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Full Length Research Paper

Determining the yield and several quality parameters of 'Chili Jalapeno' in comparison to 'Pical' and 'Geyik Boynuzu' pepper cultivars under Mediterranean conditions

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We studied yield and quality parameters of three hot Chili pepper cultivars under Antakya conditions. The cultivars tested were 'Chili Jalapeno', 'Pical' and 'Geyik Boynuzu', which is a local cultivar. The experiment was designed as a completely randomized block design with three blocks in each treatment and conducted for two years. The variable measured in the experiment include total yield (kg/da), fruit number (number/plant), yield per plant (g/plant), fruit weight (g), fruit width (cm), fruit length (cm), skin + flesh width (mm) and soluble solids (%). The results indicated that 'Chili Jalapeno' and 'Pical' cultivars gave significantly higher total yield than 'Geyik Boynuzu' with 1951 and 1818 kg/da, respectively while 1593 kg/da yield was recovered from 'Geyik Boynuzu'. Similarly, for yield per plant, 'Chili Jalapeno' and 'Pical' cultivars gave significantly higher yield than 'Geyik Boynuzu'. The highest soluble solid was found on 'Pical' while the lowest from 'Geyik Boynuzu'. Moreover, 'Pical' was determined as the thinnest skin + flesh width. For these reasons, 'Pical' could be recommended for dry pepper production. We suggest 'Chili Jalapeno' cultivar for pickling. 'Geyik Boynuzu' is a local cultivar that is commonly grown in the region. For this cultivar, we suggest breeding studies should be initiated to further improve this cultivar.

Key words: Pepper, cultivar, pepper production, Antakya, *Capsicum annuum* L.

INTRODUCTION

Pepper, *Capsicum annuum* L., is the member of Capsicum genus and Solanaceae family. Thompson described five subspecies. The Chili peppers belong to *Capsicum annuum* var. *annuum*. It is believed that pepper was dispersed to the world from America although no countries in America could be accepted as center of origin (Günay, 1992).

Total world pepper production is 17,000,000 t (Anonymous, 1998). Turkey is the third largest pepper producing country, after China and Mexico with 1,010,000 t chili and 390,000 t bell pepper production (Anonymous, 1998). The major part of pepper production in Turkey is conducted on Aegean, Mediterranean, Marmara, Black Sea and Southern Anatolian regions. In general, productions in Aegean and Mediterranean regions are for table consumptions, while in Marmara, the peppers are produced for processing. The Eastern Mediterranean regions where Kahramanmaraş, Hatay and Gaziantep provinces are located are important for red dry pepper production. With a 73,634 t chili pepper production, Hatay is an important pepper producing province (Anonymous, 1997).

Pepper production in Turkey is not conducted for table consumption but paste, pickle, dried (powder and other types) as well. In Hatay, the peppers are dried by placing them along with a rope from the peduncle region. It is said that 1000 pepper per each member of the family is

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Table 1. The results of total yield (kg/da), yield per plant (g/plant), fruit number (number/plant) and fruit weight (g), studied in the experiment.

Cultivar	Year	Total yield (kg/da)	Yield per plant (g/plant)	Fruit number (number/plant)	Fruit weight (g)
'Chili Jalapeno'	1st year	1880 AB[1]	940.0 AB	56.00 B	16.60 B
	2nd year	2022 A	1011.0 A	66.33 AB	14.94 B
	Mean	1951 a[2]	975.6 a	61.17 a	15.77 b
'Pical'	1st year	1610 BC	805.0 BC	59.67 B	13.24 B
	2nd year	2025 A	1013.0 A	76.33 A	13.05 B
	Mean	1818 a	908.7 a	68.00 a	13.15 b
'Geyik Boynuzu'	1st year	1426 C	713.0 C	21.33 C	33.30 A
	2nd year	1760 AB	880.2 AB	24.83 C	35.13 A
	Mean	1593 b	796.6 b	22.83 b	34.22 a
$Duncan_{(0.05)}$		314.1	150.7	11.63	4.258
$Duncan_{(0.05)}$		222.1	106.5	8.22	3.010

[1]Different letters indicate statistically significant differences at 5% by Duncan. [2]Different letters indicate statistically significant differences at 5% by Duncan between the means of the experimental years.

dried for each year. This indicates that hot dried pepper is a popular food among the people of Hatay.

Having full yield and quality potential from the limited amount of land in production is a very significant parameter for country's economy as well as humanity. Today, the pepper yield has reached to a very high level, when compared to the past, with the utilization of high quality seeds and application of agricultural practices adequately. The yield was 570 kg/da in 1960 which had reached 1400 kg/da today. Vural et al. (1992) studied the yield performances of five processing pepper cultivar on 'Menemen' ecological conditions and found that the yield varied between 1530 - 1919 kg/da.

The average pepper yield is 1500 kg/da in Hatay province (Anonymous, 1999). Turkey is still behind the other countries in terms of yield when compared to them. This low yield is probably caused by the utilization of low-yielded local cultivars. In Hatay, producers use the seed which they take from their or their neighbors' previous productions. This may cause some yield loses. This study was conducted to compare the local cultivar ('Geyik Boynuzu') to the others in term of yield and other parameters, and to determine their pomological characteristics.

MATERIALS AND METHODS

'Geyik Boynuzu' (local cultivar), 'Pical' (Clause) and 'Chili Jalapeno' (Excel Seeds) were used as plant material in the experiment. The experiment was conducted on Mustafa Kemal University, Agricultural Faculty, Experimental Station in the first year and HATAŞ Paste Factory's field in the second year.

The experiment was set up and conducted according to randomized bock design with three replicates. The seedlings of 'Pical' were gifted from HATAŞ Paste Factory. The seedling 'Geyik Boynuzu' and 'Chili Jalapeno' were produced on Mustafa Kemal University, Agricultural Faculty greenhouses under a second plastic protection. The seedlings were planted on 100 x 50 cm making 12 plants on a 6 m^2 area.

Prior to planting, the soil was fertilized by 15:15:15 (N:P:K) fertilizer, 50 kg/da. Planting was done 25 April and 2 May in the first and second years of the experiment. For fertilization, 30 kg/da Ammonium sulphate and 30 kg/da potassium nitrate were given in two applications; the first one on fruit set and the second was before the second harvest (Günay, 1992). Furrow irrigation was used and care was taken to avoid contamination of irrigation water to the soil/stem interface. Given that weeds are vector for powdery mildew, weed control was carried out on the experimental site.

Total yield (kg/da, yield per plant (g/plant), fruit number (number/ plant), fruit weight (g), fruit width (cm), fruit length (cm), skin + flesh width (mm), and soluble solids (%) were measured for the cultivar. The data were subjected to analysis of variance by MSTAT pocket program and the means were compared by Duncan test.

RESULTS AND DISCUSSION

Total yield and yield per plant

The results of the Analysis of variance for total yield parameter (total yield (kg/da) and yield per plant (g/plant)), fruit number (number/plant) and fruit weight (g) for the genotypes as well as their mean comparisons by Duncan test at (5%) are given in Table 1.

The yield varied between 1951 and 1593 kg/da for the

experimental cultivars. Also, the yield for the cultivars significantly varied between the experimental years. The highest yield was recovered from 'Pical' and 'Chili Jalapeno' in 2002 with 2025 and 2022 kg/da, respectively. The lowest yield was recovered from 'Geyik Boynuzu', the local cultivar, with 1426 kg/da. 'Chili Jalapeno' and 'Pical' cultivars yielded statistically significant pepper than 'Geyik Boynuzu'. Cerne et al. (1989) found 2740 kg/da for 'Slatki Rumeni' cultivar in Slovenia. Costa et al. (1989) found 'Nebi' as the highest yielding cultivar with 3900 kg/da in Spain. Vural et al. (1992) studied the yield performances of five processing pepper cultivar on Menemen ecological conditions and found that the yield varied between 1530 - 1919 kg/da. Abak et al. (2002) found the average yield as 5 ton/da with the cultivars 'Tatli Sivri', 'Ata 100', 'Charleston Bagci', while a local cultivars, 'Maras Yerli' yielded 500 - 600 kg/da. When the experimental cultivars were compared with 'Tatli Sivri', 'Ata 100', 'Charleston Bagci', 'Slatki Rumeni and 'Nebi', it was concluded than they were lower yielding, whereas they yielded more peppers than hot pepper types studied on Menemen conditions and 'Maraş Yerli' local cultivar.

The yield per plant (g/plant) was found to be statistically significant for cultivars and years. The average yields per plant were between 796.6 - 1013.0 g. The highest yield was determined as 1013.0 and 1011.0 g/plant for 'Pical' and 'Chili Jalapeno', respectively. The lowest yield was found for 'Geyik Boynuzu' in first year. The differences among cultivars found to be statistically significant and 'Pical' and 'Chili Jalapeno' had significantly higher yield than 'Geyik Boynuzu'. The averages of Türkmen et al. (1995)'s study, though conducted under greenhouse conditions, could not reach that of ours. Koludar (1995) found the average yield per plant as 530 - 1320 g on 'Charleston Bagci' where he tested the performance of this cultivar at various periods. Türkmen et al. (1995) recovered 323 - 343 g/plant under greenhouse conditions for 'Ilica 256' and 'Pip EGW' cultivars.

Fruit number and fruit weight

The results of the analysis of variance for fruit number (number/plant) and fruit weight (g) for the genotypes as well as their mean comparisons by Duncan test at (5%) were given in Table 1. Fruit numbers of the experimental cultivars varied from 21.33 to 76.33. When average fruit numbers were considered, the difference between 'Chili Jalapeno' and 'Pical' was found insignificant with 61.17 and 68.00, respectively. However, 'Geyik Boynuzu' had significantly lower fruit number than both cultivars with 22.83. When the annual averages were considered, higher fruit number was recovered in second year.

For fruit weight, 'Geyik Boynuzu' was found to be superior to other cultivars. The fruit weight varied from 13.05 to 35.13 g. This variation is mostly caused by large fruits of 'Geyik Boynuzu'. 'Chili Jalapeno' and 'Pical' had no significantly different fruit weights with 15.77 and 13.15 g, respectively. 'Geyik Boynuzu', however, is significantly larger p than both 'Chili Jalapeno' and 'Pical'. These findings, measured in our ecological conditions, are higher than those of Türkmen et al. (1995) with 'Ilica' 256 and 'Pip EGW' cultivars. However, Costa et al. (1989) reported that their experimental cultivars had 24 - 30 g of pepper.

Fruit width and fruit width

The results of the Analysis of variance for fruit width (cm) and fruit length (cm) for the genotypes as well as their mean comparisons by Duncan test at (5%) are given in Table 2. The fruit widths for the experimental genotypes were found to be statistically significant. The highest fruit widths were recovered from 'Geyik Boynuzu' cultivars, which also had the largest peppers. The fruit width of 'Geyik Boynuzu' was 2.88 cm. The fruit width for 'Chili Jalapeno' was 2.18 and 1.73 cm for 'Pical'.

The average fruit length was also statistically different for cultivars. The fruit length varied from 5.8 - 11.94 cm. The shortest peppers were recovered from 'Chili Jalapeno' while the longest were from 'Geyik Boynuzu'. The fruit length of 'Pical' was intermediate (9.75 cm). The fruit length among the *C. annuum* genotypes vary from 2 - 3 cm to 15 - 20 cm. Koludar (1995) found the average fruit length as 12 - 13 cm for 'Charleston Bagci'.

Skin + flesh width and soluble solids

The results of the analysis of variance for skin + flesh width (mm) and soluble solids (%) for the genotypes as well as their mean comparisons by Duncan test at (5%) are given in Table 2. Skin + flesh width varied from 1.497 to 2.583 mm. 'Chili Jalapeno' was found to be thickest among the cultivars tested with 2.567 mm. The thinnest skin + flesh width was recovered from 'Pical' (1.592 mm). The local cultivar, 'Geyik Boynuzu' had intermediate skin + flesh width. With this skin + flesh width, 'Pical' can be recommended for dried red pepper production. Thin skin + flesh width is advantageous in dry pepper production since its drying is faster.

The rate of disolution varied from 6.36 - 7.49% among the experimental cultivars. 'Pical' was statistically found to dissolve faster than the other two genotypes, while 'Chili Jalapeno' dissolves faster than' Geyik Boynuzu'.

In conclusion, we recommend 'Pical' and 'Chili Jalapeno' cultivars for the region. 'Pical' can especially be of value for dry red hot pepper production, while 'Chili Jalapeno' is recommended for pickling. Although 'Geyik

Table 2. The results of fruit width (cm), fruit length (cm), skin + flesh width (mm) and soluble solids (%), studied in the experiment.

Cultivar	Year	Fruit width (cm)	Fruit length (cm)	Skin + flesh width (mm)	Soluble solids (%)
	1st year	2.83 BC[1]	6.10 D	2.550 A	6.76 AB
'Chili Jalapeno'	2nd year	1.97 CD	5.69 D	2.583 A	6.59 B
	Mean	2.18 b[2]	5.89 c	2.567 a	6.68 b
	1st year	1.68 D	9.08 C	1.687 BC	7.49 A
'Pical'	2nd year	1.78 D	10.43 B	1.476 C	7.49 A
	Mean	1.73 c	9.75 b	1.592 c	7.49 a
	1st year	2.72 AB	11.12 B	1.957 B	6.63 B
'Geyik Boynuzu'	2nd year	3.04 A	12.76 A	1.970 B	6.36 B
	Mean	2.88 a	11.94 a	1.963 b	6.50 b
$Duncan_{(0.05)}$		0.453	0.947	0.293	0.718
$Duncan_{(0.05)}$		0.320	0.670	0.207	0.508

[1]Different letters indicate statistically significant differences at 5% by Duncan. [2]Different letters indicate statistically significant differences at 5% by Duncan between the means of the experimental years.

Boynuzu' is the dominating cultivars for the region, it is a low yielding cultivar. Therefore, breeding program aiming to increase yield potential of 'Geyik Boynuzu' should be initiated; and, high yielding types should be produced and introduced to the regional growers.

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