

The Effect of Different Level Crop Load and Humic Substance Applications on Yield and Yield Components of Alphonse Lavallee Grape Cultivar

A. Sarıkaya, A. Akın

Abstract—This study was carried out to investigate effects of Control (C), 18 bud/vine, 23 bud/vine, 28 bud/vine, 18 bud/vine + TKI-Humas (soil), 23 bud/vine + TKI-Humas (soil), 28 bud/vine + TKI-Humas (soil) applications on yield and yield components of Alphonse Lavallee grape cultivar. The results were obtained as the highest cluster weight (302.31 g) with 18 bud/vine application; the highest berry weight (6.31 g) with 23 bud/vine + TKI-Humas (soil) and (6.79 g) with 28 bud/vine + TKI-Humas (soil) applications; the highest maturity index (36.95) with 18 bud/vine + TKI-Humas (soil) application; the highest L* color intensity (33.99) with 18 bud/vine + TKI-Humas (soil); the highest a* color intensity (1.53) with 23 bud/vine + TKI-Humas (soil) application. The effects of applications on grape fresh yield, grape juice yield and b* color intensity values were not found statistically significant.

Keywords—Alphonse Lavallee grape cultivar, crop load, TKI-Humas substances (soil), yield, quality.

I. INTRODUCTION

GRAPE is the most grown fruit species in Turkey. It was produced 77 million tons from 7 million hectares in the World [1]. 4.175.000 tons grape from 467.093 hectares were produced vineyard in Turkey [2].

The winter buds on the annual canes of the grape trunk are closely related to the grape yield and quality. Winter buds of the culture grape vine (*Vitis vinifera* L.) are in the form of mixed buds. They have primordia of cluster and shoot [3]. Each winter bud contains three growing points. The most important growing point in terms of crop yield is located in the middle of them [4].

The formation of cluster primordia in the winter bud becomes at the beginning of May. The number of cluster primordia becomes at the end of the vegetation period [5], [6].

In viticulture, the number of winter bud is very important in winter pruning period and considered in terms of crop load. It is advised that balanced pruning activity should be performed to obtain high quality grapes that the vine can bear by considering bud fertility. The number of buds on per vine or per square meter is expressed as the load of the vine (crop load). Crop load is determined according to the developmental strength, age, type, cultivation system, bud fertility, irrigation,

Aynur Sankaya is with the Selcuk University Agriculture Faculty and Department of Horticulture, Konya, 42075, Turkey (e-mail: zea_aynur@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).

soil and climatic characteristics of the vine and the amount of grape yield of previous year [7].

TKI-Humas; the liquid is a natural organic soil conditioner, produced from leonardit and low-quality lignite. It has humic acid and fulvic acid (12%) [8]. Effects of plant growth-stimulating of humic substances are associated with increased macro-nutrient intake [9]. The statement about the effect of humic acid on plant growth by [10] is that humic substances are useful in microbial activity by increasing conversions as a result of the stimulating plant growth hormones. According to [11], humic acid plays an important role in nutrition of the plant [12].

II. REVIEW OF LITERATURE

A study was conducted on Eksikara and Ermenek grape cultivars. As a result, the highest 100 berry weight was obtained with 20 bud/vine + Taris-ZF foliar fertilizer application in Eksikara variety and with 115 bud/vine + Taris-ZF foliar fertilizer application in Ermenek variety [13]. The highest fresh grape yield was determined with 26 bud/vine + no fertilizer application in Gok grape variety [14]. In another study, the highest grape yield was found with 18 bud/vine + Taris-ZF foliar fertilizer application in Kara Dimrit grape variety [15].

TARIS-ZF foliar fertilizer was 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 increased. However, berry width, berry length, berry length to berry width ratio, total sugar, total acid, maturity index and the number of bud burst values decreased [16]. TSS ratio increased with the application of humic acid in Ercis grape variety [17]. Maturity index was increased with reduced cluster number in Amasya and Cardinal grape varieties. But, titratable acid and fresh grape yield were decreased [18].

Effects of some applications on grape yield and quality of Horoz Karası and Gok grape cultivars were examined. The results showed that grape yield, berry weight, berry red and blue color intensity values of Horoz Karası grape variety increased with 1/3 CR + HA application, and grape yield and maturity index values of Gok grape variety increased with 1/3 CR application [19].

Hasandede grape variety was investigated in grafted on 5 BB rootstock in 2011. The highest berry weight was found with Control K (3.57 g) application. The highest °Brix was identified with C (17.47%) application. The highest maturity

index was determined with 1/3 Cluster Tip Reduction (56.95) and 1/3 Cluster Tip Reduction + Humic Acid (56.70) applications [20].

The aim of this study was to determine the effects on yield and quality of different crop load and Humic Substance applications in Alphonse Lavallee grape cultivar.

III. METHODOLOGY

This study was conducted in Alphonse Lavallee grape variety grafted on 1103 Paulsen rootstock in Turkey in 2015. The cultivar is evaluated as table grape. The berry color is purplish black skin. The study was conducted with 3 different applications as 3 replications.

Experimental design; 1) Control (C), 2) 18 bud/vine, 3) 23 bud/vine, 4) 28 bud/vine, 5) 18 bud/vine + TKI-Humas (soil), 6) 23 bud/vine + TKI-Humas (soil), 7) 28 bud/vine + TKI-Humas (soil). Effects on yield and yield components of this application in Alphonse Lavallee grape cultivar were determined.

A. Application of Crop Load

Crop load is the bud number of 1 m².

B. Composition of TKI-Humas

TKI-Humas; leonardit produced from low-quality lignite, containing 12% humic and fulvic acid is a liquid natural organic soil conditioner [8]. TKI-Humas contains total organic matter (5%), humic acid + fulvic acid (12%), water soluble potassium oxide (3%), pH (11-12).

C. Implementation of TKI-Humas on Soil

333 ml TKI-Humas/5 lt water for each vine was applied. Applications were made in the evening near the cool hours.

1. TKI-Humas was applied to soil before bud burst,
2. TKI-Humas was applied to soil before blooming.

D. Fresh Grape Yield (kg/vine)

Fresh grape yield was calculated by weighing all the yields from the vines in the parcels and dividing it with the number of vines.

E. Cluster Weight (g)

Cluster weight was found by dividing the total grape yield with the number of grape cluster obtained from each parcel.

F. Berry Weight (g)

Berry weight was calculated by dividing the total weight with the number of berries collected using the method [21].

G. Maturity Index (°Brix /TA)

Maturity index was determined with the division of °Brix to TA. °Brix (total soluble solid substance) (%) was determined by squeezing the grapes (berries) collected by Amerine and Cruess method [22] 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.

H. Must Yield (ml)

Must yield was determined as the amount of juice obtained by squeezing the grapes that were picked.

I. Color Density

Color density was determined using a colorimeter device (CR-400 Minolta Co., Osaka, Japan). Color intensity values were provided as CIEL* (Commision Internationale de l'Eclairage) a*, b* coordinates, which defined the color in a three-dimensional space [22]. 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

A. Effects of Applications on Fresh Grape Yield

Fresh grape yield was not found statistically significant (Fig. 1). In similar studies, Kara Dimrit grape variety (*Vitis vinifera* L.) was determined the highest grape yield with 18 bud/vine application in [15]. Horoz Karası (Ermenek) grape variety was obtained the highest grape yield with 115 bud/vine application in [16]. Fresh grape yield increased with humic acid application in Ercis grape cultivar in [18]. It was determined that grape yield increased with 1/3 CR + HA application in Horoz Karası grape variety and with 1/3 CR application in Gok grape variety in [19].

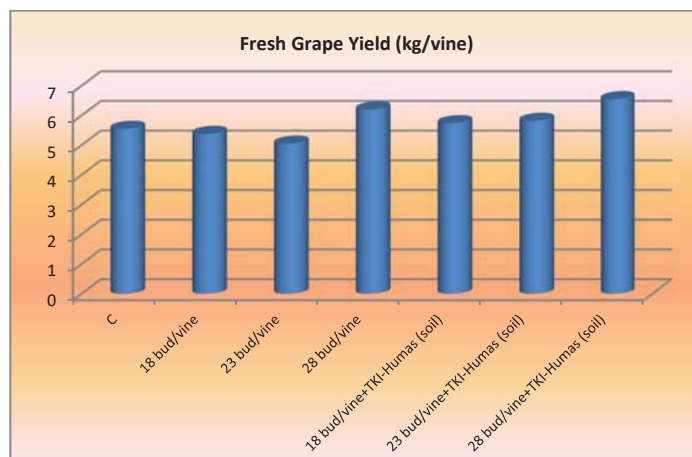


Fig. 1 Effects of applications on fresh grape yield

B. Effects of Applications on Cluster Weight

The highest cluster weight was taken with 302.31 g from 18 bud/vine application in Alphonse Lavallee grape variety. The least cluster weight was taken with 236.73 g from 28 bud/vine application (Fig. 2).

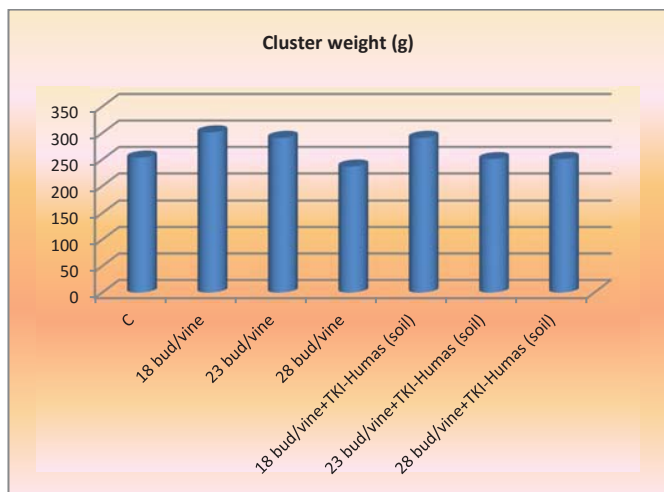


Fig. 2 Effects of applications on cluster weight

C. Effects of Applications on Berry Weight

The variety was given a different response according to applications in terms of berry weight. The highest berry weight was taken with 6.31 g from 23 bud/vine + TKI-Humas (soil) and 6.79 g from 28 bud/vine + TKI-Humas (soil) applications in Alphonse Lavallee grape variety. The least berry weight was taken with 4.43 g from 28 bud/vine application (Fig. 3). In another study, it was shown that 1/3 CR + HA application increased berry weight of Horoz Karasi grape variety [20].

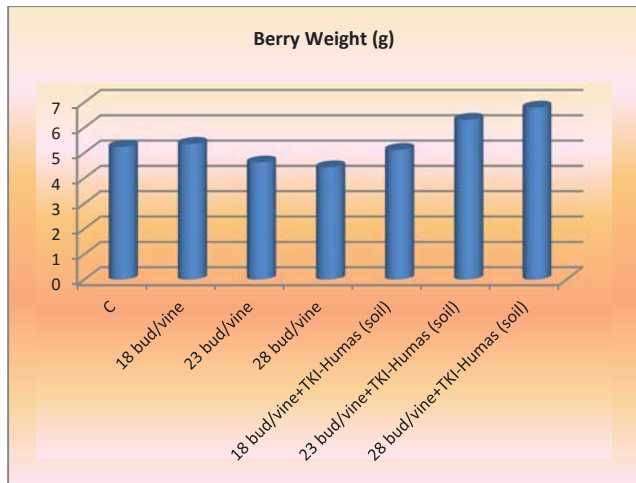


Fig. 3 Effects of applications on berry weight

D. Effects of Applications on Maturity Index

The highest maturity index was taken with 36.95 from 18 bud/vine + TKI-Humas (soil) application in Alphonse Lavallee grape variety. The least maturity index was taken with 24.84 from 28 bud/vine + TKI-Humas (soil) application (Fig. 4). In similar studies, maturity index value increased on reducing cluster number application in Amasya and Cardinal grape cultivars [19]. Maturity index increased with 1/3 CTR and 1/3 CTR + HA applications in Hasandede wine grape variety [21].

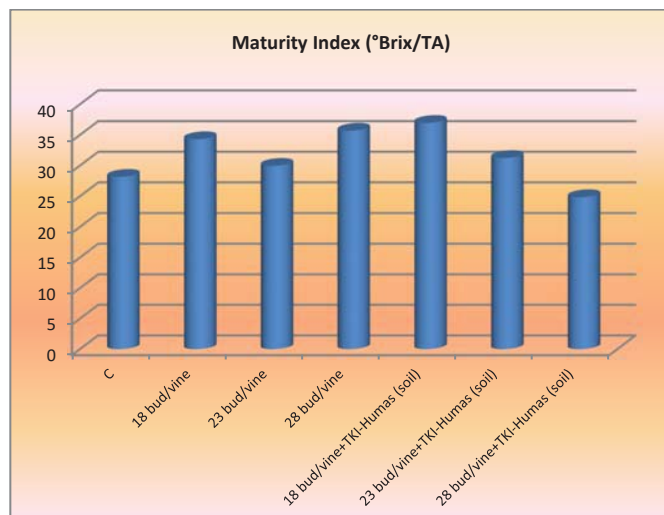


Fig. 4 Effects of applications on maturity index

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

Must yield was not found statistical significant (Fig. 5).

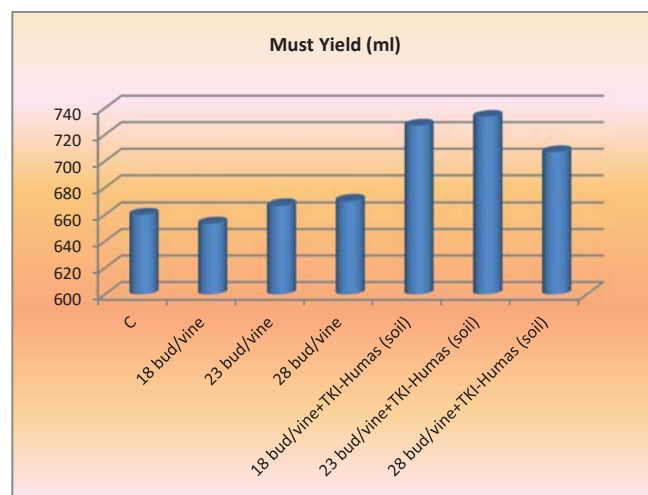


Fig. 5 Effects of applications on must yield

F. Effect of Applications on L* Color Intensity

It was found a different response according to applications in terms of highest L* color intensity value. The highest L* color intensity was obtained with 33.99 from 18 bud/vine + TKI-Humas (soil) application in Alphonse Lavallee grape variety. The least L* color intensity was taken with 30.66 from 28 bud/vine + TKI-Humas (soil) application (Fig. 6).

G. Effect of Applications on a* Color Intensity

It was determined a different response according to applications in terms of highest a* color intensity value. The highest a* color intensity was obtained with 1.53 from 23 bud/vine + TKI-Humas (soil) application in Alphonse Lavallee grape variety. a* color intensity increased compared to control (0.34) with this application. The least a* color intensity was taken with 0.34 from C application (Fig. 6). In similar studies, a* color intensity value was increased with 1/3 CR + HA application increased grape yield, berry weight,

berry red and blue color intensity values of Horoz Karası grape variety [20].

H. Effect of Applications on b^* Color Intensity

It was not found statistical significant response of applications in terms of b^* color intensity value (Fig. 6).

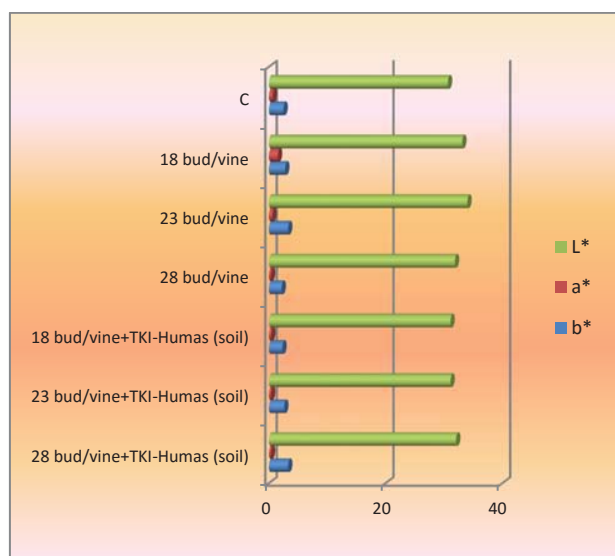


Fig. 6 Effects of applications on color intensity

V. CONCLUSION

Consequently, it can be recommended to increase cluster weight with 18 bud/vine application, and to increase berry weight with 23 bud/vine + TKI-Humas (soil) application or 28 bud/vine + TKI-Humas (soil) application in Alphonse Lavallee grape cultivar.

ACKNOWLEDGMENTS

This study is a part of the master's thesis of Aynur Sarıkaya. In addition, Selcuk University Scientific Research Project supported this study (Selcuk University-BAP, Konya-Turkey, Project Number: 15201083). The authors wish to thank to BAP Staffs.

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