

Influence of Thinning Grapes on Vine Block Wintering, in Five Grape Varieties for Red Wines, Cultivated in NW Romania

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Abstract. Five grape varieties for red wines (Pinot noir, Merlot, Cabernet Sauvignon, Syrah and Burgund mare) were tested in 2009-2010, in NW Romania (Rătești wine-growing center), under two types of cultural technology: thinning and without thinning grapes. The work of fruit load standardization through thinning grapes has been made at the beginning of veraison (third decade of July in 2009 and the first decade of August in 2010). In this study, were made observations regarding temperatures during the period 2009-2010 and the level of critical temperature during winter, in order to establish the quantity of carbohydrates (g %) from vine shoots and bud viability (%). The experiment was a bifactorial series (cultivar x fruit load standardization) with five grape wine varieties grown and two different applied technologies: thinning and without thinning grapes. Regardless of the standardization of fruit load, Syrah variety distinguished with high carbohydrate values of string, obtained during the two years of testing (15.94 g %) meaning good adaptability of the variety to climatic conditions in the Rătești wine area. The other four species showed significant differences from the Syrah variety, however, between them, the differences are insignificant. The two variants analyzed (thinning and no thinning) had a significant influence on the accumulation of reserve substances. The string bud viability was high (over 85 %) to all five species tested.

Keywords. carbohydrate, bud viability, thinning grapes, grape varieties for red wines, vine block wintering

INTRODUCTION

The multitude of factors that influence the quality of the grapes and their way of handling has spurred interest among producers but also of researchers alike. One of these factors, as specified by Brasher and Vasconcelos (2000) is the settings harvest level through the thinning of the grapes in the veraison. Also, Winkler *et al.* (1974) argues that this work is most easily accomplished by the producers, rather than perform thinning inflorescences.

The work of thinning the grapes (bunches) runs after grain growth, and through this work, as well as in the case of inflorescence thinning, it concludes the load of fruit on each vine block in part by a corresponding number of potential natural grape specific to each vine block in part (Pop, 2010).

This work is practiced often in table grape varieties but recent is practiced and wine grape varieties because the application of thinning work on of grapes helps regulate production and improve the quality of grapes (Petrie and Clingeffer, 2006), especially anthocyanins and flavors of grapes skins.

The biggest disadvantage of this practice carried on a large scale is given by the higher cost of production, so in America and recently in Australia, grapes thinning is done mechanically (Clingeffer, 1993; Clingeffer *et al.*, 2002), but the risk of damaging the vine block and grapes are particularly strong repercussions on the growth and grape quality. Shoots maturation, expressed through reserve substance accumulations, assure plant

resistance to negative critical temperature during relative repose period and when vegetation starts the following year (bursting into buds and young shoots growth start) (Ciobanu *et al.*, 2010).

MATERIALS AND METHODS

Researches were conducted at Rătești wine-growing center and they concerned both carbohydrates accumulation (g %) in shoots and buds viability (%), for ecoclimatic conditions of year 2009 and 2010. The biological material used in this study was comprised by five types of grapes for red wines: Pinot noir, Merlot, Cabernet Sauvignon, Syrah and Burgund mare. The design of the experimental was linear, bifactorial series type (cultivar x fruit load standardization, two years 2009-2010), and statistical interpretation of the results was made using Duncan test (Ardelean *et al.*, 2007). Fruit load standardization was differentiated by applying thinning grapes at the beginning of veraison (third decade of July in 2009 and the first decade of August in 2010) and whiteout thinning.

For the establishment of maturation level, shoots harvest was realized in the second of December both in 2009 and 2010. The method used for carbohydrates determination (after N. Varga and improved by S.C.D.V.V. Blaj), implies sugar extraction with ethylic alcohol, and starch with perchloric acid respectively, in known conditions. Intensity of the obtained coloration is measured colorimetric.

For the determination of bud viability, shoots harvest was realized at the end of February both in 2009 and 2010. For bud viability ten shoots per variety. Bud viability was determined through cross sectioning of the winter bud, and observing if the main, secondary and tertiary buds have a light green color.

RESULTS AND DISCUSSIONS

The period between grape harvest and leaf fall is important to restore the carbohydrates reserve and mineral substances necessary for wintering block vines, but also for the regeneration of active elements, that ensure fructification wood for next year (Holzapfel and Smith, 2011).

To determine the suitability of the five varieties studied in conditions of NW Romania, maturation level was determined through chemical and colorimetric analysis regarding carbohydrates content.

The vine accumulates carbohydrates in two forms: starch and soluble sugars.

After the starch content the wood is not sufficiently mature at less than 4 g%, sufficiently mature between 4 g% and 6 g%, good matured between 6 g% and 8 g% and very good matured over 8 g% starch in the string (Dumitriu, 2008).

In the Rătești wine-growing center, 2009 was a favourable year for grape varieties for red wines, and average temperature in September (18.6 °C) and October (14.6 °C) was higher than its average in previous years, thus, carbohydrate accumulation in the string was favoured.

In 2010, temperatures in September and October had a negative influence of carbohydrates accumulation in the string. Average temperatures of these months, 14.6 °C in September and 6.9 °C in October, were lower than those recorded in previous year (Fig. 1), this disfavoring the accumulation of reserve substances in string the quantity of carbohydrates at the five species studied being smaller than the previous year.

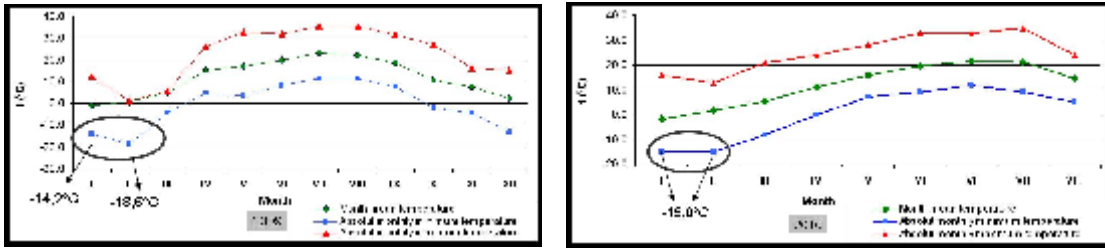


Fig. 1 Oscillation of air temperature (average, minimum and absolute maximum) in 2009 and 2010, for Rătești Wine Center

These differences in accumulated carbohydrates string varieties investigated in two experimental years, was due to climatic conditions during the growing season of 2010. Because in July (hottest month) of 2010 was an average temperature of 21.7 ° C, lower compared to those recorded in previous years, and rainfall was high (197.2 mm), has influenced their conduct by delaying phenophases whit 2-3 weeks. Therefore, the accumulation of reserve substances in the organs of vine block (shoots) was delayed. Lower accumulation of reserve substances in the string was due to the fact that in 2010, the grape production was higher than in 2009, is consuming a larger amount of substance for the production of grapes.

Weather conditions have especially influenced mode of accumulating reserve substances. Starch concentration accumulated in string in the two years experimental was similar, 3.8 to 4.4 g% in 2009 and 4.1 to 4.5 g% in 2010. The difference appears at the concentration of sugars in the string. In 2009, all five varieties have accumulated concentrations of sugar from 10.8 to 12.9 g% versus 2010, when the string has accumulated a smaller quantity of 7.9 to 10.1 g % (Fig. 2).

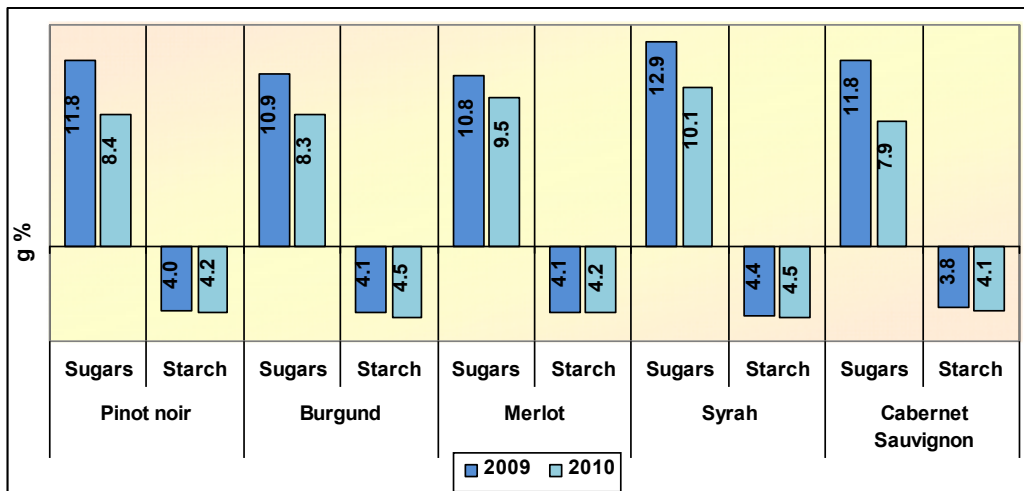


Fig. 2 Sugar and starch accumulation (g %) within dry shoots depending on climatic condition in 2009-2010 (mean of the two variants)

Analyzing the maturation of strings in terms of starch accumulation, they were mature enough to cope with the winter conditions. Only at Cabernet Sauvignon, in 2009 the strings were insufficiently matured the quantity of starch being 3.8 g%. However, this value was influenced to the fact that some of the starch was converted into sugar because the harvesting

of strings for determinations was made about three weeks after leaf fall (due to unfavorable conditions - rain), therefore the quantity of soluble sugars was higher than starch in all five varieties.

Syrah variety, being a new variety brought into culture in Romania and without a history of its behavior at the climatic conditions of our country, has acquired, in 2009, the largest quantity of sugar (12.9 g%) and starch (4.4 g%) in the string compared to other varieties studied, showing good suitability for the NW of Romania. In 2010, there was a decrease of reserve substances as the other varieties caused by the weather, but still showed good values: 10.1 g% and 4.5 g% starch sugars

Comparing starch concentration of strings obtained in Rătești growing center with those obtained of Mursa (2009) at Cabernet Sauvignon (7.5-8.45 g%) and Merlot (8.26-10 g%), in Cozmesti viticultural center, we find a big difference. But this difference can be given by growing system, load of fruit, applied technology, different climatic conditions between the two centers of wine but also the moment were harvested the strings for determination of starch.

Accumulation of soluble sugars (11.8 g% in 2009 and 8.4 g% in 2010) at Pinot noir in the two years experimental at Rătești was lower than that recorded by Koblet *et al.* (1993) at the end of growing of the same variety (14.5 g%). In contrast, the same authors found a quantity of starch in strings of only 2.5 g%, compared with values registered at Rătești, of 4.0 g% in 2009 and 4.2 g% in 2010 to Pinot noir.

Accumulation of reserve substances in strings was influenced by the standardization of grapes fruit load by thinning (Tab. 1).

Carbohydrate content of strings caused an individualization of Syrah variety, which recorded the highest values: 16.00 g% at thinning version, 15.88 g% at without thinning and 15.94 g% - the average of both variants. For each of the two variants and for average this variety was significantly different from all other versions.

Tab. 1

Influence of variety, variant and variety x variant upon carbohydrates accumulation (g%)

Variety \ Variant	Thinning	Without thinning	Average per variety
Pinot noir	14.22 c	13.97 cd	14.09 BC
Burgund mare	13.98 cd	13.83 cd	13.91 CD
Merlot	14.33 b	14.25 c	14.29 B
Syrah	16.00 a	15.88 a	15.94 A
Cabernet Sauvignon	13.82 cd	13.72 d	13.77 D
Average per variant	14.47 M	14.33 N	

DS 5% for two cultivar means = 0.20 g %

DS 5% for two variants = 0.08 g %

DS 5% for two C x V interaction means = 0.38-0.45 g %

Note: Difference between two values followed by at least one point is insignificant.

Cabernet Sauvignon variety accumulated the lowest quantity of carbohydrates in both cases studied: without thinning 13.72 g% and thinning 13.82 g%, and the average: 13.77 g%. For this variety, the differences between the two variants are not significant.

On average, for this character, Pinot noir (14.09 g%) did not differ significantly by Burgund mare (13.91 g%) and Merlot (14.29 g%) and Burgund mare not significantly different from Cabernet Sauvignon (13.77 g%).

Carbohydrate accumulation did not have the same intensity for the two cases studied because of higher consumption of substances of reserves for vine growth and grape

production at variant without thinning, and this is confirmed by processing statistical data. Mean variant with thinning (14.47 g%) was superior to the version without thinning (14.33 g%).

In the two experimental years (2009-2010), during the repose period not were registered absolute minimum temperatures that to endanger the proper conduct of the vine physiological processes (Fig. 1).

Data that concern percentage of viable buds (Tab. 2) were ranked first Pinot noir variety, with 96.1% for thinning version and in last place Cabernet Sauvignon variety with 85.8% the variant without thinning, viability low of this variety being given by depositing a lower quantity of carbohydrates in strings.

Tab. 2

Influence of variety, variant and variety x variant upon main buds viability (%)

Variety \ Variant	Thinning	Without thinning	Average per variety
Pinot noir	96.1 a	93.6 a	94.9 A
Burgund mare	93.7 a	91.6 b	92.6 B
Merlot	93.9 a	91.8 b	92.8 B
Syrah	91.2 bc	88.3 cd	89.7 C
Cabernet Sauvignon	88.3 cd	85.8 d	87.0 D
Average per variant	92.6 M	90.2 N	

DS 5% for two cultivar means = 1.4-1.4 %

DS 5% for two variants = 0.6 %

DS 5% /for two C x V interaction means = 2.8-3.2 %

Note: Difference between two values followed by at least one point is insignificant

Regardless years and the standardization production of grapes of each variety averages indicate a maximum percentage of viable buds reached Pinot noir variety (94.9%) and a minimum reached of Cabernet Sauvignon variety (87.0%), both differing significantly to one another, but also from the rest of the media.

Also significantly was distinguished the mean calculated of Syrah variety (89.7%) by comparison with all the others varieties, proving a very good resistance to weather conditions during the repose period for area of culture.

By applying the thinning work, there were significant differences between the means of both variants (thinning: 92.6% and without thinning: 90.2%).

Viability of Cabernet Sauvignon variety registered in the conditions of Rătești wine center (87.04%) is close in value to that obtained by Jianu (2000) for Recaș (92%) and much higher than that of Mursa (2009) for Cozmesti (24.47%) in the NE of Romania. Bud viability at Merlot variety in experience from Rătești (92.8%) is close to that obtained in Recaș (90.6%) by Jianu (2000) and higher than the value obtained at Cozmesti (29-32%) by Mursa (2009).

CONCLUSIONS

The average duration of vegetation period (193 days) corresponding to the two experimental years and the high temperatures recorded in September and October, contributed to good carbohydrate accumulation in string.

Regardless of the standardization of fruit load, Syrah variety distinguished with high carbohydrate values of string, obtained during the two years of testing (15.94 g%) meaning good adaptability of the variety to climatic conditions in the Rătești wine-growing center. The

other four species showed significant differences from the Syrah variety, however, between them, the differences are insignificant. Thus, the carbohydrate content of Merlot variety was 14.29 g%, Pinot noir was 14.09 g%, Burgund mare 13.91% and Cabernet Sauvignon showed the lowest carbohydrate content, 13.77 g%. The two variants analyzed (thinning and without thinning) had a significant influence on the accumulation of reserve substances.

In general, the string bud viability was high (over 85%) to all five species tested. Of these, it is noted that Pinot noir had the best percentage of viable buds in both analyzed variants (96.14% in variant with thinning and 93.60% in variant without thinning). At the opposite pole lies Cabernet Sauvignon variety which recorded the lowest percentage of viable buds (88.25% in variant with thinning and 85.83% in variant without thinning), lower viability of this variety is given by the deposit of lower amounts of carbohydrates in string.

Through high values obtained at bud viability, it can be concluded that under the conditions Rătești wine center, grape varieties for red wine find the optimal conditions for wintering.

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