



Determination of Cracking Resistance and Fruit Quality Parameters of Big Lory and Prime Giant Cherry Cultivars under the Ecological Conditions of Eğirdir (Isparta)

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Abstract

Turkey is one of the largest cherry producer and exporter countries of the world. The fact that 0900 Ziraat is the main variety used in cultivation limits both export period and export quantity. It is required to use new early and late varieties that allow cultivation in different periods. The rain that falls during maturity period causes cracking in cherry fruits and impairs the quality of the leads. This study was conducted on the cherry varieties of Big Lory and Prime Giant in Fruit Growing Research Station. The harvested fruit samples were tested in terms of fruit weight, fruit width, fruit length, fruit flesh firmness, fruit stem weight, fruit stem length, total soluble solids (TSS), pH, titratable acidity (TA), TSS / TA ratio, fruit skin color, and artificial cracking. As a result, both of the cherry cultivars were found to be suitable to the needs of the market in terms of some fruit quality parameters. The results suggested that they had pretty good values of especially fruit weight (13.38 g for Big Lory; 14.32 g for Prime Giant) and fruit width (31,15 mm for Big Lory; 31,84 mm for Prime Giant). The cracking index was determined to be 53.73 in Big Lory and 38.30 in Prime Giant.

Key Words: *Prunus avium* L., fruit quality, cracking index

Introductions

Turkey is one of the largest cherry producer and exporter countries of the world. The positive developments that have taken place in export in recent years have positive impact on both production and quality. According to the data of 2012, production and export quantities are 480.748 tons and 46.477 tons, respectively (Anonymous, 2014a). In our country, both cherry varieties having early ripening time and cherry varieties having late ripening time are produced. However 0900 Ziraat, which the main variety, is the most important variety not only in production but also in export (Öztürk et al., 2005). Although Turkey is the leading country in sweet cherry production in the world, its export figures are considerably low. It is needed to prolong production and export seasons as well as to increase production quantity and, to this end, to cultivate cherry varieties having early ripening time and cherry varieties having late ripening time as suitable for regions.

In most of the regions where cherry production is performed, fruit cracking is a major problem (Sekse,

1995). Cracking in cherry fruits eliminates the chance of marketing. Besides, certain diseases occur in scar tissues. As a result, healthy fruits around such diseased fruits are adversely affected. In spite of differences between cherry varieties, fruits are susceptible to cracking especially 10 to 25 days before the date of harvest. The said susceptibility increases during the optimum harvest time (Christiensen, 1973). It is seen that, in some extreme years when cracking damage is high, more than 80% and even all of the fruits are lost (Christiensen, 1996; Csiszár, 2004). Especially the rain that falls during and 30 days before harvest leads to significant loss.

The objective of this study was to analyze the fruit quality parameters and cracking resistance of two cherry varieties that may prolong production season under the ecological conditions of our region and to obtain reference data for the prospective variety crossbreeds included in the ongoing project of our institution.

Table 1. Fruit weight, fruit width, fruit length, fruit flesh firmness, fruit stem weight, fruit stem length, total soluble solids and pH values of Big Lory and Prime Giant varieties. * : $P \leq 0.05$, ** : $P \leq 0.01$, *** : $P \leq 0.001$

Variety	Fruit Weight (g)	Fruit Width (mm)	Fruit Length (mm)	Fruit Flesh Firmness (N)	Fruit Stem Weight (g)	Fruit Stem Length (mm)	Total Soluble Solids %	pH
Big Lory	13.38b	31.15b	25.20b	16.28b	0.17b	35.90b	20.73a	3.29a
Prime Giant	14.32a	31.84a	27.48a	17.06a	0.21a	47.80a	17.86b	3.12b
Significant	*	*	***	*	*	***	***	***
LSD	0.83	0.69	0.56	0.64	0.03	2.82	1.51	0.07

Materials and Methods

This study was conducted in Fruit Research Station located in Eğirdir district of Isparta province in 2014. In the study, cherry trees grafted onto Gisela-6 rootstock were analyzed in accordance with the experiment plan.

As the design of field experiment, Randomized Block Design was replicated 4 times. No processes other than standard cultivation processes were conducted on the trees for the purpose of preventing cracking. Then, on 13.06.2014, fruits were harvested. As the design of laboratory analysis, Randomized Lots Test Pattern was replicated 4 times. For pomological evaluations, 20 cherry fruits were sampled to represent each tree. On the other hand, during cracking tests, 50 cherry fruits were sampled to represent each tree. In order to determine cracking index, fruits were immersed for 6 hours in distilled water having a temperature of 20 °C inside 2 Liter vessels (Christensen, 1972).

In the sampled fruits, fruit quality parameters such as fruit weight (g), fruit width (mm), fruit length (mm), fruit stem weight (g), fruit stem length (mm), were determined. Fruit flesh firmness (N) was measured by pricking with a tip having a diameter of 6 mm up to a depth of 8 mm at a speed of 10 cm/min. In the measurement, a texture analyzer (Güss FTA Type GS14 Fruit-Texture Analyser Model, Strand, South Africa) was used. Total soluble solids (%) and titratable acidity (g/100 mL) were measured by digital refractometer and digital buret and digital pH meter (Hanna pH 330 model, WTW, Germany), respectively, after squeezing. For measuring fruit skin color, a Minolta CR-400 (Konika Minolta Inc., Japan) chroma meter was used. In the evaluation of fruit skin color, the values of illumination (L^*), red-green (a^*) and

yellow-blue (b^*), hue angle (h°), and chroma (C^*) were taken into consideration.

Data obtained from the test were subjected to variance analysis, using the JMP statistical package. Differences between the sweet cherry varieties were grouped according to the LSD multiple comparison tests ($P \leq 0.05$; $P \leq 0.01$; $P \leq 0.001$).

Results and Discussion

As a result of the study, for prolonging production season under the ecological conditions of Eğirdir, Big Lory and Prime Giant sweet cherry varieties gave good results in terms of fruit quality parameters. Especially Prime Giant sweet cherry variety stood out with its fruit quality parameters like fruit weight, fruit width, fruit length, fruit flesh firmness, stem weight and stem length.

Big Lory and Prime Giant were analyzed in terms of fruit weight. The difference was found to be statistically significant ($P \leq 0.05$). It was seen that Prime Giant (14.32 g) was superior to Big Lory (13.38 g) in fruit weight (Table 1). Previous studies produced similar results. In their study, Diaz-Mula et al., (2010) determined that fruit weight in Prime Giant was 13.36 g. Similarly, in terms of fruit width, Prime Giant (31.84 mm) had a fruit width value higher than that of Big Lory (31.15 mm). The difference of fruit width between the varieties was statistically significant ($P \leq 0.05$; Table 1). In a comparison of fruit length, the difference between the two varieties was found to be statistically significant ($P \leq 0.001$). It was found that, just like in fruit weight and fruit width, Prime Giant (27.48 mm) had a fruit length value higher than that of Big Lory (25.20 mm). The varieties were compared with each other in terms of fruit flesh firmness, and the difference between them was found to be statistically significant ($P \leq 0.05$). Prime Giant (17.06 N) had a harder fruit flesh than Big Lory (16.28 N). In a

comparison of fruit stem weight, the difference between the two varieties was found to be statistically significant ($P \leq 0.05$). Compared to Big Lory (0.17 g), Prime Giant (0.21 g) had a weightier fruit stem. In the comparison of fruit stems, just like in fruit stem weight, the difference of fruit stem length between the two varieties was found to be statistically significant ($P \leq 0.001$). It was seen that

Prime Giant (47.80 mm) had a fruit stem longer than that of Big Lory (35.90 mm). The data obtained demonstrate that both varieties have considerably high values in terms of fruit quality parameters, but Prime Giant stands out (Table 1). There are positive comments about both of the varieties in terms of fruit quality parameters (Long, 2014; ACP, 2014).

Table 2. Titratable acidity, TSS/TA ratio, cracking index, fruit skin color (L^* , a^* , b^* , C^* and hue) values of Big Lory and Prime Giant varieties. * : $P \leq 0.05$, ** : $P \leq 0.01$, *** : $P \leq 0.001$

Variety	Titratable Acidity (g/100 ml)	TSS/ TA Ratio (%)	Cracking Index	Fruit Skin Color				
				L^*	a^*	b^*	C^*	hue
Big Lory	0.60b	34.82a	53.73a	31.08b	16.52b	8.01b	18.40b	26.91a
Prime Giant	0.65a	28.31b	38.30b	33.74a	25.44a	12.44a	28.36a	25.81b
Significant	*	***	*	***	***	***	***	*
LSD	0.04	1.95	12.22	0.86	1.86	1	2.08	1.07

In a comparison of TSS values, the difference between the two varieties was found to be statistically significant ($P \leq 0.001$). Big Lory (20.73) had a higher TSS values compared to Prime Giant (17.86). Just like in TSS, Big Lory (3.29) had a higher pH value than Prime Giant (3.12). The pH values of the two varieties were compared, and the difference was found to be statistically significant ($P \leq 0.001$; Table 1).

In terms of TA, the difference between the varieties is statistically significant ($P \leq 0.05$). Prime Giant (0.65 g/100 ml) had a higher value than Big Lory (0.60 g/100 ml). Both varieties were analyzed in terms of TSS/TA, and it was seen that, compared to Prime Giant (28.31), Big Lory (34.82) had a higher value. The difference of TSS/TA between the two varieties was found to be statistically significant ($P \leq 0.001$). Both of the sweet cherry varieties were compared in terms of their fruit skin color values. As a result, it was seen that Prime Giant variety got the highest values in L^* , a^* , b^* and C^* , while the highest hue value was encountered in Big Lory variety. In terms of a^* and L^* values, Prime Giant more red and bright than the Big Lory (Table 2).

The difference of cracking index between the two varieties was found to be statistically significant ($P \leq 0.05$). Compared to Prime Giant (38.30), Big Lory (53.73) had a higher value (Table 2). According to our study, Prime Giant is more resistant to cracking than Big Lory. The height of the values cracking index that occurred during a period of ripening may be due to

excess rainfall (Anonymous, 2014b). In a study conducted on 30 different sweet cherry varieties, Big Lory was found to have a cracking index of 39,2% and thus be among the varieties susceptible to cracking (Greco et al., 2005). Similarly, Big Lory was accepted to be one of the varieties that ripen in mid-season and said to be susceptible to cracking resulting from rainfall (ACP, 2014).

Given the harvest time of both sweet cherry varieties, it is possible to state that they have the fruit quality parameters necessary for contributing to sweet cherry production and marketing process in Eğirdir region. Especially Prime Giant variety stood out with its fruit quality parameters like fruit weight, fruit width, and fruit length. However, it should be noted that, in years of excessive rainfall like 2014, major cracking damage may occur before and during harvest.

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