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Studies on the Effects of Different Crop Loads on Yield and Quality in Round Seedless Cultivar (*Vitis vinifera* L.)

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Abstract: The effects of three different crop load (45, 75 and 105 bud vinestock^{-1}) to yield and quality components on table grapes, raisins seedless and vines were investigation on grafted and ungrafted seedless vineyard. Trials were conducted on Round seedless variety in Manisa. In the grafted vineyard, the yield increases paralelly to the crop load. A yield difference of 116% between minimum and maximum crop loads occurred in table grapes. However, total soluble solids (TSS) and the number of defective clusters reduced at the ratio of 6.3 and 30.1%. Output of raisins (31.1%) increased. Also, number of dormant buds increased paralelly to crop loads (46.2%). In the ungrafted vineyard, a yield difference of 96 % between minimum and maximum crop loads occurred in table grapes. However, TSS reduced at the ratio of 8.7 % the number of defective cluster increased at the ratio of 81.8 %. Raisins yield (45.1%) increased paralelly to crop loads, on the contrary to productivity (4.1 %). Such as, number of dormant buds increased paralelly to crop loads (72.6%).

Key words: Round seedless, grapevine, crop load, yield

Introduction

Turkey takes an important position in the viniculture of the world and ranks 6th place in fresh production and 4th place in the vineyard area (Anonymous, 1999). The mostly important region is Aegean region because of its large vineyard area and its high production capacity. In terms of economically importance, the dried production dominates over the table grapes in the mentioned region (Anonymous, 1999). Due to filoksera contamination rootstock using are spreaded during the last years and some problems were shown because of the similar cultural practices in the grafted and ungrafted vineyards. Some years determined negative effects of these incorrect applications on vegetative growth and fruit quality (Çelik, 1998; Çelik *et al*., 1998). On the other hand, cluster tip deaths determined dating from the veraision period because of excessive fruitlet (Chritensen *et al*., 1994). Some years, total soluble solid content was decreased and ripening period for drying was delayed (Clingelefer, 1984). However, controlling of yielding via pruning is an important way for increase the table grapes and raisins seedless quality.

For this reason, in this research work different crop load levels were applicated on the grafted and ungrafted vinestock and the effects of these pruning treatments on the vegetative growth and fruit quality were investigated.

Materials and Methods

The study was carried out at the under farmer conditions, vineyard of Manisa, in 1999 -2001. The 12 years aged ungrafted and grafted on rootstock *(Berlandieri x Riparia Teleki 8B Sel. Kober 5BB) Vitis vinifera L. cultivar Round seedless* variety, which planted as big 'T' training system. The soil structures of these vineyards are homogeneously and sandy- loamly and the routine cultural processings such as soil management, fertilization and plant protection were done.

In this study, three different crop load levels were treated as 45, 75 and 105 bud vinestock^{-1} and 3, 5 and 7 one-year- old wood, which has 15 buds on were left for obtain these crop lood levels. For determining the effects of these pruning treatments on the table grapes quality and yield, number of affected clusters (unit vine^{-1}), fresh grapes yield (kg vine^{-1}), average cluster weight (g), weight of 100 berry as fresh (g), total soluble solids (%), titretable acidity (g L^{-1}), berry rupture point force (g), output of raisins (%), expertise value (type of number), number of unbreaking buds (unit vine^{-1}) and shoot weight (kg vine^{-1}) were investigated (Winkler *et al*., 1974; İlhan and İlter, 1992).

Results and Discussion

Statistical analysis of the obtained data were done and effects of different crop load levels on table grapes and raisins seedless in grafted and ungrafted vineyards and on the vine growth were investigated.

Effects of different crop load levels on table grapes quality: The fresh grapes yield was affected from different crop load levels which are statistically significant and as a result of analysis of variance three different groups were determined (Table 1). In grafted, highest yield was found in 105 and 75 bud vinestock^{-1} levels [20.80 kg vine^{-1}, (grafted group); 16.95 kg vine^{-1}, (grafted group)] followed by 45 bud vinestock^{-1} levels [9.15 kg vine^{-1}, (grafted group)]. However, in ungrafted, highest yield was found in 105 and 75 bud vinestock^{-1} levels (17.10 kg vine^{-1} and 15.10 kg vine^{-1}) followed by 45 bud vinestock^{-1} levels (8.95 kg vine^{-1}). These results are very similar to some previous studies (May *et al*., 1973; Howell *et al*., 1991; İlgin and Kismali, 1998).

Some effects such like cluster-end deads, which, shown during the last years, excessive vegetative growth and defective clusters brings down to table grapes and raisins seedless quality. For this reason, because of different pruning levels, number of damaged clusters were changed in grafted and ungrafted vineyards at statistically significant levels. Number of damaged clusters changed from 1.86 to 2.66 per vine for 45 bud vinestock^{-1} level and 2.58 per vine for 75 bud vinestock^{-1} level in the grafted vineyard. Number of damaged clusters changed from 1.49 per vine for 45 bud vinestock^{-1} level and 1.08 per vine for 75 bud vinestock^{-1} level to 2.71 per vine for 105 bud vinestock^{-1} level in the ungrafted vineyard (Table 2).

Cluster size is a very important parameter for table grapes quality and this parameter was measured as cluster weight in this study. Average cluster weight, which affected from different pruning levels reaches to high levels (480.4 and 476.1g) at 75 bud vinestock^{-1} pruning level, in grafted and ungrafted vineyards at statistically not significant levels (Table 3). Similar results were found in some previous studies (MeCarthy and Crimi, 1973; İlter *et al*., 1992; Altindişli and Kismali, 1998).

A negative correlation coefficient were determined between total soluble solids (TSS) and different crop load levels and total soluble solid content was decreased with an increase in yield level. Highest TSS contents was found in 45 and 75 bud vinestock^{-1} levels (22.91, 22.90, 22.87 and 22.60 %; grafted group) followed by 105 bud vinestock^{-1} level (21.53 and 20.10%; ungrafted group) (Table 4). The total yield had increased due to increase in crop load

Table 1: The effects of different crop load levels on the fresh grapes yield (kg vine^{-1})

	Crop load levels (bud vinestock^{-1})			
Vineyards	45	75	105	LSD 5%
Grafted	9.15c	16.95b	20.80a	3.40
Ungrafted	8.95c	15.10b	17.10b	3.39

Values within a column followed by the same letter are not significant (P<0.05)

Table 2: The effects of different crop load levels on the number of affected clusters (unit vine^{-1})

	Crop load levels (bud vinestock^{-1})			
Vineyards	45	75	105	LSD 5%
Grafted	2.66	2.58	1.86	0.85
Ungrafted	1.49	1.08	2.71	0.81

Table 3: The effects of different crop load levels on the average cluster weight (unit vine^{-1})

	Crop load levels (bud vinestock^{-1})			
Vineyards	45	75	105	LSD 5%
Grafted	471.2	480.4	476.3	NS
Ungrafted	470.3	476.1	44.1	NS

NS: Non significant

Table 4: The effects of different crop load levels on total soluble solids (%)

	Crop load levels (bud vinestock^{-1})			
Vineyards	45	75	105	LSD 5%
Grafted	22.91a	22.87a	21.53b	1.56
Ungrafted	22.90a	22.60a	20.10b	1.34

Values within a column followed by the same letter are not significant (P<0.05)

Table 5: The effects of different crop load levels on titretable acidity (g L^{-1})

	Crop load levels (bud vinestock^{-1})			
Vineyards	45	75	105	LSD 5%
Grafted	3.05b	3.15b	2.80a	1.56
Ungrafted	2.99b	3.17b	2.68a	0.84

Values within a column followed by the same letter are not significant (P<0.05)

Table 6: The effects of different crop load levels on output of raisins (%)

	Crop load levels (bud vinestock^{-1})			
Vineyards	45	75	105	LSD 5%
Grafted	26.81a	26.96a	25.82b	0.28
Ungrafted	26.82a	26.85a	25.75b	0.36

Values within a column followed by the same letter are not significant (P<0.05)

Table 7: The effects of different crop load levels on raisins expertise value

	Crop load levels (bud vinestock^{-1})			
Vineyards	45	75	105	LSD 5%
Grafted	$8^{3/4}$c	$9^{3/4}$b	$10^{3/4}$a	0.651
Ungrafted	$8^{3/4}$c	$10^{3/4}$a	$9^{3/4}$b	0.651

Values within a column followed by the same letter are not significant (P<0.05)

Table 8: The effects of different crop load levels on the number of breaking buds (unit vine^{-1})

	Crop load levels (bud vinestock^{-1})			
Vineyards	45	75	105	LSD 5%
Grafted	15.21c	20.12b	28.24a	4.28
Ungrafted	16.40c	21.30b	28.31a	3.51

Values within a column followed by the same letter are not significant (P<0.05)

Table 9: The effects of different crop load levels on shoot weight (kg vine^{-1})

	Crop load levels (bud vinestock^{-1})			
Vineyards	45	75	105	LSD5%
Grafted	3.21a	2.90b	2.80c	0.91
Ungrafted	3.10a	2.88b	2.71c	0.65

Values within a column followed by the same letter are not significant (P<0.05)

and TSS per grape was decreased (Howell *et al.*, 1991; İlhan and İlter, 1992; Reynolds *et al.*, 1994).

Titretable acidity was affected from different crop load levels statistically significant and as a result of analysis of variance two different groups were determined (Table 5). In grafted, highest yield was found in 105 bud vinestock^{-1} levels (2.80 g L^{-1}) followed by 75 and 45 bud vinestock^{-1} levels (3.15, 3.05 g L^{-1}). Similar results were found in the ungrafted vineyard. However, between different crop load levels and weight of 100 berry as fresh and berry rupture point force no determined any relation.

Effects of different crop load levels on raisins seedless quality: Raisins seedless output was affected from different crop load levels statistically significant and two different groups were determined. Highest output values were determined as 26.81 and 26.96% respectively from grafted vineyard in 45 and 75 bud vinestock^{-1} levels (Table 6). Same results obtained from ungrafted vineyards too. 45 and 75 bud vinestock^{-1} levels accumulates more sugar per unit grape compare with 105 bud vinestock^{-1} level and during the drying processes raisins output increases.

Some relations were found with expertise value statically significant and as a result of analysis of variance three different groups were determined. In grafted, highest expertise type of number was found in 105 bud vinestock^{-1} pruning levels ($10^{1/2}$) followed by 75 bud vinestock^{-1} ($9^{3/4}$) and 45 bud vinestock^{-1} ($8^{3/4}$) levels. In contrast, highest expertise value was found in 75 bud vinestock^{-1} pruning levels ($9^{1/4}$) followed by 105 bud vinestock^{-1} ($9^{1/2}$) and 45 bud vinestock^{-1} ($8^{3/4}$) levels in the ungrafted vineyards (Table 7).

Effects of different crop load levels on vegetative growth of vinestock: Number of unbreaking buds affected from different crop load levels statistically significant and three different statistic groups were determined. Highest number of unbreaking buds determined at the 105 bud/vinestock pruning level in grafted and ungrafted vineyards (28.24 per vine and 28.31 per vine) followed by 45 and 75 bud vine^{-1} levels (20.12 per vine and 21.30; 15.21 per vine and 16.40 per vine) (Table 8). According to the obtained results, a relationship between crop load levels and number of unbreaking buds was determined. Similar results were found in some previous studies (Clingelefer, 1984; Chritensen *et al.*,1994; Reynolds *et al.*, 1994).

Shoot weight affected from different crop load levels significantly and three different groups were determined. Highest shoot weight determined at the 45 bud vinestock^{-1} pruning level in grafted and ungrafted vineyards (3.20, 3.10 kg vine^{-1}) followed by 75 and 105 bud vine^{-1} levels (2.90, 2.88, 2.81, 2.71, 21.30 kg vine^{-1}) (Table 9).

This result may comment as increased crop load has a negative effect on vegetative growth (İlhan and İlter, 1992; Chritensen *et al.*, 1994; İlgin and Kismali, 1998).

In the research work, the effects of different crop load levels (45, 75 and 105 bud vinestock^{-1}) on yield, some quality parameters on the table grapes and raisins seedless in grafted and ungrafted vineyards and on the vine growth were investigated.

Yield as table grapes was increased 116% from 45 bud vinestock^{-1} to 105 bud vinestock^{-1} pruning levels but total soluble solids and the number of affected clusters were decreased as 6.3 and 30.1%, respectively in the grafted vineyard. On the other side, number of unbreaking buds increased with an increase in

crop load (46.2%). In the ungrafted vineyard, yield as table grapes was increased 96% from 45 bud/vinestock to 105 bud vinestock^{-1} pruning levels but total soluble solids decreased as 8.7 % and the number of affected clusters were increased as 81.8%. However, number of unbreaking buds increased with an increase in crop load (72.6%). Increases in the table grapes (21.6 %), total soluble solids content (10 %), the number of affected clusters (47.0 %), yield as raisins seedless (15.1 %) and expertise value were determined in the vineyard which grafted on 5 BB rootstock compared with ungrafted vineyard.

Increases in vegetative growth and the number of affected clusters were determined at the lowest crop load levels in the grafted and ungrafted vineyards. The best balance of vegetative/generative growth ratio was determined at the 105 bud vinestock^{-1} pruning level for grafted vineyard and 75 bud vinestock^{-1} level for ungrafted vineyard. These results are bring into being that the productivity of the variety grafted on 5 BB rootstock is rather satisfactory.

As a result, 105 bud vinestock^{-1} crop load level for grafted, 75 bud vinestock^{-1} crop load level for ungrafted vineyards may suggest as pruning rank.

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