EFFECT OF EARLY BERRY THINNING AND GIRDLING ON GRAPE QUALITY OF CV. VICTORIA

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Abstract

The research was carried out at University of Belgrade Faculty of Agriculture experimental station "Radmilovac" on table grape Victoria cv with aim to improve grape quality and with consideration the introduction of these ampelographic measures in regular grapevine growing.

The research included two treatments of berry thinning (thinning bunch tip - BtT and first lateral wink -BtW), girdling (G) and control (C). Combined effect of berry thinning and girdling were not examined. The following features were examined: fertility and yield, bunch and berry dimensions, bunch and berry structure, sugar content and total acidity.

The thinning treatments did not have significant effect on uvometric parameters and grape quality, but they improved the yield by 41.7% (BtW) and 51.4% (BtT) in comparison to the control. It can be explained by bad fruit set influenced by unfavourable meteorological conditions during flowering in control treatment. Berry thinning achieves a better fruit set. Berry thinning should be applied as a regular ampelographic measure according to weather conditions during flowering phonological stage.

Results confirm the positive influence of girdling. The yield was increased by 88,34% compared to control, berries had a higher diameter (for about 1mm with respect to control), fruit set and bunch mass were in higher level against other treatments, sugar content (17,00%), total acidity (5,75 g/L) were improved too.

Girdling can be introduced as a regular ampelographic measure in the table cultivars vineyards, in order to obtain higher yields and better quality of table grape.

Key words: table grape, berry thinning, girdling, Victoria, grape quality

INTRODUCTION

Appearance is one of the major factors the consumer uses to evaluate the quality of table grapes, especially visual attributes such as berry size, shape and colour (Ferrara et al., 2017) together with taste, aroma and texture. Consumers like large, seedless berries along with pleasant flavours and aromas (Costenaro da Silva et al., 2010). The sensory quality of table grapes depends primarily on TSS, TA, organic acid composition and the balance between these factors (Munoz-Robredo et al., 2011). Berry size is one of the main factor of acceptance table grapes and it is very important for marketing. Berry size is

genetically predetermined among cultivars, but it can be considerably increased by numerous viticultural practices (Keskin et al., 2013). Custer thinning and girdling are common and simple practices applied for this purpose (Xi et al., 2020). Cluster or berry thinning affects the accumulation of sugar in the berry, pH, total acidity, flavour formation, and colour during ripening (Ezzahouani and Williams 2003). The most common method to reduce the number of berries is the remove some cluster parts and provide better position for other berries on rachis (Rodríguez et al., 2013) and due to an increase in the source/sink ratio, it improves the quality of the remaining berries (Pastore et al, 2011).

Girdling is another treatment which involves the removal of a strip of phloem from either stem, cane or thunk. In grapevines, girdling is performed after the fruit set with aim to increase berry size or at early veraison to improve fruit colour and advance fruit maturity (Tyagi et al., 2020)..

'Victoria' is an attractive and perspective table grape cultivar in Serbia. It is new cultivar created by crossing of Cardinal and Afus Ali obtained in Romania, with green-yellow skin color, winged conical clusters and elliptical, large berries with seeds.

MATERIALS AND METHODS

The research was carried out in vineyard with Victoria cv wich belongs to University of Belgrade Faculty of Agriculture experimental station "Radmilovac".

According to Reionization vine growing regions in Serbia,the vineyard belongs to the in Central Serbia, Belgrade wine region. The vineyard was planted in 2009 with distance was 3.0 m between rows and 1 m within a row. Guyot training system was used were in pruning was left arc with 8 buds and spur with 2 buds.

The research included two treatments of berry thinning (thinning bunch tip - BtT and first lateral wink -BtW), girdling (G) and control (C). Interaction of berry thinning and girdling were not examined.

Berry thinning and girdling were performed on 20.06.2020. after the fruit set in the phenological phase 75 BBCH described by Lorenz et al. (1994).

Picture 1. *Scisors for girdling*

Girdling was conducted using single-blade scisors after the first shoot on the arc. The practice using this instrument is not to peel off the bark, but to complete a full circle in a pressure that does not penetrate the xylem. The cut wes 2−4 mm deep.

Yield per vine was measured during harvest and yield per hectare was calculated. Fertility coefficients and uvometric parameters were measured and calculated according to Matijašević (2017). TSS was determined with a digital refractometer (Atago, Tokyo, Japan) and expressed as % of sugar in grape juice Titratable acidity (TA) was determinated by titration method with 0.1 N NaOH and total acid content expressed as g/l tartaric acid.

RESULTS AND DISCUSSIONS

The fertility was determined during flowering phenological stage by counting fertile and infertile shoots, as well as the inflorescence number per each fertile shoot on vine and total inflorescence per vine. Results were presented in the table 1.

Cultivar Victoria in Belgrade wine-growing region in 2020 had average 5.6 fertile shoots, 2.4 infertile shoots and 10.9 inflorescences on 10 buds left by pruning.

Table 1. *Fertility of cv. Victoria*

Vine number	Fertile shoots	Infertile shoots	Inflorescences
Vine 1	6	2	11
Vine 2	7	1	12
Vine 3	4	4	7
Vine 4	6	2	12
Vine 5	5	3	13
Vine 6	6	2	12
Vine 7	5	3	10
Vine 8	4	4	8
Vine 9	7	1	13
Vine 10	6	2	11
Average	5,6	2,4	10.9

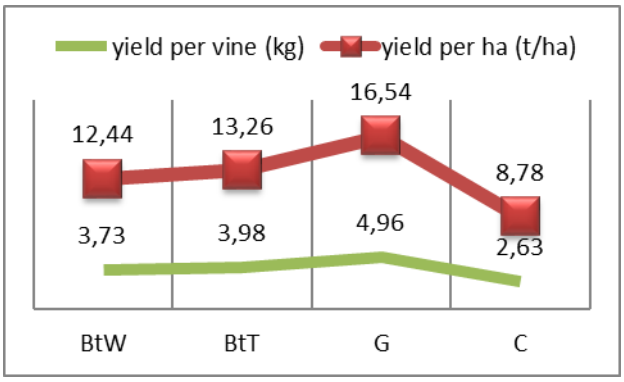
According to obtained results, were calculated fertility coefficients: 1.36 coefficient of potential fertility and 1.94 coefficient of absolute fertility. Marković et al. (2016) reported values of these coefficients for Victoria cv 1.37 and 1.74, respectively.

Due to the removal part of every single cluster, it can be expected the yield per hectare of thinned groups, BtW (wink-thinned) and BtT (tip-tinned), will be reduced, but, results showed increasing of yield per hectare in the treated group by 41.70% and 51.04% compared to control group (C), respectively.

Figure 1. *Yield of cv. Victoria*

Girdling treatment (G) had affected the higher incressing of yield compared to the control, for the 88.34%.

In the control group observed presecne of loose bunches with a high number of little, undeveloped (millerandage) berries, as a consequence of bad fruit set influenced by unfavorable meteorological conditions during flowering. Those berries had fallen off or held on to the bunch, but stay completly undeveloped, and they affected low yield in control. Better fruit set in gridled group is the result of better carbohydrate nutrition above the girdle because the transport of sugars from leaves to the root system is blocked by girdling treatment (Roper and Williams, 1989; Soltekin et al., 2016), so the sap flow is directed to buds, inflorescences, and berries. In the other side, thinning affects better source/sink ratio with the same aim – better nutrition of remaining berries.



Picture 2. *Presence of undeveloped (millerandage) berries cv. Victoria*

Applied treatments achieves a better fruit set and reduce presence of millerandage berries in a bunch, especially in a G treatment. In berry thinning treatments were noticed presence of partially developed berries.

Girdling and thinning applied at fruit-set is known to increase berry size but due to the complexity of agricultural systems, it needs to be substantiated for each cultivar and region (Tyagi et al., 2020). In this study, berry diameter (Figure 2.) were slightly increased with the application of treatmants (except BtW) compared to the control (normally and partially developed berries were taken into account).

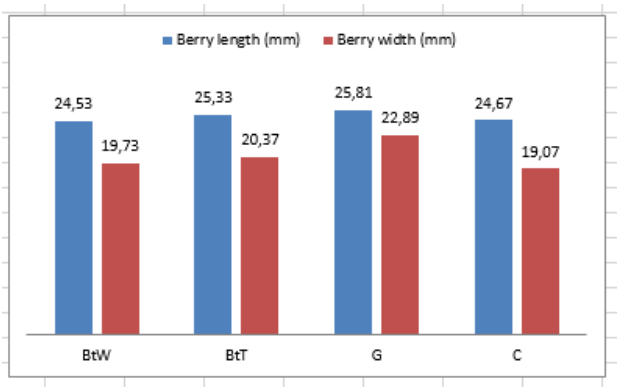


Figure 2. *Berry diameter*

Consequently, larger berry had higher berry weight. Xi et al. (2020) suggested that cluster thinning and girdling had no effect on berry weight or berry weight slightly increased. This results are in agreement with the previous. Average berry weight were: 7,37g; 6,59g; 6,45g and 6,1g for G, BtT, BtW and C treatment, respectively (data not show).

The shortest bunch was observed in the BtT treatment due to removing bunch tip for about ¼ of the length of bunch at the moment of application. The longest bunch was in girdling treatment. (Figure 3)

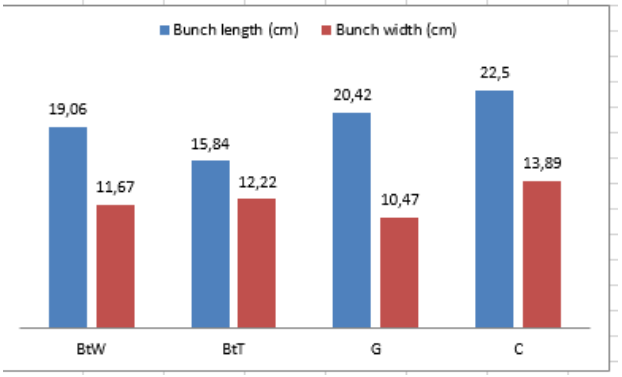


Figure 3. *The bunch length and width*

Because of millerandage berries, bunches in C were the narrowest, afterwards G, BtW and BtT, as the widest.

Girdling achieves the best fruit set compared to another applied treatments. This is one of the main factors wich causing better results in G treatment for for most of the tested parameters. The bunch mass (569,33g) and number of normally developed berries (96.33) were on the highest level. At berry thinning treatments had higher berry number per bunch, but lower bunch mass compared to control. Fruit set in BtT and BtW were better then control, but due to presence of partially developed berries, berry number per bunch was higher while bunch mass was lower than control (Figure 4).

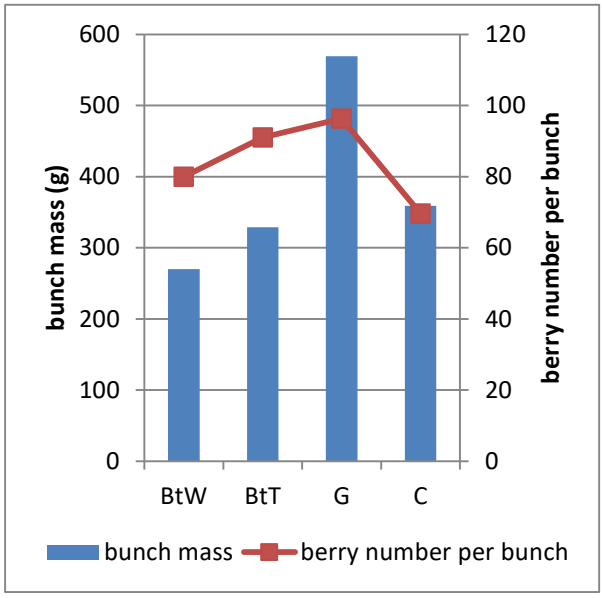


Figure 4. *The bunch mass and berry number per bunch*

The bunch and berry structure represents cultivar characteristics. Based on mechanical composition of grape and berry can gets an assessment of grapes quality, which have a special scientific and practical significance.

The largest percentage of berry skin was recorded for BtW 5.32%, followed by BtT 4.00% then C 3.58% and at the end G 2.76%, while the percentage of pulp was inversely proportional to berry skin. This results were expected, due to the highest berry size were recorded in G treatment. The contribution of seeds ranged from 0.49% in BtW, to 0.79% on C treatment (Figure 5).

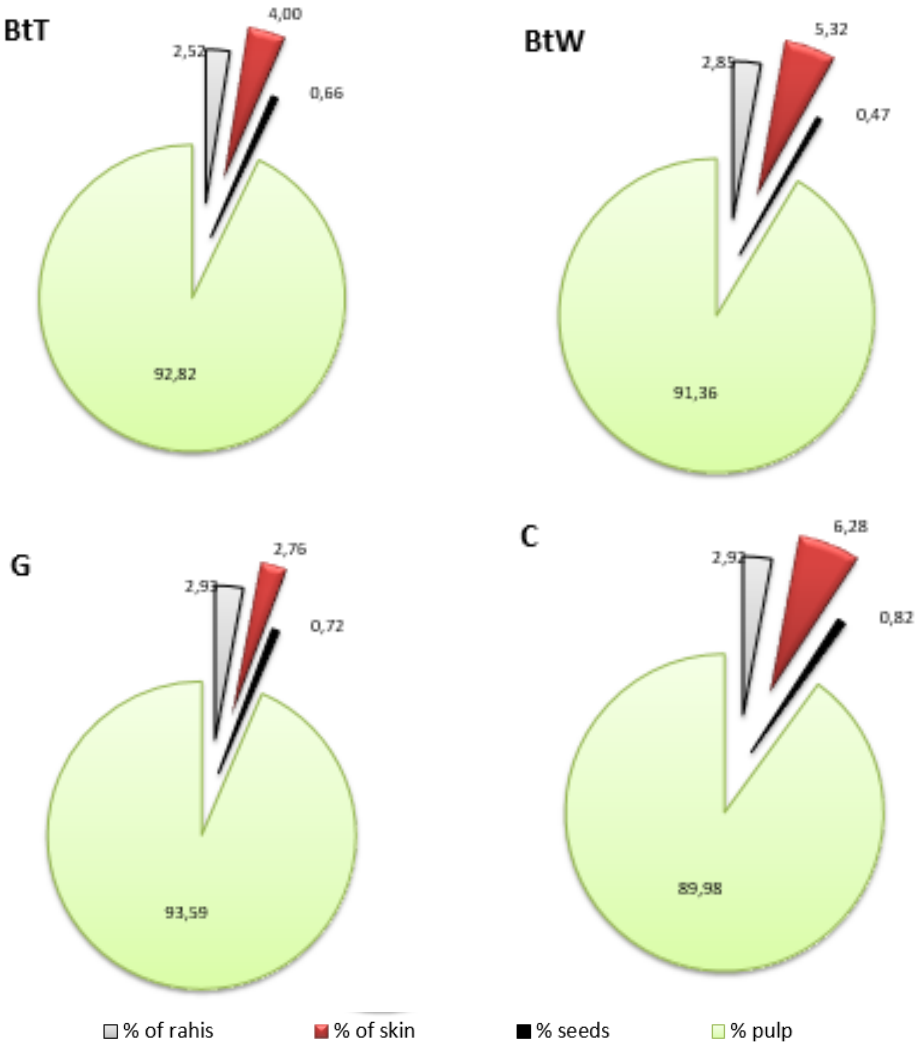


Figure 5. Bunch structure

One of indicators of grape maturity is sugar content, determined as the TSS content in berry juice. TSS percentage of girdling and wink-thinned vines was improved, while tip-thinned vines produced berries with TSS content nearly equal to control. Similar results were reported by Keskin et al. (2013), the who analysed effect of thinning and girdling on four table grape cultivars.

Organic acids contribute to whole taste and organoleptic quality of table grape depends mostly on sugar content, organic acid content and balance between them. Results (Figure 6) show that the highest TA content was obtained in control. Applied treatments, reduced titratable acidity. TA content decreased in G and BtW, and stronger in BtT. Kok (2016) reports a decrease in TA, too, from 8.72 g/L in control to 6.93 g/L in thinning treatment.

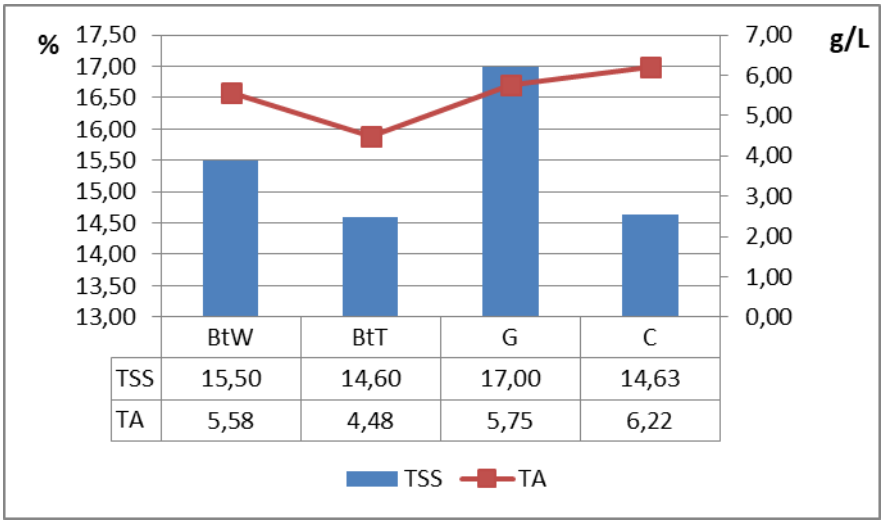


Figure 6. *TSS and TA content*

CONCLUSIONS

According to the results obtained from this present study, it can be concluded that girdling was able to increase yield and improve fruit quality, but the effect of berry thinning is less consistent.

However, it should be noted that more detailed studies need to be undertaken in the future.

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