

The Effects of Yield and Yield Components of Some Quality Increase Applications on Razakı Grape Variety

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Abstract—This study was conducted Razakı grape variety (*Vitis vinifera* L.) and its vine which was aged 19 was grown on 5 BB rootstock in a vegetation period of 2014 in Afyon province in Turkey. In this research, it was investigated whether the applications of Control (C), 1/3 Cluster Tip Reduction (1/3 CTR), Shoot Tip Reduction (STR), 1/3 CTR + STR, Boric Acid (BA), 1/3 CTR + BA, STR + BA, 1/3 CTR + STR + BA on yield and yield components of Razakı grape variety. The results were obtained as the highest fresh grape yield (7.74 kg/vine) with C application; as the highest cluster weight (244.62 g) with STR application; as the highest 100 berry weight (504.08 g) with C application; as the highest maturity index (36.89) with BA application; as the highest must yield (695.00 ml) with BA and (695.00 ml) with 1/3 CTR + STR + BA applications; as the highest intensity of L* color (46.93) with STR and (46.10) with 1/3 CTR + STR + BA applications; as the highest intensity of a* color (-5.37) with 1/3 CTR + STR and (-5.01) with STR, as the highest intensity of b* color (12.59) with STR application. The shoot tip reduction to increase cluster weight and boric acid application to increase maturity index of Razakı grape variety can be recommended.

Keywords—Razakı, 1/3 cluster tip reduction, shoot tip reduction, boric acid, yield and yield components.

I. INTRODUCTION

GRAPE is an important fruit species in Turkey. Turkey is the most suitable location for viticulture. It is producing about 68 million tons grapes from about 7 million hectares in the World [1]. Turkey has the 5th with 468.792 ha viticulture area, and the 6th with 4.011.409 tons production in Turkey [2].

Micronutrients include nonmetallic the only plant nutrients B's higher plants as nutrients for the absolute necessity of approximately 90 years ago [3] as applicable. Factors affecting soil B intake of plant; Plant available soil B content, soil pH 's, type of ions in the soil vary, The amount and type of minerals in the soil, soil organic matter is covered [4], [5].

II. REVIEW OF LITERATURE

TARIS-ZF foliar fertilizer applied on leaves of Horoz Karası (Ermenek) grape cultivar, fresh grape yield, cluster weight, 100 berry weight, berry stalk connection force, must yield and pruning waste weight values were increased.

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However, berry width, berry length, berry length/berry width ratio, total sugar, total acid, maturity index and the number of bud burst values were decreased [6]. While it was found yield, cluster weight, berry weight and must statistically significant effect on the rate, TSS and the total acidity of Humic acid application in Ercis grape variety. TSS ratio increased with the application of humic acid, the total acidity ratio is determined to fall [7].

Hadim-Aladag (Konya) when NPK is applied and not applied as ground fertilizer. The experiment was carried out in NoPoKo not applied and NPK applied 150-50-50 g/vine stocks (N1P1K1) by giving Boron as 11% Borax dosages; Bo 0 g, B1 2,5 g, B2 5 g, B3 10 g Boron/vinestock. The Boron application: I. Boron application was on vinestock drop-lines by mixing it (20-30 cm deep) 15 days before blooming, II. Application started 15 days before blooming and repeated at 15 day intervals. One fourth of boron was applied by spraying on the leaves in four times. The yield increased at the range of 13.50%-70.45% with the increase of boron level as compared to the control [8].

Reducing cluster number application in Amasya and Cardinal grape cultivars decreased the amount of titratable acid and fresh grape yield per vine, while it increased the index of maturity value [9]. Leaf collection and implementation of cluster thinning in Crimson seedless grape cultivar resulted in increases of cluster weight, cluster size, berry size, berry color, °Brix and fruit juice values and decreases in accelerating the maturation process and the acidity values [10].

This study was carried out in 5 BB rootstock grafted on Horoz Karası and Gök grape varieties (*Vitis vinifera* L.) during the 2010 growth season. Effects of 1/3 cluster reduction (CR), 1/3 CR + herbagegreen (HG) and 1/3 CR + humic acid (HA) applications on grape yield and quality of cultivars were examined. The results showed that 1/3 CR + HA application increased grape yield, berry weight, berry red and blue color intensity values of Horoz Karası grape variety and 1/3 CR application increased grape yield and maturity index values of Gök grape variety [11].

The study investigated the effects on grape yield and quality of control, 1/3 cluster tip reduction, repetitive applications of herbagegreen (HG), humic acid (HA), combined foliar fertilizer (CFF), gibberellic acid (GA), gibberellic acid + combined foliar fertilizer (GA + CFF) and gibberellic acid + herbagegreen (GA+HG) performed in the Müşküle table grape variety. The longest cluster was obtained in control, the highest °Brix and

L* color value were obtained in 1/3 cluster tip reduction, the highest grape yield was obtained in 1/3 cluster tip reduction + herbapgreen, the highest berry length/berry width, and b* color value in 1/3 cluster tip reduction + hümik asit, the highest maturity index were obtained in 1/3 cluster tip reduction + combined foliar fertilizer, the highest must yield and a* color value were obtained in 1/3 cluster tip reduction + gibberellik asit + herbapgreen applications [12].

In the study was investigated effects on grape yield and quality of control (C), 1/3 cluster tip reduction (1/3 CTR) and 1/3 CTR + humic acid (HA) applications from foliar in the 5 BB rootstock grafted on Hasandede wine grape variety. Maturity index was increased, berry weight, °Brix and titratable acidity values were decreased, grape yield, cluster weight, cluster length and berry length/ berry width values were not significantly with 1/3 CTR and 1/3 CTR + HA applications [13]. Tartaric and malic acids of 'Red Globe' were mostly influenced by the cluster-berry thinning treatment [14].

The influence of two treatments for reducing grape yield, cluster thinning and berry thinning, on red wine composition and quality were studied in a *Vitis vinifera* cv Syrah vineyard in AOC Penedès (Spain). Cluster thinning reduced grape yield per vine by around 40% whereas berry thinning only reduced it by around 20%. Cluster thinning and berry thinning grapes had higher titratable acidity content and b color intensity than control grapes. Berry thinning grapes had higher color intensity than control grapes [15].

A research was conducted in Çanakkale, Turkey aimed to study the effects of cluster tipping applications on the yield and quality of Uslu (*V. vinifera* L.) and Cardinal (*V. vinifera* L.) grape cultivars. When the berries were 5–7 mm, the clusters were tipped at 1/3rd, 1/6th and 1/12th of the cluster length. In Uslu, cluster length (cm), cluster width (cm), cluster compactness (1–9), number of berries/cluster (n), berry weight (g) and titratable acidity (TA) (%) parameters were affected by the applications. In Cardinal, cluster length (cm), cluster compactness (1–9), number of berries/cluster (n), berry weight (g), total soluble solid (TSS) (%), titratable acidity (TA) (%) and maturity index parameters were affected by the applications. Yield was not affected by cluster tipping in Uslu and Cardinal grape cultivars. It was concluded that the cluster tipping applied to the Uslu in a proportion of one-third and to the Cardinal in a proportion of one-sixth of the cluster length would be positively sufficient in terms of increasing the grape quality [16].

This study was conducted Ismailoglu grape type (*Vitis vinifera* L.) and its vine which was aged 15 was grown on its own root in a vegetation period of 2013 in Nevşehir province in Turkey. In this research, it was investigated whether the applications of Control (C), 1/3 cluster tip reduction (1/3 CTR), shoot tip reduction (STR), 1/3 CTR + STR, TKI-HUMAS (TKI-HM) (Soil) (S), TKI-HM (Foliar) (F), TKI-HM (S + F), 1/3 CTR + TKI-HM (S), 1/3 CTR + TKI-HM (F), 1/3 CTR + TKI-HM (S+F), STR + TKI-HM (S), STR + TKI-HM (F), STR + TKI-HM (S + F), 1/3 CTR + STR + TKI-HM (S), 1/3 CTR + STR + TKI-HM (F), 1/3 CTR + STR + TKI-HM

(S + F) on yield and yield components of Ismailoglu grape type. The results were obtained as the highest fresh grape yield (16.15 kg/vine) with TKI-HM (S), as the highest cluster weight (652.39 g) with 1/3 CTR + STR, as the highest 100 berry weight (419.07 g) with 1/3 CTR + STR + TKI-HM (F), as the highest maturity index (44.06) with 1/3 CTR, as the highest must yield (810.00 ml) with STR + TKI-HM (F), as the highest intensity of L* color (42.04) with TKI-HM (S + F), as the highest intensity of a* color (2.60) with 1/3 CTR + TKI-HM (S), as the highest intensity of b* color (7.16) with 1/3 CTR + TKI-HM (S) applications. To increase the fresh grape yield of Ismailoglu grape type was recommended TKI-HM (S) application [17].

The objective of this study was to determine the effects on grape yield and its quality of Control (C), 1/3 Cluster Tip Reduction (1/3 CTR), Shoot Tip Reduction (STR), 1/3 CTR + STR, Boric Acid (BA), 1/3 CTR + BA, STR + BA, 1/3 CTR + STR + BA) applications in Razakı grape variety.

III. METHODOLOGY

This study was conducted in 5 BB rootstock grafted on Razakı (*Vitis vinifera* L.) grape variety during the 2014 growth season in Afyon province in Turkey. The cultivar is consumed as table grape, yellow-green skin, seedy, the end of August and early September maturing. Study material which is planted with 4 x 4 m distance, goble training method, irrigated and 19 years old vineyard has been established equal in vegetative development plans are based on randomized plots. The study was conducted with 3 different applications as 3 replications.

Experimental design; 1) Control (C), 2) 1/3 Cluster Tip Reduction (1/3 CTR), 3) Shoot Tip Reduction (STR), 4) 1/3 CTR + STR, 5) Boric Acid (BA), 6) 1/3 CTR + BA, 7) STR + BA, 8) 1/3 CTR + STR + BA. It was determined effects on yield and yield components of this application in Razakı grape variety. In this study, three vine plots in each replication including 24 in the vine, in the third iteration total of have been conducted in the 72 vines.

- A. *1/3 Cluster Tip Reduction (CTR)*: The 1/3 cluster tip reduction (berry thinning) was applied by cutting the tips of the cluster at the point of one third of the cluster length, while the 1/3 cluster reduction of all clusters outside the control in the berry set period was conducted.
- B. *Shoot Tip Reduction (STR)*: From 40 to 45 cm long and 10 cm from the ends of the shoots located on the cluster part is amputated.
- C. *Application in Boric Acid Form to Foliar (BA)*: The first boric acid application: a week before flowering, the second application was used including berry period. Applications; 100 liters of water, 100 g boric acid, 500 g urea to be prepared was sprayed onto the cool evening hours, the leaves of the vine leaves.

Maturing of the grapes after harvest and the data was obtained according to the following criteria.

Fresh grape yield (kg/vine); it was calculated by weighing all the yields from the vines in the parcels and dividing it with the number of vines.

The cluster weight (g); it was found by dividing the total grape yield with the number of grape cluster obtained from each parcel.

The 100 berry weight (g); it was calculated by the total weight with the number of 100 berries collected using the method [18].

The maturity index ($^{\circ}$ Brix /TA); it was determined with the division of $^{\circ}$ Brix to TA. $^{\circ}$ Brix (total soluble solid substance) (%) was determined by squeezing the grapes (berries) collected from the vines using the method [18] and keeping the resulting juice at 20°C in a digital refractometer device (Atago RX 7000 Alpha). TA (titratable acidity) (g/l) was calculated using the titration method from the juice squeezed from the same grapes. Pipette 5 ml of the grape juice 50 ml of pure water in the beaker taken to be completed was subjected to titration with 0.1 N NaOH [19].

The must yield (ml); it was determined as the amount of juice obtained by squeezing the grapes that were picked.

Color density; it was determined using a colorimeter device (CR-400 Minolta Co., Osaka, Japan). Color intensity values were provided as CIEL* (Commission Internationale de l'Éclairage) a* b* coordinates, which defined the color in a three-dimensional space. However, L* indicated lightness, while a* and b* were the chromaticity coordinates, green-red and blue-yellow coordinates, respectively. L* is an approximate measurement of luminosity, which is the property according to which each color can be considered as equivalent to a member of the gray scale, between black and white, taking values within the range of 0 to 100. Thus, a* takes positive values for reddish colors and negative values for the greenish ones, whereas b* takes positive values for yellowish colors and negative values for the bluish ones [20]. For the color measurement, 10 grapes per cluster were selected from two opposite sides of the cluster and at 5 different heights. In this way, the color datum was the mean of 10 grapes for each application. The research was planned in a completely randomized block design as a simple factorial experiment and variance analyses and multiple comparison tests were done by JMP statistical package program (version 7.0; SAS Institute, Cary, NC, USA).

IV. FINDINGS AND COMMENTS

It was found statistically significant that the effects of all of the applications on fresh grape yield, cluster weight, 100 berry weight, maturity index, must yield, intensity of L* color, a* color and b* color in Razaki grape variety.

A. Effects of Applications on Fresh Grape Yield

It was found a different response according to applications in terms of grape yield. The maximum fresh grape yield was taken with 7.74 kg/vine from C application in Razaki grape variety. The least fresh grape yield was taken with 2.11 kg/vine from 1/3 CTR + BA and 2.48 kg/vine from 1/3 CTR + STR + BA applications. Other datas were found among of these values (Fig. 1).

While Taris-ZF foliar fertilizer application did not increase fresh grape yield of Hesap Ali and Eksi Kara varieties, it

increased that of Ermenek grape variety [6]. It is showed that 1/3 CR + HA application increased grape yield of Horoz Karası grape variety and 1/3 CR application of Gök üzüm grape variety [11]. It was reported that the bunch reduction application decreased grape yield [9]. Cluster thinning reduced grape yield per vine by around 40% whereas berry thinning only reduced it by around 20% in *Vitis vinifera* cv Syrah [15].

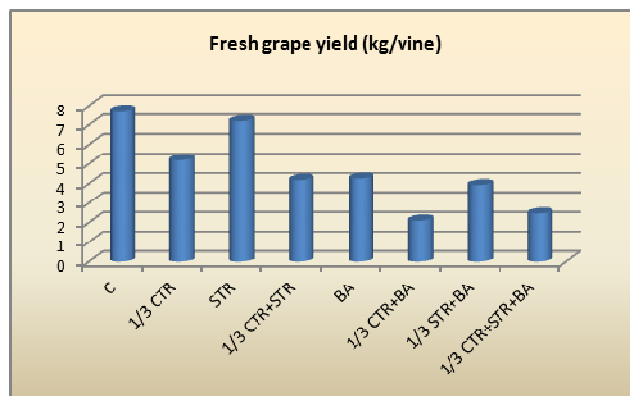


Fig. 1 Effects of applications on fresh grape yield

B. Effects of Applications on Cluster Weight

The results were found a different response according to applications in terms of cluster weight. The highest cluster weight was taken with 244,62 g from STR application in Razaki grape variety. Cluster weight increased 20.32% compared to control (203.30 g) with this application. The least cluster weight was taken with 124.64 g from 1/3 CTR + BA and 116.73 g from 1/3 CTR + STR + BA applications (Fig. 2).



Fig. 2 Effects of applications on cluster weight

In similar studies, while Taris-ZF foliar fertilizer application was not increased the cluster weight of Hesap Ali and Eksi Kara varieties, it was increased in Ermenek variety [7].

C. Effects of Applications on 100 Berry Weight

The variety was given a different response according to applications in terms of 100 berry weight. The highest 100 berry weight was taken with 504.08 g from C application in

Razakı grape variety. The least 100 berry weight was taken with 314.75 g from STR + BA application (Fig. 3).

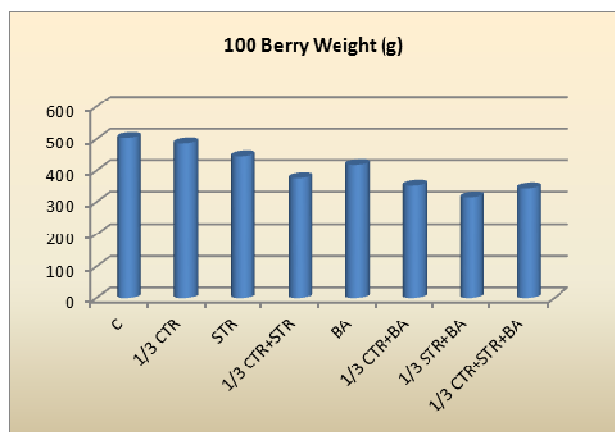


Fig. 3 Effects of applications on 100 berry weight

Other studies on this subject showed that while Taris-ZF foliar fertilizer application increased berry weight of Eksi Kara and Ermenek varieties, increase in Hesap Ali variety was not found to be significant [7].

D. Effects of Applications on Maturity Index

It was found a different response according to applications in terms of maturity index. The highest maturity index was taken with 36.89 from BA application in Razakı grape variety. Maturity index increased 63.40% compared to control (23.39) with this application. The least maturity index was taken with 15.48 from STR application (Fig. 4).

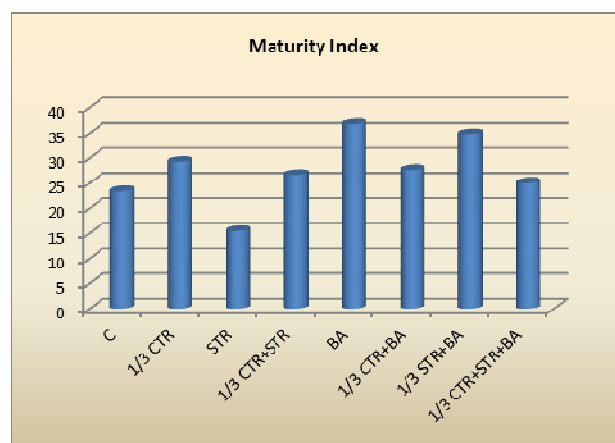


Fig. 4 Effects of applications on maturity index

In similar studies, while Taris-ZF foliar fertilizer application increased the maturity index of Hesap Ali and Eksi Kara varieties, increase in Ermenek grape variety was not found to be significant [6]. Maturity index value was increased on reducing cluster number application in Amasya and Cardinal grape cultivars [9].

E. Effect of Applications on Must Yield (Grape Juice)

It was found a different response according to applications in terms of must yield. The highest must yield was taken with 695.00 ml from BA and 695.00 ml from 1/3 CTR + STR + BA applications in Razakı grape variety. The least maturity index was taken with 655.00 ml from 1/3 CTR + STR application (Fig. 5).

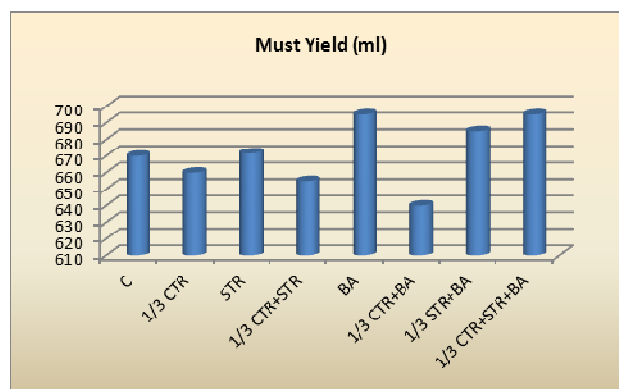


Fig. 5 Effects of applications on must yield

In similar studies, as Taris-ZF foliar fertilizer application increased the must yield of Eksi Kara and Ermenek varieties, increase in Hesap Ali was not found to be significant [6].

F. Effect of Applications on L* Color Intensity

The highest L* color intensity was obtained with 46.93 from STR and 46.10 from 1/3 CTR + STR + BA applications in Razakı grape variety. L* color intensity increased white (brightness) compared to control (42.59) with this application. The least L* color intensity was taken with 42.59 from C application (Fig. 6). In similar studies, L* color intensity increased with 1/3 CTR application in Müşküle table grape variety [12].

G. Effect of Applications on a* Color Intensity

The highest a* color intensity was obtained with -5.01 from STR and from -5.37 1/3 CTR + STR applications in Razakı grape variety. a* color intensity increased compared to control (-2.40) with this application. That is, increased greenish color of berries. The least a* color intensity was taken with -2.40 from C, -3.63 from 1/3 CTR + BA and -3.56 from 1/3 CTR + STR + BA applications (Fig. 6). In similar studies, a* color intensity value was increased with berry thinning application in Syrah grape variety [15].

H. Effect of Applications on b* Color Intensity

The highest b* color intensity was obtained with 12.59 from STR application in Razakı grape variety. b* color intensity increased compared to control (10.45) with this application. That is, increased yellowish color of berries. The least b* color intensity was taken with 10.07 from 1/3 CTR + STR + BA application (Fig. 6). In similar studies, b* color intensity increased with cluster thinning and berry thinning applications in Syrah grape variety ([15]).

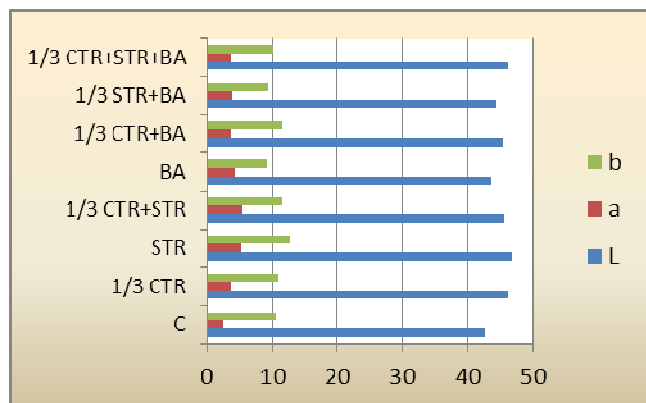


Fig. 6 Effects of applications on color intensity

IV. CONCLUSION

Consequently, the shoot tip reduction to increase cluster weight and boric acid application to increase maturity index of Razakı grape variety can be recommended.

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