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Araştırma Makalesi/Research Article

The Effects of Cluster Tip Reduction and Boric Acid Applications on Yield and Yield Components of Tilki Kuyruğu Grape Cultivar

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Abstract

This study was conducted on grownTilki Kuyrugu grape variety (*Vitis vinifera* L.) in Mersin province in Turkey in 2016 on the cultivar which is 12 years old and grown on their own roots and evaluated as table grape. In this research, it was investigated that the effects of Control (C), 1/3 Cluster Tip Reduction (1/3 CTR), 1/6 Cluster Tip Reduction (1/6 CTR), 1/9 Cluster Tip Reduction (1/9 CTR), 1/3 CTR+Boric Acid (BA), 1/6 CTR+BA, 1/9 CTR+BA applications on yield and yield components of Tilki Kuyrugu grape variety. The results were obtained as the highest fresh grape yield (10.26 kg/vine) with 1/9 CTR, (10.14 kg/vine) with 1/3 CTR and (10.09 kg/vine) with 1/3 CTR+BA applications; the highest cluster weight were (341.89 g) with 1/9 CTR, (338.11 g) with 1/3 CTR and (336.22 g) with 1/3 CTR+BA applications; the highest 100 berry weight were (513.39 g) with 1/9 CTR, (511.38 g) with 1/6 CTR+BA, (509.28 g) with 1/9 CTR+BA, (507.06 g) with 1/6 CTR, (487.31 g) with 1/3 CTR+BA and (477.79 g) with 1/3 CTR applications; and the highest must yield was (700.00 ml/kg) with 1/9 CTR+BA application. The effects of the applications on the maturity index value were not found signicificant in respect of statistically. It can be recommendedwe can recommend 1/9 Cluster Tip Reduction application to improve fresh grape yield, cluster weight and 100 berry weight of Tilki Kuyruğu grape variety.
Keywords: Boric acid, cluster tip reduction, Tilki Kuyruğu grape variety, yield, yield components

Öz

Tilki Kuyruğu Üzüm Çeşidinde Salkım Ucu Kesme ve Borik Asit Uygulamalarının Verim ve Verim Unsurları Üzerine Etkileri

Bu çalışma, 2016 yılında Mersin İlinde yetiştirilen Tilki Kuyruğu (*Vitis vinifera* L.) üzüm çeşidinde gerçekleştirilmiştir. Bu çeşit 12 yaşında olup, kendi kökü üzerinde yetiştirilmekte ve sofralık olarak değerlendirilmektedir. Bu çalışma, 2016 yılı vejetasyon periyodunda Mersin İli, Erdemli ilçesi, Üzümlü Köyü'nde kendi kökü üzerinde yetiştirilen 12 yaşındaki Tilki Kuyruğu (*Vitis vinifera* L.) üzüm çeşidinde gerçekleştirilmiştir. Araştırmada, Kontrol (K), 1/3 Salkım Ucu Kesme (1/3 SUK), 1/6 Salkım Ucu Kesme (1/6 SUK), 1/9 Salkım Ucu Kesme (1/9 SUK), 1/3 SUK+Borik Asit (BA), 1/6 SUK+BA, 1/9 SUK+BA uygulamalarının Tilki Kuyruğu üzüm çeşidinde verim ve verim unsurları üzerine etkileri incelenmiştir. En yüksek taze üzüm verimi (10.26 kg/asma) 1/9 SUK, (10.14 kg/asma) 1/3 SUK ve (10.09 kg/asma) 1/3 SUK+BA uygulamaları ile; en yüksek salkım ağırlığı (341.89 g) 1/9 SUK, (338.11 g) 1/3 SUK ve (336.22 g) 1/3 SUK+BA uygulamaları ile; en yüksek 100 tane ağırlığı (513.39 g) 1/9 SUK, (511.38 g) 1/6 SUK+BA, (509.28 g) 1/9 SUK+BA, (507.06 g) 1/6 SUK, (487.31 g) 1/3 SUK+BA ve (477.79 g) 1/3 SUK uygulamaları ile; en yüksek şıra randımanı (700.00 ml/kg) 1/9 SUK+BA uygulaması ile elde edilmiştir. Uygulamaların olgunluk indisi değeri üzerine etkisi istatistiki olarak önemli bulunmamıştır. Tilki Kuyruğu üzüm çeşidinde, taze üzüm verimi, salkım ağırlığı ve 100 tane ağırlığını artırmak için 1/9 Salkım Ucu Kesme uygulamaları tavsiye edilebilir.
Anahtar Kelimeler: Borik asit, salkım ucu kesme, Tilki Kuyruğu üzüm çeşidi, verim, verim unsurları

Introductıon

Viticulture is a very important branch of agriculture in Turkey. It is produced 67.067.129 tons of grapes from 6.969.373 hectares in the World (FAO, 2016). Turkey has the 5th viticulture area with 461.956 hectares, and the 6th biggest producer with 3.650.000 tons of production. (TÜİK, 2016). The boron deficiency decreased the amounts of ascorbic acid and a non-protein compound. It also remarkably decreases the activity of glutathione reductase (Cakmak and Romheld, 1997).

Perlette grape cultivar was studied on fruit yield and quality with foliar sprays of certain macro and micro-nutrients in India. Grape yield and berry weight were increased with foliar sprays of boron in Perlette grape variety (Usha and Singh, 2002).

Micronutrients (Fe, Zn, Mn and Br) were used as a mixture at a concentration of 50 and 100 mg/l in a chelated form in two different concentrations and salicylic acid at (100 and 150) mg/l in local grape variety (Bez El Naka). Cluster weight, berries weight, juice volume, T.S.S, and acidity values were improved by all treatments as compared with control (Abdel-Salam, 2016).

A research on Uslu (*V. vinifera* L.) and Cardinal (*V. vinifera* L.) grape cultivars were conducted in Canakkale in Turkey. 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 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 (Dardeniz, 2014).

Blauer Portugieser grapevine variety was studied on two different yield reductions based on cluster thinning. Blauer Portugieser significantly decreased titratable acidity in grape and wine, and increased pH in wine. While yield per vine was significantly decreased. °Brix was increased in grape (Reščič et al., 2015).

In Chambourcin (*Vitis vinifera* x *V. rupestris*) grapevines were conducted on different level pruning and cluster thinning. While grape yield was decreased, the total soluble solids in juice was increased by applications (Kurtural et al., 2016).

In 'Houman' grape plants were removed lateral floral clusters. Floral cluster pruning was increased berry size, fruit weight and the total content of soluble solids. But, the level of titratable acidity was decreased (Zhang et al., 2016).

The effects of leaf removal and cluster thinning on the clonal selection of Riesling × Silvaner wine grape were determined in terms of yield and quality. The highest total soluble solids content and grape yield were found with plants with 66%clusters and without leaf removal applications. Maturity index was significantly higher in plants without leaf thinning; but was not affected by removed clusters (Almanza-Merchán et al., 2011).

The aim of this study was identifying the effects of Control, 1/3, 1/6, 1/9 Cluster Tip Reductions, Boric acid and combined applications in Tilki Kuyrugu grape variety.

Materials and Methods

This study was conducted on Tilki Kuyrugu grape variety (*Vitis vinifera* L.) in Mersin province in Turkey in 2016. The cultivar is 12 years old and grown on their own roots. It is evaluated as table grape. The cultivar is consumed as table grape, yellow-green skin, seeded, in the middle of September maturity period. The present study was conducted with seven different applications as three replications.

The experimental design is as below;

1) Control (C),
2) 1/3 Cluster Tip Reduction (1/3 CTR),
3) 1/6 Cluster Tip Reduction (1/6 CTR),
4) 1/9 Cluster Tip Reduction (1/9 CTR),
5) 1/3 CTR+Boric Acid (BA),
6) 1/6 CTR+BA,
7) 1/9 CTR+BA.

The effects on yield and yield components of this application in Tilki Kuyrugu grape variety were determined. In this study, three vine plots as in each replication including 21 and 63 vines were used in total with replications.

1/3 Cluster Tip Reduction (1/3 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.

1/6 Cluster Tip Reduction (1/6 CTR): The 1/6 cluster tip reduction (berry thinning) was applied by cutting the tips of the cluster at the point of one sixth of the cluster length, while the 1/6 cluster reduction of all clusters outside the control in the berry set period was conducted.

1/9 Cluster Tip Reduction (1/9 CTR): The 1/9 cluster tip reduction (berry thinning) was applied by cutting the tips of the cluster at the point of one in nine of the cluster length, while the 1/9 cluster reduction of all clusters outside the control in the berry set period was conducted.

Application in Boric Acid Form to Foliar (BA): The first boric acid application: a week before flowering, the second application was used in berry period. Applications; 100 liters of water, 100 g boric acid, 500 g urea were prepared, and there was sprayed onto in the cool evening hours.

Maturing of the grapes after harvest and the data were 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 to the number of vines.

Cluster Weight (g): It was found by dividing the total grape yield with the number of grape cluster obtained from each parcel.

1000 Berry Weight (g): It was calculated 100 berries weight collected using the method (Amerine and Cruess, 1960).

Must Yield (ml/kg): It was determined as the amount of juice obtained by squeezing the grapes that were picked.

Maturity Index (°Brix /TA): It was determined with the division of °Brix to TA. ºBrix (total soluble solid substance) (%) was determined by squeezing the grapes (berries) collected from the vines using the method (Amerine and Cruess, 1960) and read at 20 °C in a digital refractometer device (Atago RX 7000 Alpha). TA (titratable acidity) (g/l) was calculated by using the titration method from the juice squeezed from the same grapes. 5 ml of the grape juice completed to 50 ml with pure water in the beaker was subjected to titration with 0.1 N NaOH (Nelson, 1985).

The research was planned in a completely randomized block design as a simple factorial experiment, and analysed by JMP statistical package program (version 7.0; SAS Institute, Cary, NC, USA).

Results and Discussion

The effects of all the applications on fresh grape yield, cluter weight, 100 berry weight and must yield in Tilki Kuyrugu grape variety were found statistical significant.

Effects of Applications on Fresh Grape Yield

The result of applications on fresh grape yield was found statistical significant. (Fig. 1). The highest fresh grape yield were obtained (10.26 kg/vine) with 1/9 CTR, (10.14 kg/vine) with 1/3 CTR and (10.09 kg/vine) with 1/3+BA applications compared to C (6.18 kg/vine). In similar studies, grape yield was increased wit foliar sprays of boric acid in Perlette grape variety (Usha and Singh, 2002). Grape yield was decreased by cluster thinning (Reščič et al., 2015). Grape yield was decreased by cluster thinning in Chambourcin (*Vitis vinifera* x *V. rupestris*) (Kurtural et al., 2016). In 'Houman' grape plant, fruit weight was increased by removing lateral floral clusters (Zhang et al., 2016). Grape yield was increased by cluster thinning in the clonal selection Riesling × Silvaner wine grape (Almanza-Merchán et al., 2011).

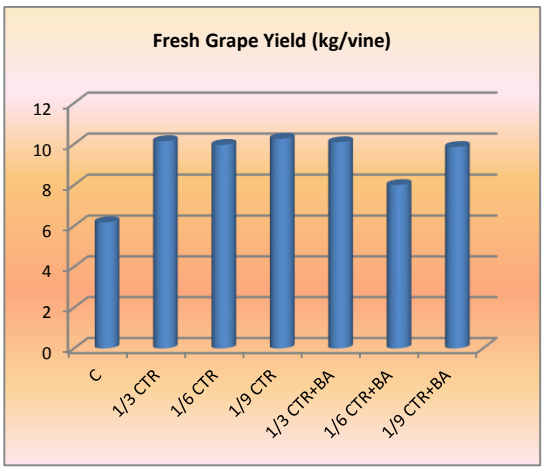

Figure 1. Effects of applications on fresh grape yield

Effects of Applications on Cluster Weight

A different response according to applications in terms of cluster weight was found statistical significant. (Fig. 2). The highest cluster weight were determined (341.89 g) with 1/9 CTR, (338.11 g) with 1/3 CTR and (336.22 g) with 1/3 CTR+BA applications compared to C (206.11 g). In similar studies, cluster weight was improved by all treatments as compared with control in local grape variety (Bez El Naka) (Abdel-Salam, 2016).

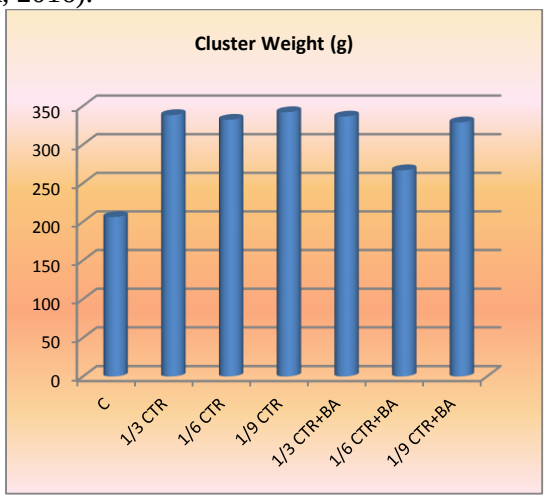

Figure 2. Effects of applications on cluster weight

Effects of Applications on 1000 Berry Weight

The result of applications on 100 berry weight was found statistical significant (Fig. 3). The highest 100 berry weight were obtained (513.39 g) with 1/9 CTR, (511.38 g) with 1/6 CTR+BA, (509.28 g) with 1/9 CTR+BA, (507.06 g) with 1/6 CTR, (487.31 g) with 1/3 CTR+BA and (477.79 g) with 1/3 CTR applications compared to C (396.00 g) application. In similar studies, berry weight was increased with foliar sprays of bor in Perlette grape variety (Usha and Singh, 2002). Berry weight was improved by all treatments as compared with control in local grape variety (Bez El Naka) (Abdel-Salam, 2016). In 'Houman' grape planti berry weight was increased by removal of lateral floral clusters (Zhang et al., 2016).

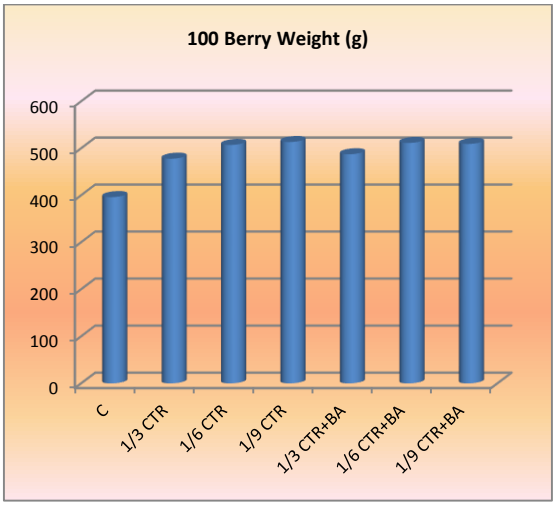

Figure 3. Effects of applications on 1000 berry weight

Effect of Applications on Must Yield (Grape Juice)

The result of applications on must yield is determined as a statistical significant. (Fig. 4). The highest must yield was (700.00 ml/kg) with 1/9 CTR+BA application compared to C (653.33 ml/kg).

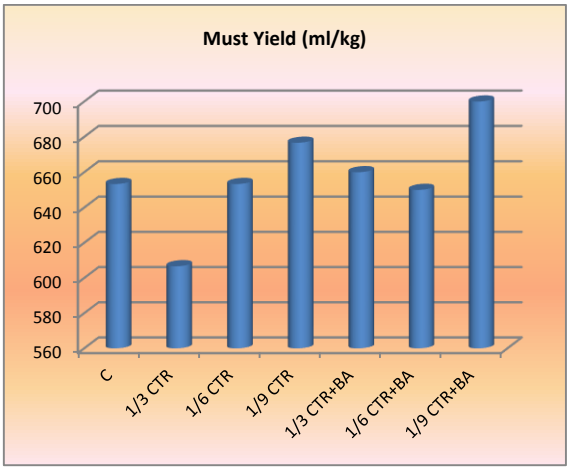

Figure 4. Effects of applications on must yield

Effects of Applications on Maturity Index

Maturity index was not found statistical significant (Fig. 5). In similar studies, maturity index was decreased by cluster thinning in the clonal selection of Riesling × Silvaner wine grape (Almanza-Merchán et al., 2011).

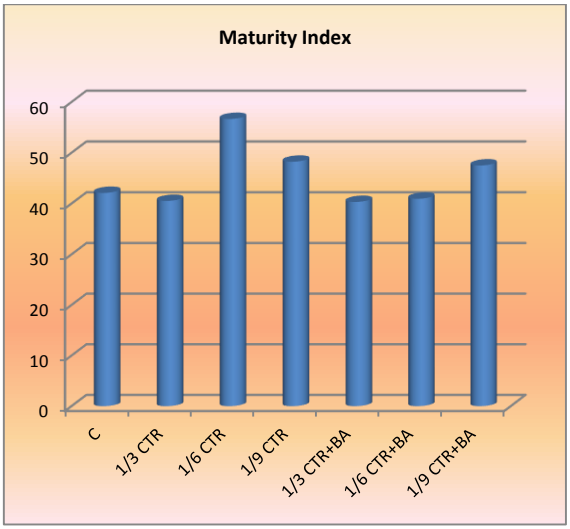

Figure 5. Effects of applications on maturity index

Conclusion

Consequently, we can recommend 1/9 CTR application to improve fresh grape yield, cluster weight and 100 berry weight.

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References

Abdel–Salam, M.M., 2016. Effect of Foliar Application of Salicylic Acid and Micronutrients on the Berries Quality of "Bez El Naka" Local Grape Cultivar. Middle East Journal of Applied Sciences. 6 (1): 178–188.

Almanza–Merchán, P.J., Fischer, G., Serrano–Cely, P.A., Balaguera–López, H.E., Galvis, J.A., 2011. Effects of leaf removal and cluster thinning on yield and quality of grapes (*Vitis vinifera* L., *Riesling* × *Silvaner*) in Corrales, Boyaca (Colombia). Agronomía Colombiana. 29 (1): 35–42.

Amerine, M.A., Cruess, M.V., 1960. The technology of wine making. The Avi Publishing Comp.,Inc. Westport, Connecticut, U.S.A., 709 pp.

Cakmak, I., Romheld, V., 1997. Boron-deficiency induced impairments of cellular functions in plants. In: Boron in Soils and Plants: Reviews. Eds. B. Dell, P.H. Brown and R.W. Bell. Kluwer Academic Publishers, Dordrecht, The Netherlands. pp. 71–83.

Dardeniz, A., 2014. Effects of cluster tipping on yield and quality of Uslu and Cardinal table grape cultivars. ÇOMÜ Agricultural Faculty Journal. 2 (1): 21–26.

FAO, 2016. FAO Statistical Database. http://faostat.fao.org. Rome:Retrieved September 24, 2016.

Kurtural, S.K., Dami, I.E., Taylor, B.H., 2016. Effects of pruning and cluster thinning on yield and fruit composition of 'Chambourcin' grapevines. HortTechnology. 16 (2): 233–240.

Nelson, K.E., 1985. Harvesting and handling california table grapes for market. Bull. 1913, Univ. California, DANR Publication, Oakland, CA, 1985.

Reščič, J., Mikulič-Petkovšek, M., Štampar, F., Zupan, A., Rusjan, D., 2015. The ımpact of cluster thinning on fertility and berry and wine composition of 'Blauer Portugieser' (*Vitis Vinifera* L.) grapevine variety. J. Int. Sci. Vigne Vin. 49 (4): 275–291.

TÜİK, 2016. Crop Production Statistics. http://tuikapp.tuik.gov.tr/bitkiselapp/bitkisel.zul Tuik, Retrieved September 24, 2016.

Usha, K., Singh, B., 2002. Effect of macro and micro-nutrient spray on fruit yield and quality of grape (Vitis Vinifera L.) cv. Perlette. ISHS Acta Horticulturae 594: International Symposium on Foliar Nutrition of Perennial Fruit Plants. DOI: 10.17660/ActaHortic.2002.594.21, 2002.

Zhang, L., Xu, Y.S., Jia, Y., Wang, J.Y., Yuan, Y., Yu, Y., Tao, J.M., 2016. Effect of floral cluster pruning on anthocyanin levels and anthocyanain-related gene expression in 'Houman' grape''. Horticulture Research. 3, 16037; doi:10.1038/hortres.2016.37, 2016.