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Effects of Pruning Intensity on Grape Yield and Quality of Erciş Grape Cultivar (Vitis vinifera L.)

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Abstract

The present study was conducted to investigate the effects of different pruning intensity treatments on grape yield and quality of Erciş grape cultivar in the year 2014. The gobble-trained grapevines grown on their own roots were subjected to three different pruning intensities during winter pruning [16 buds/grapevine (8 shoots x 2 buds); 24 buds/grapevine (8 shoots × 3 buds); 32 buds/grapevine (8 shoots x 4 buds)]. Compared to low pruning intensity (16 buds/grapevine), high pruning intensity treatments (32 buds/grapevine) increased grapevine yield by 55%, but decreased cluster weight by 17%, cluster width by 25.2%, cluster length by 12.5%, grape width by 10.9%, grape length by 6.7%, 100-grape weight by 22.7% and water soluble dry matter yield by 2.6%.

Keywords: Erciş grape, Pruning intensity, Yield, Quality

INTRODUCTION

Grape is among the mostly cultured fruits worldwide. As it was in several fruit species, there are various cultural practices to improve the yield and quality in grapes. Among these practices, pruning is a significant practice. Pruning is a cultural practice targeting to benefit from vineyards uppermost level through arranging growth and development well balanced with yield and quality. Number of buds to be left over the grapevine in winter pruning (pruning intensity – fruit load) is directly effective on growth, development, yield and quality. The cultivar, purpose of use, rootstock, training system, age and development of grapevine and ecological conditions are the factors with great influences on pruning intensity [1]. A physiological balance to be established and preserved between vigor and yield-quality of vines is directly related to conscious winter and summer pruning. Development and fruit quality is directly influenced by the arrangements made over the yields. Therefore while in winter pruning, grapevines should be loaded with a fruit load (pruning intensity) proportional to their development capacities [1, 2, 3, 4, 5, 6]. Since pruning intensity is influenced by several factors, it is necessary to identify proper pruning intensities for different grape cultivars grown under different conditions.

The present study was conducted to investigate the effects of different pruning intensity treatments on growth, yield and quality of Erciş grape cultivar.

MATERIALS and METHODS

The present study was conducted on Erciş grape cultivar grown in Van region of Turkey in 2014. Experimental vineyard is grown over their own roots, 20 years old and gobble-trained with 2x1.5 m planting spacing. Van region has an altitude of 1725 m. Annual average temperature of the region is 10 □C, annual precipitation is 385.2 mm and annual average relative humidity is 57.3% [7]. Vigor levels of the grapevines were determined based on pruning wood weights in winter pruning. Experiments were conducted on grapevines with close vigor levels. Based on vigor levels, three different pruning densities were applied to grapevines as of low [16 buds/grapevine (2 buds × 8 shoots)], normal [24 buds/grapevine (3 buds × 8 shoots)] and high [32 buds/grapevine (4 buds × 8 shoots)]. Experiments were conducted in randomized blocks design with three replications with 4 grapevines in each replication. Throughout the experiments, two soil tillage, two flooding irrigation and two fungicide treatments against powdery mildew were performed. Since the shoots exhibit a lateral growth without any external supports, shoot tip pinching was performed just before flowering. Following the treatments, shooting ratio (%), annual branch diameter (cm), annual branch length (cm), number of shoots per grapevine, number of clusters per shoot, grapevine yield (kg), number of clusters per grapevine, average cluster weight (g), cluster width and length (cm), 100-grape weight (g), grape width and length (mm), juice yield (ml/g), water soluble dry matter yield (g), titratable acidity (g/l) and juice pH values were determined. Resultant data were statistically analyzed with SPSS 22.0 software and means were compared with Duncan's multiple range test.

RESULTS and DISCUSSION

Compared to low pruning density, high pruning density treatments decreased shooting ratio by 6.1% (Table 1). Several other researchers also reported decreasing shooting ratios with increasing pruning intensities [8, 9, 10, 11, 12]. High pruning intensity also decreased branch diameter by 13.6% and branch length by 5.1% (Table 1). Similarly, Dardeniz and Kısmalı [13], Çelik [9], Shalan [12], Shoeib [14] and El-Kady et al. [15] reported decreased branch diameter and length with increasing number of buds left in pruning. Compared to low pruning intensity, high pruning intensity decreased number of shoots per grapevine by 87.5% ad number of clusters per shoot by 22.4% (Table 1). İlhan [8] indicated that increase in number of buds increased number of shoots per grapevine and decreased number of clusters per shoot in seedless grape cultivar.

Again compared to low pruning intensity, high pruning intensity treatments increased grapevine yield by 55.0% and number of clusters per grapevine by 53.7% and decreased average cluster weight by 17.0% (Table 1). Previous researchers reported increasing grapevine yields and number of clusters per grapevine and decreasing average cluster weights with increasing number of buds left in pruning [8, 9,

12, 16, 17, 18, 19, 20].

It was observed that high pruning intensity decreased cluster width by 25.2%, cluster length by 12.5%, grape width by 10.9%, grape length by 6.7 and 100-grape weight by 22.7% (Table 1). Shalan [12]; Dardeniz and Kısmalı [13] reported decreasing cluster dimensions with high pruning intensities; Çelik [9] indicated that pruning intensity was not effective on grape weight, grape volume and dimensions; Ewart et al. [21]; Christensen et al. [22] reported decreasing grape dimensions with decreasing pruning intensities; İlhan [8]; Ilgın and Yıldız [19]; Dardeniz and Kısmalı [13] indicated that high pruning intensity decreased 100-grape weights.

Compared to low pruning intensity, high pruning intensity treatments decreased juice yield by 2.4%, water soluble dry matter yield by 2.6%, juice pH by 4.1% and increased titratable acidity by 25% (Table 1). Similar results were also reported by previous researchers [8, 12, 13, 16, 17, 19, 23, 24].

CONCLUSION

It was concluded based on current findings that increase in number of buds increased grapevine yield, number of clusters, number of shoots per grapevine and titratable acidity; decreased grapevine development, grape yield and quality parameters. Decreases in cluster weights resulted from decreases in cluster and grape dimensions and weights and the increase in yield was resulted from increase in number of clusters. Normal pruning intensity (24 buds/grapevine) with medium branch diameters, medium size clusters and grapes, sufficient yield levels was identified as the most proper pruning level for different training systems and vigor levels of vineyard.

Table 1. Effects of different pruning intensities on grapevine development, grape yield and quality

Characteristics	Low (16 buds/grapevine)	Normal (24 buds/grapevine)	High (32 buds/grapevine)	Mean
Shooting ratio (%)	0.95±0.08a	0.96±0.00a	0.90±0,05a	0.94±0.06
Branch diameter (mm)	10.23±2.15a	9.64±1.67b	9.00±1.22c	9.626±1.79*
Branch length (cm)	96.15±16.15a	93.39±19.16a	91.44±20.00a	93.661±18.51
Number of shoots per grapevine (shoot number /grapevine)	15.33±1.23c	22.00±1.21b	28.75±1.66a	22.03±5.72*
Number of clusters per shoot (cluster number /shoot)	1.18±0.17a	1.107±1.10a	0.96±0.08b	1.083±1.50*
Grapevine yield (kg/grapevine)	7.12±1.95b	9.54±2.23a	11.05±2.35a	9.24±2.69*
Number of clusters per grapevine (cluster number / grapevine)	18.00±2.37c	24.33±2.06b	27.67±2.23a	23.33±4.60*
Average cluster weight (g)	353.45±101.83a	335.02±112.55ab	301.94±78.73b	330.1±104.2*
Cluster width (cm)	11.57±2.24a	10.300±1.79b	9.23±1.36c	10.367±2.06*
Cluster length (cm)	19.16±2.85a	18.38±2.40a	17.03±2.21b	18.19±2.64*
100-grape weight (g)	278.47±31.94a	237.90±21.23b	226.94±22.10b	247.77±33.5*
Grape width (mm)	17.58±1.30a	16.44±1.26b	15.85±1.33c	16.62±1.48*
Grape length (mm)	17.08±1.21a	16.28±1.00b	15.99±1.28b	16.45±1.25*
Juice yield (ml/100 g)	73.27±2.66a	73.20±2.96a	71.53±2.90a	72.67±2.89
Water soluble dry matter (%)	17.52±1.10a	17.40±0.34a	17.07±0.75a	17.33±0.80
Titratable acidity (g/l)	5.20±1.19b	6.27±1.04a	6.50±1.36a	5.99±1.31*
Juice pH	3.33±0.042a	3.21±0.05b	3.19±0.08b	3.24±0.08*

The means indicated with different letters in the same row are significantly different ($p<0.05$). * The difference between the means is significant ($p<0.05$).

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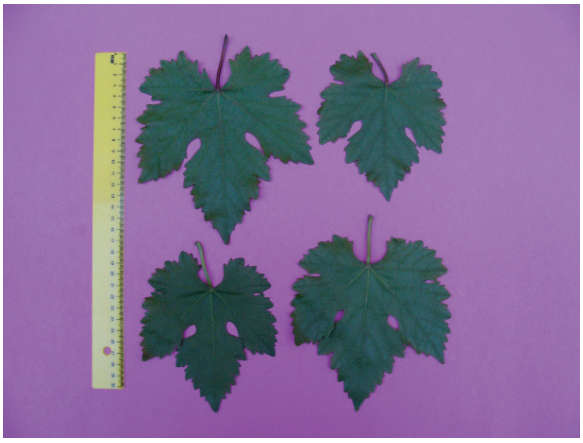

Figure 1. Leaves of Erciş grape cultivar

Figure 2. Cluster of Erciş grape cultivar

Figure 3. Pruning treatments