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Olive Characteristic Determination of Six Cultivar Candidates for Scratched Green Table Olive Production

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Abstract

Variety was reported as most important factor for quality characteristics of table olive.So that researchers indented to develop new high quality olive cultivars. For this purpose Ataturk Central Horticultural Research Institute developed nearly 1500 olive genotypes by crossing Turkish, Spanish and Italian high quality table olive cultivars. 6 olive genotypes were selected as new cultivar candidates for green table olive production by researchers according to their high fruit yield, relatively resistance to disease, large homogeneous green ripening fruits. These 6 green olives were used as material in this study and Domat which extensively produced green table olive cultivar was used to comparison. This research includes harvesting the olives at green maturity, production of scratched green table olive and determination of the physical and chemical characteristics of produced table olives. Size and weight of fruit and seed, water, titratable acidity, pH, tissue hardness, color and oleuropein absorbance (K_{345}) value and salt analysis were applied toevaluate fruits and determine their suitability for scratched green table olive production. Fruit weight and flesh to seed ratio of fresh olives were 5.18-7.65 g and 4.5-6.8 LT011 had highest fruit weight and LT001 had highest flesh to seed ratio. Result of this study showed that LT001 and LT011 had superior characteristics for scratched green table olive production and this research also provided required data forthe new cultivar registration procedure.

Keywords: Genotype; Oleuropein; Hardness; Domat

Introduction

Many of the traditional olive cultivars do not meet the requirements for these new olive growing regions [1] because olive industry has dramatically changed and new olive growing techniques and systems has been used in the last decades [2]. New cultivars prompted the development of olive breeding programs in the main olive-producing countries based in intra-specific cross-breeding between cultivars of known merit aiming at combining the good qualities of the progenitors in some of the genotypes of the progenies [3,4]. The concept of quality in fruit products is wide, complex and dynamic. It implies a large number of attributes with different significance according to the interest and expectations of the different stakeholders of the chain, from producers to

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consumers [5]. Fruit weight, flesh and seed ratio and texture hardness (especially after processing) were thought as important physical quality attribute and has great importance for table olive breeding programs [6,7]. So that this research is aimed to produce scratched green table olivesfrom 6 cultivar candidates and determinate their some physical and chemical characteristics.

Materials and Methods

In this study, olive of 6 cultivar candidates which were chosen by breeding researcher on the basis of their high productivity and resistance to diseases and low periodicity according to results of national cross breeding project (Obtaining New Olive Varieties by Crossing, 1990-2018) and Domat cultivar were evaluated. Those trees were planted at in 1.5 m x 3 m distance in olive genotype observation orchard of Ataturk Central Horticultural Research Institute (Yalova/Turkey) in 2001.Maturity index of olives were followed according [8] and olives were randomly handpicked in 2014-2015. Code of olives, their crossing combination and maturity index were given in Table1.

Code	Crossing combination	Maturation index
BE001	Belle d'Espagne X Edinciksu	1.2
BE003	Belle d'Espagne X Edinciksu	1.2
BE005	Belle d'Espagne X Edinciksu	0.9
LE001	Lucques X Edinciksu	1.1
LT001	Lucques X Tavşanyüreği	1.2
LT011	LucquesTavşanyüreği	1.1

Table 1: Olives code numbers, their parents and their maturity index.

Method of table olive production

Olives were processed to starched green table olive according to method of, Turkish Food Codex Table Olive Communiqué Regulation [9]. Each olive was vertically scratched and kept in tap water. This water was changed daily with fresh tap water during 10 days. After those olives kept in 8% brinewhose pH was adjusted to 5 by addition of acetic acid to accelerate spontaneous fermentation and prevent growing of unwanted microorganism. Olives were fermented in brine at~ 16°C until pH fall to 4.4.

Physical and chemical analysis

Fruit weight, flesh to seed ratio, pH value, titratable acidity and sodium chloride content were determined according to official method of Turkish Table Olive Standard [10]. Water content of olive samples was determined in a conventional oven at 75±2°C [11]. Color values of olive skin were measured with a color meter (Konica Minolta, Japan). Texture hardness of olive was measured with fruit harness tester (W.O.W FRH-5, Japan). Absorbance value of oleuropein was determined by spectrophotometric method at 345 nm according to [12].

Statistical analysis

Randomized experimental design was used and analysis of variance was applied with the Duncan multiple comparison test of the means ($p<0.01$) to determine the presence of significant differences among the samples. Statistical analysis was performed by using the JMP v. 5.0 statistical package programs (SAS Institute, Cary, N.C., U.S.A.). Different letters indicate significant difference in same colon of tables.

Results and Discussions

Price of olive increase according to its fruit weight and flesh to seed ratio [13] so that, these values are required to be high for new olive cultivar. Flesh to seed ratio was required at least 5 for new table olive cultivar candidates by breeding researchers [14]. Fruit and seed size, fruit weight and flesh to seed ratio of olive were given in Table 2. In this study fruit weight and flesh to seed ratio was determined similar with result of [15] but higher than results of [16] and [17] for evaluated olive cultivars and cultivar candidates. In this research flesh to seed ratio of all table olives had higher than 5 except BE003 and LT011.

Sample	Fruit length (cm)	Fruit width (cm)	Seed length (cm)	Seed width (cm)	Fruit weight (g)	Flesh to seed ratio
BE001	2.1	3.1	0.9	2.4ab	6.2b	5.0c
BE003	2.0	2.8	0.9	2.2c	5.6c	5.0c
BE005	1.9	3.1	0.9	2.6a	5.6c	4.0e
LE001	2.0	2.9	0.9	2.1c	5.2d	6.3b
LT001	2.2	2.9	0.9	2.0c	6.2b	6.8a
LT011	2.3	3.1	0.9	2.1c	7.6a	5.7bc
Domat	2.2	2.9	0.9	2.2bc	6.4b	4.6d

Table 2**:** Fruit and seed size, fruit weight and flesh to seed ratio of processed olive.

Glossy color and high flesh hardness of table olives was one of the required criteria [18,14]. According to surface color of olives distinguishes four elaboration types according to surface color: green, turning color, natural black and ripe olives [8]. So that in these research table olives was categorized in green olive. Color values, hardness, pH and titratable acidity of raw olive samples were given in Table 3. The hardness of aolive is its surface resistance to penetration of an indenter which is an important table olive quality criteria [14,19]. In this research hardness, pH and titratable acidity of olive samples were determined between 372-576 g, 4.31-4.48 and 0.14-0.23 % oleic acid. Titratable acidity contents of the olives were similar with results of [20,21].

Sample	Color values			Hardness (g)	pH	Titratable acidity (% oleic acid)
	L	a	b			
BE001	39.19	0.56d	14.00	556a	4.42	0.23a
BE003	36.84	0.98c	16.01	506ab	4.32	0.14bc
BE005	39.56	1.05c	18.23	497b	4.37	0.21a
LE001	38.29	0.55d	16.02	372c	4.31	0.15bc
LT001	35.96	2.60a	14.63	393c	4.42	0.15bc
LT011	38.62	1.37b	14.58	461b	4.48	0.14c
Domat	38.54	1.58b	13.91	463b	4.40	0.18b

Table 3: Color values, hardness, pH and titratable acidity of processed olives.

Water and salt content, oleuropein absorbance value of olive samples were given in Table 4. Oleuropein was important phenolic component and responsible from this bitter taste [22] so that debittering steps were used in table olive processes [23]. In this study oleuropein content of the olives was decreased by diffusion of oleuropein during daily changing water. Scratching also accelerated the water soluble content diffusion by crossing skin barrier of olives. Oleuropein absorbance value was used as an indicator of bitterness of olives [18,24]. Oleuropein absorbance value of the samples were in accordance with the previously published works of [23,25,26]. But oleuropein absorbance values were higher than the results of previous studies [22,27].

Sample	Water (%)	Oleuropein absorbance value (K345)	Salt (%)
BE001	69.83	0.33b	2.27
BE003	68.93	0.25d	2.00
BE005	70.62	0.31bc	2.10
LE001	66.26	0.28cd	2.47
LT001	69.49	0.36b	2.17
LT011	68.42	0.48a	2.13
DOMAT	68.91	0.23d	2.33

Table 4: Water and salt content and oleuropein absorbance value of processed olive samples.

Fermentation improved flavor and texture characteristics [27] and color as a consequence of the different pigment polymerization and phenol oxidation [28]. For production of spontaneous fermented table olives, the fruit should be at optimum ripeness according to selected production method to obtain excellent color and texture hardness after processing to attract consumer [27]. In fact, in this research olives were harvested between 0.9-1.2 maturation indexes and processed with spontaneous fermentation after debittering olives by daily changing water.

Conclusions

In this research 6 cultivar candidates from previously finished cross breeding project and 1 standard cultivar were studied. Seed width, fruit weight, flesh to seed ratio, color value of hardness, titratable acidity and oleuropein absorbance value evaluated criteria determined as statistical significant different characters of olives. Differences were explained by the genetic variation of these cultivar candidates because they cultivated and processed under same conditions.

LT001 was also found to have highest fruit weight and flesh to seed ratio. As a result of this research, LT011 and LT001 were remarkable olives for scratched green table olive production and they can be advisable to breeding researcher for registration and certification.

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