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The Effects of Yield and Yield Components of Some Quality Increase Applications on Ismailoglu Grape Type in Turkey

Yaşar Önal, Aydın Akın

***Abstract*—**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 can be recommended TKI-HM (S) application.

***Keywords*—**1/3 cluster tip reduction, shoot tip reduction, TKI-Humas application, yield and yield Components.

I. Introduction

VITICULTURE has an important place in agriculture 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 4th with 477.786 ha viticulture area, and the 6th with 4.255.000 tons production in Turkey [2].

TKI-Humas; the liquid is a natural organic soil conditioner, produced from leonardit and low-quality lignite, humic and fulvic acid containing 12% [3]. Plant growth-timulating effect of humic substances is associated with increased macro-nutrient intake [4]. The statement about the effect of humic acid on plant growth by [5] is that humic substances affect the ion exchange of plant nutrients that are useful in microbial activity by increasing conversions directly as well as indirectly as a result of the stimulating plant growth hormones. According to [6], humic acid in nutrition of the plants plays an important role directly and indirectly. In the full bloom period of humic acid application, berry weight, titratable acidity and maturity index values of Italy grape cultivar increased significantly [7].

Yaşar Önal is with the Selcuk University Agriculture Faculty and Department of Horticulture, Konya, 42075, Turkey (e-mail: yasar_onal@hotmail.com).

Aydın Akın is with the Selcuk University Agriculture Faculty and Department of Horticulture, Konya, 42075, Turkey (Phone: 90 532 5014464; fax: 90 332 241 0108; e-mail: aakin@selcuk.edu.tr).

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. 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 [8]. 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 [9].

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 [10]. Leaf collection and implementation of cluster thinning in Crimson seedless grape cultivar resulted in increases of cluster weight, cluster size, berry size, berry color, ^{o}Brix and fruit juice values and decreases in accelerating the maturation process and the acidity values [11].

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 + herbagreen (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 [12].

The study investigated the effects on grape yield and quality of control, 1/3 cluster tip reduction, repetitive applications of herbagreen (HG), humic acid (HA), combined foliar fertilizer (CFF), gibberellic acid (GA), gibberellic acid + combined foliar fertilizer (GA + CFF) and gibberellic acid + herbagreen (GA+HG) performed in the Müşküle table grape variety. The longest cluster was obtained in control, the highest 0Brix and L* color value were obtained in 1/3 cluster tip reduction, the

highest grape yield was obtained in 1/3 cluster tip reduction + herbagreen, 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 + herbagreen applications [13].

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, ^{o}Brix and titratable acidity values were decreased, grape yield, cluster weight, cluster lenght and berrylenght/ berry width values were not significantly with 1/3 CTR and 1/3 CTR + HA applications [14].

In order to study the effects different concentration of humic acid and acetic acid foliar application on yield and leaves nutrient content of grape (*Vitis vinifera*), a field experimental in randomized complete block design with three replications was conducted in 2010. Foliar application treatments were T1: Control, T2: Acetic acid (1000 mg kg^{-1}), T3: Humic acid (300 mg kg^{-1}), T4: Acetic acid (1000 mg kg^{-1}) + Humic acid (300 mg kg^{-1}). Obtained results showed that: Spray treatments had significant effect on yield, cluster length and diameter and Iron, Potassium and Phosphor leaves content of grape. Maximum and minimum amount of fruits yield was obtained in T3 (Humic acid) and T1 (Control) treatments respectively. Highest amount of length and diameter of grape cluster and leaves Iron content was recorded in T4 (Acetic acid) + Humic acid) but maximum of phosphor and potassium was recorded in T3 (Acetic acid) and minimum amount of all characters was recorded in T1 (Control) [15]. Tartaric and malic acids of 'Red Globe' were mostly influenced by the cluster-berry thinning treatment [16].

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 [17].

The objective of this study was to determine the effects on grape yield and its quality of C, 1/3 CTR, STR, 1/3 CTR + STR, TKI-HM (S), TKI-HM (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) and 1/3 CTR + STR + TKI-HM (S + F) applications in Ismailoglu grape type.

III. Methodology

This study was conducted Ismailoglu (*Vitis vinifera* L.) grape type and its vine which was aged 15 was grown on its own root in a vegetation period of 2013 in Nevşehir province in Turkey. The cultivar is consumed as table grape, yellow-green skin, seedy, the end of September (late) maturing. Study material which is planted with 3 x 2 m distance, goble training method, unirrigated and 15 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) TKI-Humas (Soil), 6) TKI-Humas (Foliar), 7) TKI-Humas (Soil + Foliar), 8) 1/3 CTR + TKI-Humas (Soil), 9) 1/3 CTR + TKI-Humas (Foliar), 10) 1/3 CTR + TKI-Humas (Soil + Foliar), 11) STR + TKI-Humas (Soil), 12) STR + TKI-Humas (Foliar), 13) STR + TKI-Humas (Soil + Foliar), 14) 1/3 CTR + STR + TKI-Humas (Soil), 15) 1/3 CTR + STR + TKI-Humas (Foliar), 16) 1/3 CTR + STR + TKI-Humas (Soil + Foliar). It was determined effects on yield and yield components of this application in Ismailoğlu grape type. In this study, three vine plots in each replication including 48 in the vine, in the third iteration total of have been conducted in the 144 vines.

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.

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.

TKI-Humas Composition: TKI-Humas; leonardit produced from low-quality lignite, containing 12% humic and fulvic acid is a liquid natural organic soil conditioner [3]. Total Organic Matter: 5%; Humic Acid + Fulvic Acid: 12%; Water Soluble Potassium Oxide (K2O-3%), PH: 11-13.

TKI-Humas Implementation of the soil: Recommended in the instructions for use on the basis of 100 ml/1.5 lt dimensions, each vine 333.33 ml/5 lt is made application. Applications were made in the evening near the cool hours.

1. Application: End of March- Beginning of April (buds without waking),
2. Application: Before flowering plant root zone are provided.

Foliar Application of TKI-Humas: Recommended in the instructions for use on the basis of 250 ml/100 lt dimensions, foliar applications of each vine 2.5 ml / 1 liter calculated as the top and bottom of the leaves dripping wet spray equipment is made.

1. Application: It was applied to the leaves before flowering.
2. Application: It was applied to the leaves in period of berry set.

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

The maturity index (°Brix /TA); it was determined with the division of °Brix to TA. 0Brix (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* (Commision Internationele de I'E Clairage) 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 Ismailoglu grape type.

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 16.15 kg/vine from TKI-HM (S) application in Ismailoglu grape type. Fresh grape yield increased 270% compared to control (5.97 kg/vine) with this application. The least fresh grape yield was taken with 4.12 kg/vine from 1/3 CTR application. 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 [8]. 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 [12]. It was reported that the bunch reduction application decreased grape yield [10]. Cluster thinning reduced grape yield per vine by around 40% whereas berry thinning only reduced it by around 20% in *Vitis vinifera* cv Syrah [17].

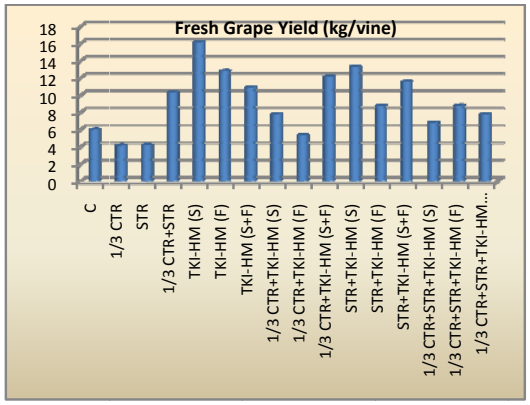

Fig. 1 Effects of applications on freh grape yield

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 652.39 g from 1/3 CTR + STR application in Ismailoglu grape type. Cluster weight increased 199.39% compared to control (327.19 g) with this application. The least cluster weight was taken with 307.52 g from 1/3 CTR and 287.81 g from 1/3 CTR + STR + TKI-HM (S) applications (Fig. 2).

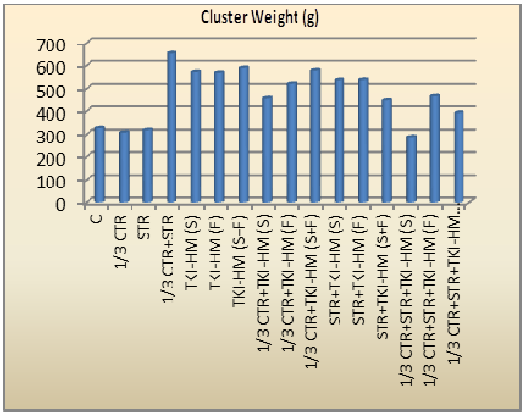

Fig. 2 Effects of applications on cluster weight

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 [8].

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 419.07 g from 1/3 CTR + STR + TKI-HM (F) application in Ismailoglu grape type. 100 berry weight increased 122.57% compared to control (341.91 g) with this application. The least 100 berry weight was taken with 295.62 g from 1/3 CTR application (Fig. 3).

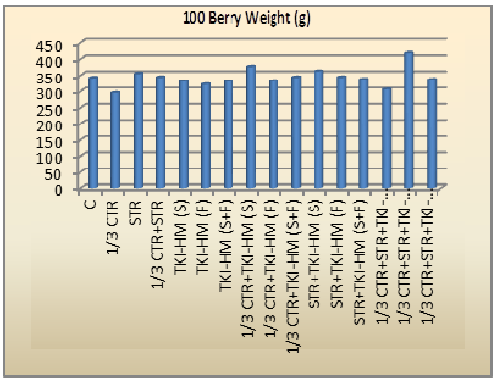

Fig. 3 Effects of applications on 100 berry weight

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 [8].

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 44.06 from 1/3 CTR application in Ismailoglu grape type. Maturity index increased 135.20% compared to control (32.59) with this application. The least maturity index was taken with 28.49 from 1/3 CTR + STR + TKI-HM (S + F) application (Fig. 4).

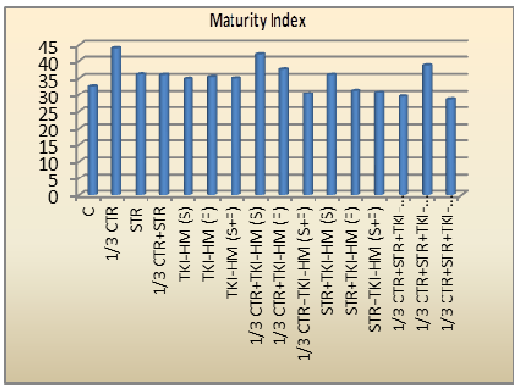

Fig. 4 Effects of applications on maturity index

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 [8]. Maturity index value was increased on reducing cluster number application in Amasya and Cardinal grape cultivars [10].

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 810.00 ml from STR + TKI-HM (F) application in Ismailoglu grape type. Maturity index increased 121.50% compared to control (666.67 ml) with this application. The least maturity index was taken with 666.67 ml from C application (Fig. 5).

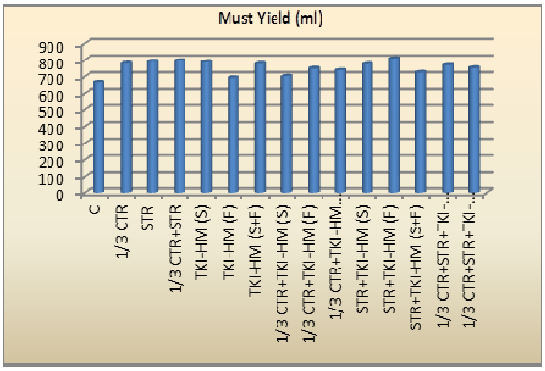

Fig. 5 Effects of applications on must yield

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 [8].

F. Effect of Applications on L Color Intensity*

The highest L* color intensity was obtained with 42.04 from TKI-HM (S+F) application in Ismailoglu grape type. L* color intensity increased white (brightness) compared to control (37.53) with this application. The least L* color intensity was taken with 37.53 from C application (Fig. 6). In similar studies, L* color intensity increased with 1/3 CTR application in Müşküle table grape variety [13].

G. Effect of Applications on a Color Intensity*

The highest a* color intensity was obtained with 2.60 from 1/3 CTR + TKI-HM (S) application in Ismailoglu grape type. a* color intensity increased compared to control (1.83) with this application. The least a* color intensity was taken with 0.83 from 1/3 CTR + STR application (Fig. 6). In similar studies, a* color intensity value was increased with berry thinning application in Syrah grape variety [17].

H. Effect of Applications on b Color Intensity*

The highest b* color intensity was obtained with 7.73 from STR + TKI-HM (S + F), with 7.46 from 1/3 CTR + TK-HM (S + F) and 1/3 CTR + TK-HM (S) applications in Ismailoglu grape type. b* color intensity increased compared to control (4.43) with this application. The least b* color intensity was taken with 2.86 from 1/3 CTR + STR + TKI-HM (S + F) application (Fig. 6). In similar studies, b color intensity increased with cluster thinning and berry thinning applications in Syrah grape variety ([17].

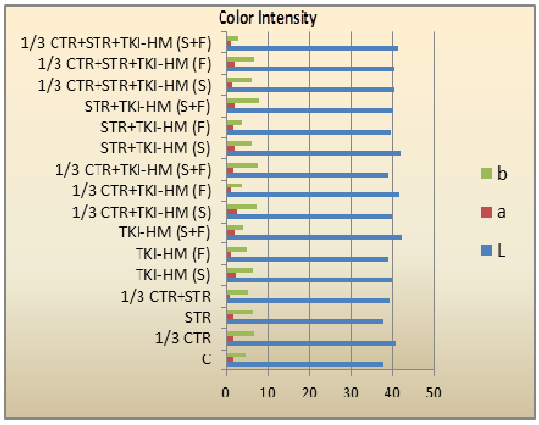

Fig. 6 Effects of applications on color intensity

IV. Conclusion

Consequently, to increase production, it can be advised that TK-HM (S) application should be used in Ismailoglu grape type.

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