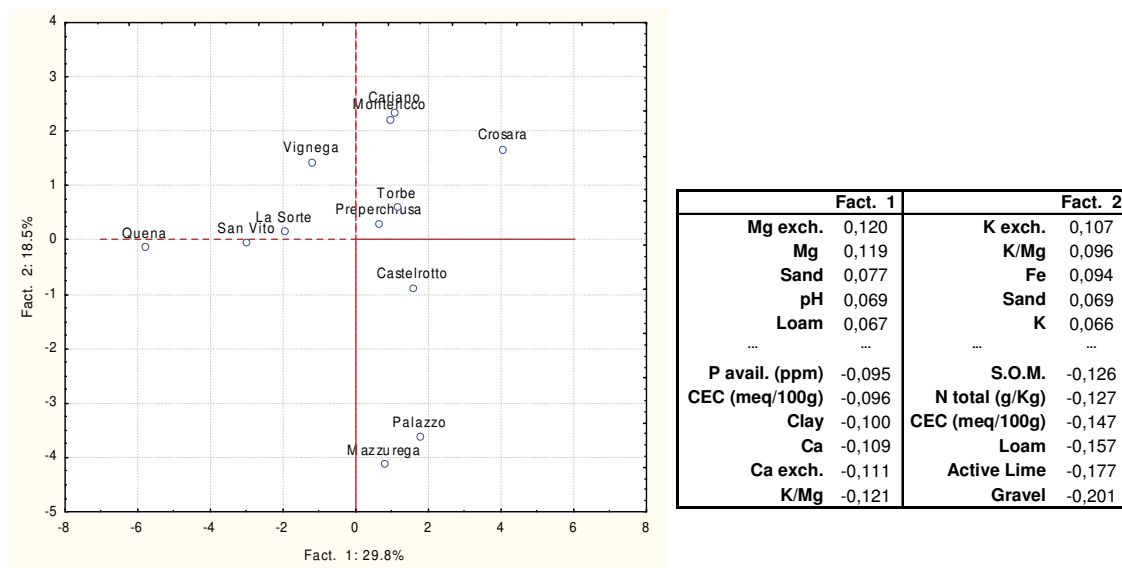


Figure 1 – PCA analysis of soil characteristics: plot of the first two factors explaining ~50 % of the variability (left) and relative contribution of soil characteristics to each factor (right).

Concerning main grape must chemical characteristics, higher levels of titratable acidity (around 7 g/L) were reached in plots of the hilly sites while sites in the plain, located at lower altitudes, produced less acid musts (Tab. 3). In all three vintages must acidity seemed not related to the ripening degree measured as sugars content (not shown).

Table 2 – Vineyard crop performances (average 2007-2009).

Site	Yield/Vine (kg)	Cluster/Vine	Cluster Weight (kg)	Drying Suitability (%)
CARIANO	8,3	30	0,30	69
CASTELROTTO	5,3	19	0,34	61
CROSARA	8,1	21	0,38	52
LA SORTE	5,4	22	0,29	69
MAZZUREGA	3,5	12	0,32	67
MONTERICCO	11,9	42	0,31	68
PALAZZO	4,5	21	0,26	81
PREPERCHIUSA	3,2	14	0,34	90
QUENA	11,1	34	0,37	76
SAN VITO	4,7	18	0,30	66
TORBE	6,7	19	0,37	68
VIGNEGA	7,3	23	0,32	73

Wines obtained by microvinification were chemically analyzed and sensory evaluated by a trained panel. As wines from 2009 season are not in bottle yet, sensory analysis of this season has still to be performed and values reported in this work refers to wines of 2007 and 2008.

Table 3 – Sugars, acidity and pH of musts (average 2007-2009).

Site	Must Sugars (g/L)	Tit. Acidity (g/L)	pH
CARIANO	211	6,0	3,2
CASTELROTTO	209	5,9	3,2
CROSARA	212	5,9	3,5
LA SORTE	192	6,8	3,2
MAZZUREGA	208	6,8	3,2
MONTERICCO	187	5,9	3,2
PALAZZO	194	6,9	3,2
PREPERCHUSA	197	7,4	3,2
QUENA	217	6,9	3,1
SAN VITO	202	5,7	3,3
TORBE	209	7,6	3,5
VIGNEGA	202	6,0	3,3

Table 4 – Chemical composition of wines averaged over 2007-2009. Only main parameters are reported.

SITE	Alcohol (vol.)	Total Acidity (g/L)	pH	Glycerol	Polyphenols (mg/L)	Anthocyanin (mg/L)
Cariano	11,6	6,3	3,1	7,1	1703	249
Castelrotto	11,5	6,5	2,9	6,7	2029	291
Crosara	11,6	5,2	3,2	6,4	927	148
La Sorte	10,2	5,6	3,2	5,4	1209	202
Mazzurega	12,3	6,5	3,1	7,2	1911	277
Montericco	9,9	5,2	3,3	5,6	1253	197
Palazzo	10,3	6,8	3,0	5,5	1176	241
Preperchiusa	10,7	6,2	3,1	5,9	1384	215
Quena	11,6	6,2	3,2	6,6	1602	223
San Vito	11,1	5,9	3,2	6,8	1281	197
Torbe	11,7	5,6	3,2	6,4	1481	278
Vignega	10,8	5,0	3,4	6,0	1423	216

Table 5 – Sensory quality of the wine. Main descriptors evaluated by panels (average 2007-2008).

SITE	Colour	Aroma	Fruit	Flower	Spicy	Herbaceous	Bitter	Astringent
Cariano	8,3	7,5	4,5	5,4	3,8	4,0	3,9	6,0
Castelrotto	9,1	7,2	4,8	4,0	3,7	4,9	3,7	6,5
Crosara	5,6	6,1	3,7	4,2	4,1	4,3	3,8	5,5
La Sorte	5,5	6,3	4,3	5,0	4,4	4,6	3,2	5,0
Mazzurega	8,2	7,5	4,0	3,6	4,8	4,8	3,6	5,9
Montericco	5,7	6,1	4,3	4,2	3,9	4,4	3,1	4,3
Palazzo	8,4	7,1	4,8	4,5	3,8	4,1	3,0	5,4
Preperchiusa	7,9	7,2	4,2	5,0	4,4	4,5	3,3	5,9
Quena	7,7	6,9	4,0	4,0	5,1	4,6	3,6	6,0
San Vito	5,7	5,9	3,8	4,9	4,0	4,8	3,7	5,2
Torbe	7,2	7,3	4,3	5,0	4,5	4,5	3,9	4,5
Vignega	6,8	7,4	3,3	4,7	5,4	5,6	3,8	4,7

Wine alcohol content in all 3 year vintages was generally lower than 12 %. On average, only the wines from Mazzurega had more than 12 % of alcohol (Tab. 4). Most sites produced wines with an alcohol content between 11 and 12 %. The lowest alcohol % value was found in the wines from Montericco. A broad range of variation was also highlighted for polyphenols and anthocyanin content of wines. Mazzurega and Castelrotto wines had the highest phenolic levels while a very little amount of these compounds were found in wines from Crosara.

Sensory evaluation of wines could reveal significant differences for most of the parameters. Color and aroma intensity (mainly related to flower and spices) were the most discriminating parameters (Tab. 5). The best sensory scores were obtained by the wines from Cariano and Castelrotto while the worse by Crosara and San Vito (Fig. 2).

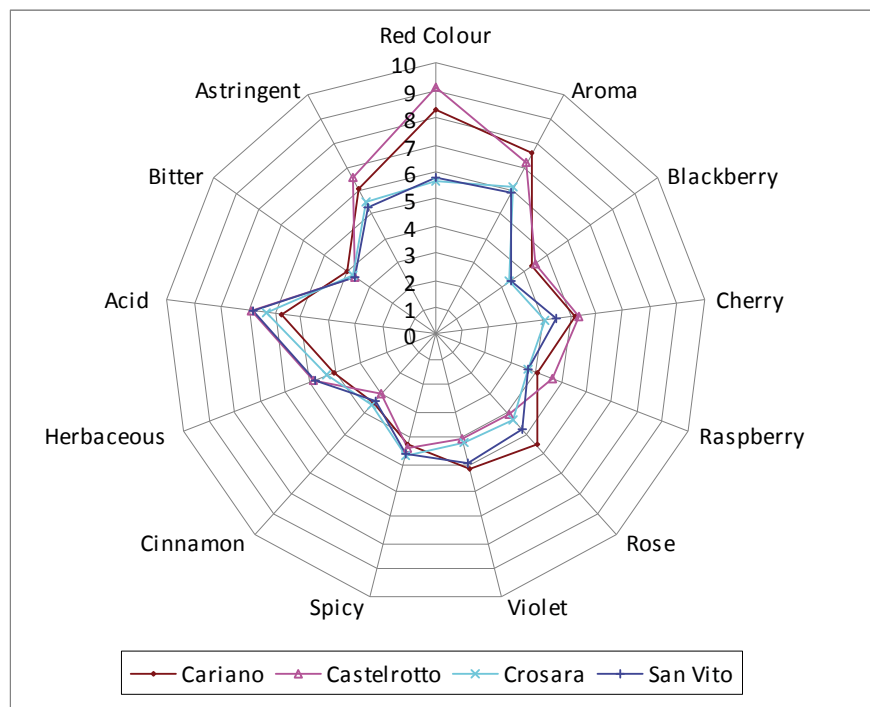


Figure 2 – Descriptors of the wines of the best (Cariano and Castelrotto) and worse (Crosara and San Vito) sites as evaluated by the panel (average 2007-2008).

To have a better view of the quality of the wines obtained from the different plots, normalized synthetic scores were calculated for the technological and sensory traits of the twelve wines (Fig. 3). Finally a global quality score was calculated considering both chemical and sensory analyses of wines. As a result, it was possible to divide the wines into three groups. Wines from sites Castelrotto, Mazzurega, Cariano, Torbe and Quena had the highest global scores, supported by both technological and sensory scores. A second group of wines (from vineyards Palazzo, Preperchiusa, Vignega) which had a relatively good sensory score, but were penalized by the technological score. This is possibly related to poor alcohol and/or polyphenolic content of wines. A third group (La Sorte, Montericco, San Vito and Crosara) is represented by the worse wines which obtained the lowest sensory and technological scores.

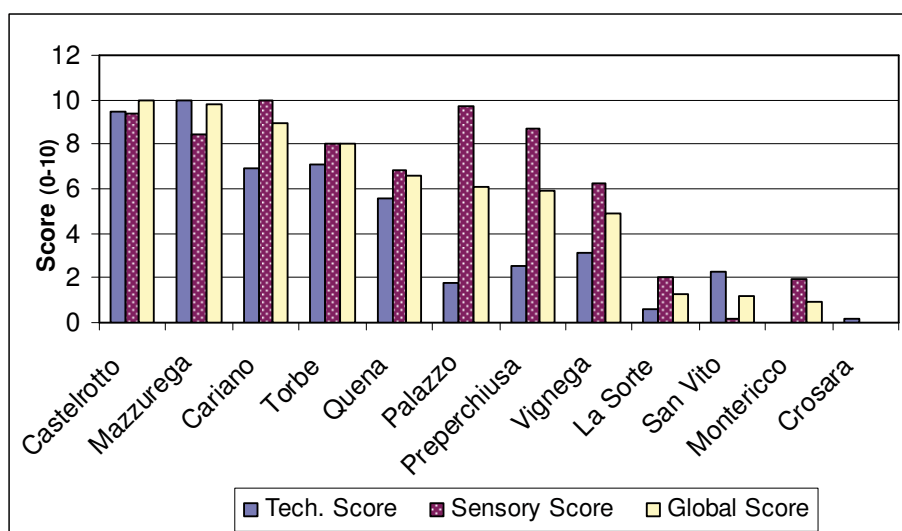


Figure 3 – Technological, sensory and global scores of the wines. Scores were attributed on the basis of the rank of the wine in selected chemical and sensory variables (0 poor, 10 very good).

CONCLUSIONS

This 3-years zoning study allowed a classification of the sites in terms of viticultural and soil characteristics, and chemical and sensory quality of the wines. Even if not fully concluded (sensory data of 2009 wines are still missing) this work allowed the identification of the best wine producing sites among the twelve considered. Mazzurega and Castrolotto had the best global scores while sites La Sorte, Montericco, San Vito and Crosara produced poor quality wines. As data collected are still partial it was not possible to analyze by PCA analysis all the variables of soil, vineyard characteristics and performances, wine composition and sensory evaluation. Such analysis will possibly allow a better determination of the soil/viticultural factors responsible of the different performances of the 12 vineyards.

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