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Oral Presentation

Comparison of pomological characteristics of different olive varieties grown in organic cultivation in Çanakkale–Geyikli ecological conditions

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Çanakkale is an important agricultural city with its diversity of product range nearly 5000 years of history as well as being a city of education, culture and history. Geyikli, town of Ezine, has a very important place in the case of olive cultivation in Çanakkale. Not only olive and olive oils grown in the region are trying to be a brand, but also there are significant developments in the field of boutique production. One of the most striking of these developments is organic cultivation. Organic cultivation in Geyikli region is carried out not only in important national cultivars such as 'Ayvalık' and 'Gemlik' but also in the newly registered local variety 'Hanım Parmagi'. This study was carried out in order to compare the pomological characteristics of the varieties of 'Hanım Parmagi', which is cultivated locally in organic farming conditions in Geyikli region, with 'Ayvalık' and 'Gemlik' cultivars, that the most important olive cultivars in our country. For this purpose, fruit width (mm), fruit length (mm), fruit weight (g of 100 fruits), seed weight (g of 100 seed), pulp ratio (%), moisture content (%), maturity index (MI), chlorophyll-a content (µg mL-1), chlorophyll-b content (µg mL-1) and total carotenoid content (µg mL-1) were determined on the commercial harvesting period (8th October 2018).

Keywords: *Olea europaea* L., Hanim Parmagi, Chlorophyll, Carotenoid, Maturity Index

INTRODUCTION

The olive (*Olea europaea* L.) is a species of the family Oleaceae, native to the coastal areas of the eastern Mediterranean Basin (the adjoining coastal areas of South-eastern Europe, Western Asia and Northern Africa) as well as North-western region of Turkey.

Olive has great genetic variation in Turkey as an important crop due to its economic value. There are many varieties, types and landraces having good potential for productivity, oil quality and table olive characters. North-western region of Turkey as cool subtropical climate has most suitable ecological conditions for highest quality olives and olive oils.

Organic olive cultivation has an important place in the agricultural activities of Canakkale. Geyikli region is one of the most important places in Canakkale for organic olive cultivation. This study was carried out to compare the pomological differences of Ayvalik, Gemlik and Hanim Parmagi varieties from organic olive cultivation in Canakkale Geyikli region.

MATERIALS AND METHODS

Materials

Hanim Parmagi, Ayvalik and Gemlik olive varieties used as plant material. The samples taken from the orchards which has organic agriculture certificate from Bozköy location of Canakkale-Geyikli region were collected from 3 different trees with 3 replications on 8 October 2018 single period (Figure 1).

Plant Materials

Ayvalik: The origin of cultivar is Gulf of Edremit. It also called as Edremit Yağlık, Sakran, Midilli, Ada Zeytini. This cultivar which has a high oil quality, is used as oil and green scratch table olive in Turkey (Figure 2).

Gemlik: The origin of cultivar is Gemlik county of Bursa. Gemlik cultivar called as Trilye. It is used as oil and black table olives in Turkey (Figure 3). This variety has high oil content (%30).

Hanim Parmagi: The origin of variety is Geyikli in Ezine region. It was registered by Olive Research Institute in 2017 (Kaya et al., 2018). It is used as green table olive in Geyikli region (Figure 4).

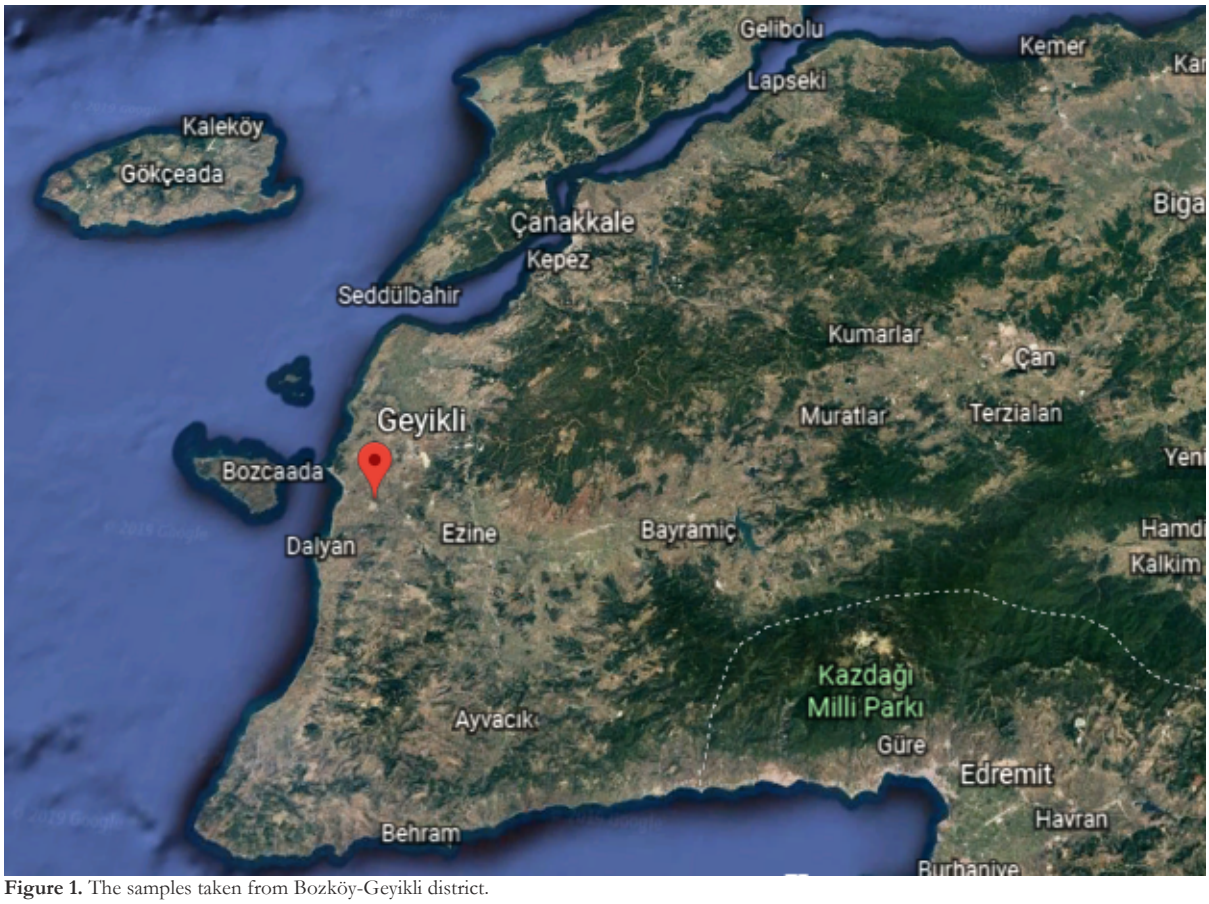


Figure 1. The samples taken from Bozköy-Geyikli district.

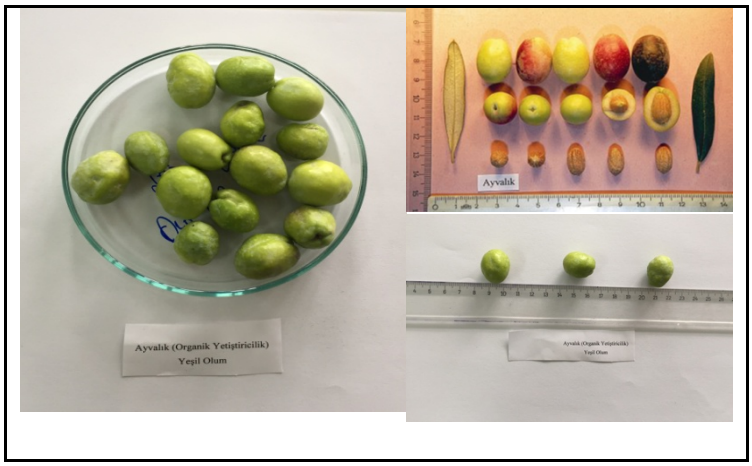


Figure 2. Ayvalik olive cultivar

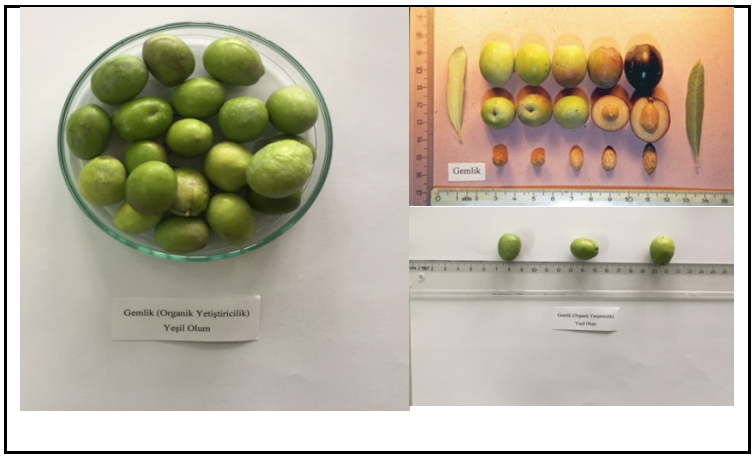


Figure 3. Gemlik olive cultivar



Figure 4. Hanim Parmagi olive cultivar

Methods

Fruit width, fruit length, seed width and seed length (mm) were measured by digital caliper. These measurements were carried out with 3 repeats and every repeat had 20 olive fruits.

Fruit weight (g 100 fruits^{-1}) was determined by digital balance.

Flesh ratios of fruits were calculated by formula that given below:

Flesh ratios of fruits = [(100 fruit weight – 100 seed weight) * (100) / (100 fruit weight)]

Percentage of moisture in fruit (%) was determined by drying in oven at 65°C until constant weight.

Maturity Index: The olives were sorted into skin and flesh color then maturity index equation was applied according to IOOC (2007). In this method, the maturation index is determined based on the color of the fruit skin and the color of the fruit flesh. 100 pieces of olives are taken from olive samples (1 kg) and the number of olives graded from 0 to 7 according to the color of the skin and fruit flesh is determined and the maturity index is calculated with the help of the equality given below.

Maturity Index: [(0 x n_0) + (1 x n_1) + (2 x n_2) +.... (7 x n_7)] / 100

Chlorophyll-a – Chlorophyll-b and Total Carotenoid Contents (µg ml^{-1}): Chlorophyll-a, chlorophyll-b and the total carotenoid contents were determined by using methanol solvent and absorbance were read at 470, 653 and 666 nm on Shimadzu UV-260 Spectrophotometer (Wellburn, 1994). The amounts of these pigments were calculated by formula that given below:

Chlorophyll-a Contents (µg ml^{-1}): (16.72*Abs666)-(9.16*Abs653)

Chlorophyll-b Contents (µg ml^{-1}): (34.09*Abs653)-(15.28*Abs666)

Total Carotenoid Contents (µg ml^{-1}): (1000*Abs470 – 1.63*Chl-a – 104.96*Chl-b)/ 221

Data were statistically analysed using One-way ANOVA by the software "SAS ver. 9" (SAS Institute Inc., Cary, NC, USA). TUKEY multiple range test was used to determine the significance of differences between treatments means by ($P<0.05$).

RESULTS AND DISCUSSION

Results of some biochemical and pomological characteristics of tested genotypes are given from Table 1 for all genotypes.

Fruit lengths of tested genotypes vary between 17.47 mm and 24.99 mm. The Hanim Parmagi variety had the longest fruits (24.99 mm), whereas Ayvalik and Gemlik cultivars showed the lowest values, 17.47 mm and 17.77 mm respectively. In addition, the recorded values in Hanim Parmagi genotype were the widest fruits (18.39 mm). However, the Ayvalik and Gemlik cultivars recorded the lowest values (13.17 mm and 13.71 mm, respectively). Gundogdu and Kaynas (2016) reported that Ayvalik cultivar had 13.96 mm fruit width and 18.23 mm fruit length on early stages of ripening while Gemlik cultivar had 16.03 mm and 21.07 mm fruit width and length in Gulf of Edremit, respectively.

Table 1. Results of some biochemical and pomological characteristics of tested genotypes*

Parameters	Ayvalik	Gemlik	Hanım Parmağı	MSD**
Fruit Width (mm)	13.17 b	13.71 b	18.39 a	0.9445
Fruit Length (mm)	17.47 b	17.77 b	24.99 a	0.6911
Seed Width (mm)	7.99 b	8.10 b	8.92 a	0.1839
Seed Length (mm)	13.44 b	13.11 b	17.08 a	0.3418
Fruit Weight (g 100Fruits^{-1})	328.60 b	326.78 b	513.88 a	15.86
Seed Weight (g 100 Seeds^{-1})	70.53 b	53.05 c	81.16 a	10.08
Flesh Ratio (%)	78.51 b	83.77 a	84.21 a	3.0105
Ratio of Moisture (%)	47.72 b	50.76 a	48.11 b	1.2109
Maturity Index	1.10 a	0.73 b	0.82 b	0.1562
Chlorophyll-a (µg ml^{-1})	1.051	1.039	0.988	N.S.**
Chlorophyll-b (µg ml^{-1})	1.818 b	1.931 ab	2.261 a	0.3698
Total Carotenoid (µg ml^{-1})	0.353 ab	0.523 a	0.173 b	0.1984

* Data are the means of 3 replicates. Values followed by different letters on line are significantly different at P<0.05.
** MSD: Minimum Significant Difference (p<0,05); N.S.: Non-Significant

Seed lengths of varieties vary between 13.11 mm and 17.08 mm. The Hanim Parmagi variety had the longest values, (17.08 mm), while Gemlik and Ayvalik cultivars showed the shorter values, 13.11 mm and 13.44 mm respectively. Hanim Parmagi genotype had the widest seeds (8.92 mm), but Ayvalik and Gemlik cultivars had not significant differences among them, 7.99 and 8.10 mm respectively. Gundogdu and Kaynas (2016) detected that Ayvalik cultivar had 7.55 mm seed width and 12.95 mm seed length on early stages of ripening while Gemlik cultivar had 7.52 mm and 13.29 mm fruit width and length in Gulf of Edremit, respectively.

Weight of 100 fruits of tested cultivars ranged from 513.88 g (Hanim Parmagi) to 326.78 g (Gemlik). There was not a significant difference between fruits of Ayvalik (328.60 g) and Gemlik cultivars, though Hanim Parmagi had the heaviest fruits. Gundogdu and Kaynas (2016) reported that weight of fruits varied from 301.8 g to 349.6 g in Gemlik cultivar on early stages of maturity, while Ayvalik cultivar had differed from 214.0 g to 325.4 g on same dates. Kaya et al. (2018) explained fruit weight of Hanim Parmagi variety was 465 g of 100 fruit.

The weights of 100 olive seed are recorded in table 1. The best values were recorded in Hanim Parmagi variety (81.16 g), Although Ayvalik and Gemlik cultivars have lowest values (70.53 g and 53.05 g). Gundogdu (2018) explained that Ayvalik cultivar ranged from 46.25 g to 70.02 g on stages of ripening while Gemlik cultivar varied from 49.42 g to 56.87 g in Gulf of Edremit, respectively

The highest fruit flesh ratios were found in 'Hanim Parmagi' (84.21%) and 'Gemlik' (83.77%). Flesh ratios of Ayvalik cultivar had the lowest value (78.51%). Kaynas et al. (2002) reported that flesh ratio of fruits is an important parameter in olive breeding and it must be higher for table olive cultivars. Also, Gundogdu and Kaynas (2016) reported that flesh ratio of fruits varied from 78.16% to 85.48% in Ayvalik cultivar on early stages of maturity, while Gemlik cultivar had differed from 83.63% to 84.99% on same dates. Kaya et al. (2018) explained fruit flesh ratio of Hanim Parmagi variety was 86.66%.

Moisture content in fruits of all cultivars was high at the initial stage of maturation (Gundogdu and Kaynas, 2016). While the highest fruit moisture content was found in 'Gemlik' (50.76 %), Hanim Parmagi and Ayvalik genotypes had the lowest moisture contents of their fruits, 48.11 % and 47.72 %, respectively. Gundogdu and Kaynas (2016) reported that fruits of Gemlik cultivar had the more moisture content in all maturity stages than Ayvalik cultivar.

Fruits of all genotypes collected early harvest period. As a result of this situation, 'Maturity Index' values are between [0-1]. The highest maturity index was found in 'Ayvalik' had the most yellowish fruits (1.10), whereas Hanim Parmagi variety (0.82) and Gemlik cultivar (0.73) showed the greener fruits. Gundogdu and Kaynas (2016) detected that Ayvalik cultivar had the higher maturity index than Gemlik cultivar at the beginning of the October in Gulf of Edremit.

There was not statistically significant difference between chlorophyll-a among the genotypes. Chlorophyll-a contents of fruits varied from 0.988 µg ml^{-1} (Hanim Parmagi) to 1.051 µg ml^{-1} (Ayvalik). However, chlorophyll-b contents of fruits of tested genotypes ranged from 1.818 µg ml^{-1} (Ayvalik) to 2.261 µg ml^{-1} (Hanim Parmagi). When the fruit is green, chlorophyll b degrades faster than chlorophyll a, and hence the chlorophyll a/b ratio increases (Giuliani et al., 2011).

Total carotenoid pigments had low amount at light green maturation stage (MI =0 – 1). At initial phase of maturity, 'Hanim Parmagi' (0.173 µg ml^{-1}), 'Ayvalik' (0.353 µg ml^{-1}) had lowest carotenoid contents, whereas 'Gemlik' (0.523 µg ml^{-1}) had most carotenoid pigments. Gundogdu and Kaynas (2016) reported that 'Gemlik' and 'Ayvalik' cultivars had very low carotenoid contents at initial phase of maturity (0.168 µg ml^{-1} and 0.147 µg ml^{-1}, respectively).

Mackinney (1961) specified that the occurrence of carotenoids is associated with chlorophyll in all photosynthetic tissues. Most fruits are green when unripe; as they ripen, photosynthetic activity decreases and chlorophyll disappears. Besides that, Simpson et al. (1976) reported that chlorophyll degradation occurs during the biosynthesis of carotenoids and anthocyanins in many fruits.

CONCLUSIONS

Geyikli region is the most important region of Canakkale in terms of both olive-olive oil quality and geographical indications and biodiversity. In addition to, especially the forgotten ecotype "Hanim Parmagi" variety is important for the protection of our region's rich olive gene resources. "Hanim Parmagi" genotype should be suggested for boutique production of table olives in Canakkale region.

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