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# Phenotypic Differences of Nut and Yield Characteristics In 'Siirt' Pistachios (*Pistacia vera* L.) Grown In Siirt Province

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**Abstract**

With good fruit characteristics, 'Siirt' is an important pistachio cultivar of Turkey. The harvest season of this cultivar usually is from early September to late September. The study was conducted in central Siirt province, origin of the cultivar 'Siirt', (the Southeastern Anatolia Region) during 1998 and 2000. This study determines the phenotypic differences related to nut and yield characteristics within the cultivar 'Siirt'. The data from nineteen selections grafted onto *P. khinjuk* and eleven selections grafted onto *P. terebinthus* were evaluated. The tree characteristics were determined for three years and nut characteristics were recorded for two years. The selections on *P. khinjuk* showed a range of 0.52-6.80 kg for yield per tree, 11.9-67.1 g/cm$^2$ for yield efficiency, 103-118 g for dehulled nut weight, 50.7-59.4 g for kernel weight and 66-93% for split nuts. In addition, selections on *P. terebinthus* had a range of 0.70-2.84 kg for yield per tree, 7.5-29.1 g/cm$^2$ for yield efficiency, 98-130 g for dehulled nut weight, 53.4-60.6 g for kernel weight and 71-91% for split nuts.

## Introduction

As a species increasingly gaining popularity in the world, pistachio trees have been grown since ancient times in Anatolia, one of its origins (1, 2, 3). Turkey has intensive native populations belonging to the pistachio species. Although pistachio growing is distributed among various regions, Southeastern Anatolia including Gaziantep, Kahraman Maras, Urfa, Diyarbakır, Mardin, Siirt, Batman, Sırnak and Adıyaman provinces, is one of the most important production regions of Turkey and the world. This region has a quite suitable climate for pistachios and includes 94% of Turkey's pictacio production (4). It is supposed to be the motherland of the pistachio cultivars known today (1, 3). The summers in this region are hot enough to ripen the fruits and the winters are cold enough to meet a good chilling requirement (1). On the other hand, the edible species *Pistachia vera L.* is commercially grown mostly under unirrigated conditions on stony, rock, calcereous and poor arid soils of this region with 300-500 mm annual rainfall (3, 5).

In Turkey, one of the major pistachio producing countries, traditional techniques

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are used for growing. In contrast, in the USA and the Mediterranean countries in recent years, pistachio production has rapidly increased as a result of modern horticultural techniques and facilities. During future years, Turkey's annual production in frame of the GAP (The South-East Anatolia Regional Project) is estimated to increase under irrigated conditions (3, 5, 6).

The species *P. terebinthus* and *P. khinjuk* are also common in scattered populations in the Southeastern Region. These are widely used as rootstocks. The most popular pistachio cultivars of Turkey are Uzun , Kırmızı and Siirt, although there are also other cultivars. The nuts of Uzun and Kırmızı cultivars are long and their green kernels are small and have excellent taste. The cultivar Siirt has larger kernels with oval nuts and high splitting percentage. No doubt, one of the most important cultivar properties in pistachio breeding is a tendency to alternate bear, and other desirable important characteristics of pistachio cultivars include large nuts and kernels, high percentage of splitting, regular bearing every year and high percentage of green kernels (3, 5, 6, 7). Ferguson et al. (8) reported that 'Kerman', the main pistachio cultivar grown commercially in California, is strongly alternate bearing. Wolpert and Ferguson (9) stated that alternate bearing is correlated with crop load. Kaska (3) stated that alternate bearing in 'Siirt' cultivar is less than other cultivars.

Although Turkey has very rich pistachio populations, not enough selection studies related to desirable characteristics have been conducted. Tekin and Akkök (4) reported promising pistachio selections which have better quality than other cultivars. All Turkish pistachio cultivars except for 'Siirt' have a strong alternate bearing characteristic. The cultivar 'Siirt' produces heavy crop in the "on years" and somewhat lower crop in the "off years" (3). In terms of both alternate bearing and other characteristics, a range of variability might also appear in other cultivars. These should be studied, and valuable selections should be investigated with replicated trials. The phenotypic differences within 'Siirt' in its origin and other locations, has not been studied. This study describes phenotypic differences related to nut and tree properties within the cultivar 'Siirt' grafted onto *P. trebinthus* and *P. khinjuk* seedling rootstocks in the Siirt central province.

## Material and Method

The study was conducted in central Siirt province situated at the Southern Anatolia Region during 1998 and 2000. A large number of 'Siirt' pistachio trees that are grafted onto *P. khinjuk* and *P. terebinthus* seedling rootstocks in the province was assessed as the material of the study. The trees differed in age from 11 to 44 years. Trees were selected based on alternate bearing and good fruit characteristics, based on informations of producers. Each vegetatively propagated selection represented a single tree on one of two rootstocks. None of selections was a seedling tree. The cultivar 'Siirt' in this province, reflecting a typical climate of the South-East, is largely cultivated with traditional techniques without modern cultural practices and grown under unirrigated conditions.

Nineteen trees grafted onto *P .khinjuk* and eleven trees grafted onto *P. terebinthus* were marked for comparison. The second year these trees were examined the ranges of tree and yield properties including tree age, tree height (m), stem circumference (cm), yield per tree (kg), yield by trunk cross-sectional area ($g/cm^2$), alternate bearing and harvest season, and nut characteristics such as nut dimensions (cm), nut numbers in cluster, weights of 100 dry hulled and dehulled nuts (g), weights of 100 kernels, percentages of split nuts (%), splitting space and its value (mm), hull separation, shell separation in dehisced nuts and separation from cluster of nuts in-hull of the trees were determined. Yield of each tree was determined for three years and nut characteristics were recorded for two years. Nut numbers in cluster were found as the average of ten clusters. The third year, the data from nut and yield properties of the same trees was recorded. Each selection examined was represented

by a single tree grafted onto either *P. khinjuk* or *P. terebinthus*. Therefore, the values were measured using a sample from the same tree over tree years, and replicates were years.

## Results and Discussions

The nineteen selections of the cultivar 'Siirt' on *Pistachia khinjuk* exhibited a range of 11-46 for tree ages, 2.05-6.60 m for tree height and 18-72 cm for trunk circumference (Table 1). The average yield per tree ranged from 0.52 kg to 6.80 kg. The highest average yield tree was obtained from SF-18 (6.80 kg), this was followed by SF-23 (6.54 kg), SF-13 (5.73 kg), SF-7 (5.52 kg) and SF-1 (5.41 kg), respectively. Significant differences among average yields per tree were found ($p<0.05$). On the other hand, yield efficiency was between 11.9 ($g/cm^2$) and 67.1 ($g/cm^2$). The highest yield efficiency was determined from SF-8 (67.1 $g/cm^2$), this was followed by SF-7 (41.2 $g/cm^2$), SF-14 (30.6 $g/cm^2$), SF-22 (26.0 $g/cm^2$), SF-27 (25.8 $g/cm^2$) and SF-4 (23.6 $g/cm^2$), respectively. There were significant differences in yield efficiency among selections ($p<0.05$). Harvest seasons varied from early september to midseptember.

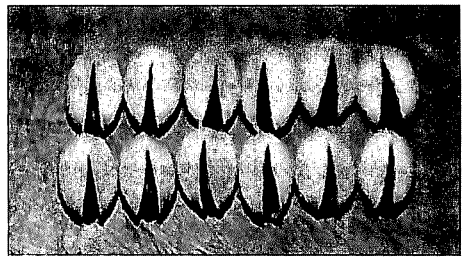

**Figure 1. Nuts of the selection SF-1.**

The eleven selections of the cultivar 'Siirt' on *Pistachia terebinthus* showed a range of 14-30 for tree ages, 2.30-3.25 m for tree height and 23-58 cm for trunk circumference (Table 2). The average yield per tree varied from 0.70kg to 2.84kg. The highest average yield tree was obtained from SF-6 (2.84kg), this was followed by SF-9 (2.45kg), SF-26 (2.20 kg) and SF-17 (1.82kg), respectively. Significant differ-

**Table 1. Tree and yield characteristics of selections of Siirt pistachio grafted onto *P. khinjuk* seedling rootstocks.**

| 'Siirt' Select. | Tree age | Tree height (m) | Trunk circumference (cm) | Yield Per Tree (kg) 1998 | 1999 | 2000 | Mean | Yield[Y] ($g/cm^2$) | Harvest Time |
|---|---|---|---|---|---|---|---|---|---|
| SF-1 | 39 | 4.20 | 72 | 4.95 | 5.78 | 5.50 | 5.41±0.23 b[z] | 13.06±0.62 g[z] | early |
| SF-4 | 32 | 4.60 | 37 | 2.62 | 2.75 | 2.36 | 2.58±0.11 g | 23.60±1.06 de | early |
| SF-5 | 35 | 4.85 | 57 | 2.75 | 3.52 | 3.02 | 3.09±0.23 f | 11.96±0.87 g | early |
| SF-7 | 36 | 5.20 | 41 | 5.50 | 5.72 | 5.34 | 5.52±0.11 b | 41.23±0.81 b | mid-Sep. |
| SF-8 | 24 | 4.10 | 27 | 3.85 | 4.13 | 3.71 | 3.89±0.12 e | 67.13±2.15 a | mid-Sep. |
| SF-10 | 42 | 6.60 | 60 | 4.13 | 4.73 | 4.68 | 4.51±0.19 d | 15.73±0.67 fg | mid-Sep. |
| SF-13 | 44 | 4.80 | 60 | 5.78 | 5.90 | 5.51 | 5.73±0.12 b | 20.04±0.42 ef | mid-Sep. |
| SF-14 | 32 | 3.45 | 35 | 3.02 | 3.19 | 2.75 | 2.98±0.13 f | 30.61±1.30 c | mid-Sep. |
| SF-15 | 12 | 2.10 | 18 | 0.55 | 0.72 | 0.28 | 0.52±0.13 i | 20.10±4.98 ef | mid-Sep. |
| SF-18 | 42 | 5.25 | 63 | 6.60 | 6.93 | 6.88 | 6.80±0.10 a | 21.49±0.31 def | mid-Sep. |
| SF-19 | 34 | 5.30 | 45 | 4.67 | 5.06 | 4.95 | 4.89±0.11 c | 30.30±0.75 c | mid-Sep. |
| SF-21 | 46 | 4.80 | 67 | 3.85 | 4.73 | 4.68 | 4.42±0.28 d | 12.37±0.78 g | mid-Sep. |
| SF-22 | 19 | 4.05 | 33 | 1.93 | 2.64 | 2.20 | 2.26±0.21 g | 26.03±2.36 cd | mid-Sep. |
| SF-23 | 40 | 5.85 | 65 | 6.05 | 6.98 | 6.60 | 6.54±0.26 a | 19.46±0.81 ef | mid-Sep. |
| SF-25 | 39 | 6.10 | 51 | 4.30 | 4.51 | 4.43 | 4.41±0.06 d | 21.30±0.29 def | mid-Sep. |
| SF-27 | 35 | 3.45 | 43 | 3.85 | 4.02 | 3.57 | 3.81±0.13 e | 25.88±0.91 cd | mid-Sep. |
| SF-28 | 13 | 2.50 | 23 | 0.83 | 1.43 | 1.10 | 1.12±0.17 h | 26.60±4.14 cd | mid-Sep. |
| SF-29 | 11 | 2.30 | 20 | 0.54 | 0.77 | 0.83 | 0.71±0.08 i | 22.40±2.81 de | mid-Sep. |
| SF-30 | 11 | 2.05 | 18 | 0.55 | 0.62 | 0.29 | 0.49±0.10 i | 18.84±3.87 ef | mid-Sep. |

[X]Based on trunk height of 40 cm from ground level.
[Y]Yield per trunk-cross sectional area.
[Z]Mean separation within rows by duncan's multiple range test ($p<0.05$).

**Table 2. Tree and yield characteristics of sleictions of 'Siirt' pistachio grafted onto *P. terebinthus* seedling rootstocks.**

| 'Siirt' Select. | Tree age | Tree height (m) | Trunk circumfer-ence (cm) | Yield Per Tree (kg) 1998 | 1999 | 2000 | Mean | Yield[y] (g/cm²) | Harvest Time |
|---|---|---|---|---|---|---|---|---|---|
| SF-2 | 17 | 3.20 | 33 | 1.54 | 1.10 | 0.92 | 1.19±0.18 d[z] | 13.66±2.10 cde[z] | early |
| SF-3 | 15 | 3.00 | 30 | 1.16 | 0.84 | 1.14 | 1.05±0.10 d | 14.56±1.44 cd | early |
| SF-6 | 21 | 3.05 | 54 | 3.19 | 2.48 | 2.90 | 2.84±0.29 a | 12.30±0.87 def | mid-Sep. |
| SF-9 | 29 | 3.25 | 58 | 2.69 | 2.20 | 2.45 | 2.45±0.14 b | 9.10±0.52 fg | mid-Sep. |
| SF-11 | 20 | 3.00 | 25 | 1.16 | 8.80 | 1.10 | 1.02±0.11 d | 20.46±2.26 b | mid-Sep. |
| SF-12 | 27 | 3.18 | 51 | 1.65 | 1.53 | 1.60 | 1.59±0.04 c | 7.67±0.15 g | mid-Sep. |
| SF-16 | 15 | 2.30 | 23 | 1.21 | 1.15 | 1.33 | 1.23±0.05 d | 29.16±1.24 a | mid-Sep. |
| SF-17 | 30 | 2.45 | 55 | 2.04 | 1.67 | 1.76 | 1.82±0.11 c | 7.56±0.48 g | mid-Sep. |
| SF-20 | 22 | 3.20 | 39 | 1.60 | 0.95 | 1.26 | 1.27±0.19 d | 10.50±1.53 efg | mid-Sep. |
| SF-24 | 14 | 2.80 | 23 | 0.69 | 0.55 | 0.86 | 0.70±0.09 e | 16.58±2.12 c | mid-Sep. |
| SF-26 | 16 | 3.15 | 35 | 2.31 | 2.20 | 2.10 | 2.20±0.06 b | 22.53±0.64 b | mid-Sep. |

[x]Based on trunk height of 40 cm from ground level.
[y]Yield per trunk-cross sectional area.
[z]Mean separation within rows by Duncan's multiple range test (P<0.05).

ences among average yields per tree were found ($p<0.05$). The yield efficiency ranged from 7.5 (g/cm$^2$) to 29.1 (g/cm$^2$). The highest yield efficiency was obtained from SF-16 (29.1g/cm$^2$), this was followed by SF-26 (22.5 g/cm$^2$), SF-11 (20.4 g/cm$^2$) and SF-24 (16.5g/cm$^2$), respectively. There were significant differences in yield efficiency among selections ($p<0.05$). Harvest season was from early September to mid-September .

On the other hand, selections on *P. khinjuk* had a range of 1.88-2.04 mm for nut length, 1.06-1.25 cm nut width, 1.07-1.21 cm and 10-19 for nut number in cluster (Table 3). The dry hulled nut weights were between 125g and 145g, and dehulled nut weights were between 103g and 118g. The kernel weight ranged from 50.7 g to 59.4g. The percentage of split nuts varied from 66% to 93%, and the selection SF-1 had the highest splitting with 93% (Figure 1) . In addition, the split opening of the nuts were large or middle. The value of split opening was between 2.46mm to 5.80mm. The majority of selections had easy separated hulls. The shell separation in dehisced nuts was hard in all of them, and separation from cluster of nuts in-hull was easy for their majority

Selections on *P. terebinthus* displayed a range of 1.85-2.03mm for nut length, 1.12-1.90cm nut width, 1.10-1.16cm and 10-17 for nut number in cluster. (Table 4). The dry hulled nut weights were from 122g to 150g, and dehulled nut weights were between 98g and 130g. The kernel weight ranged from 53.4g to 60.6g. The percentage of split nuts varied from 71% to 91%. In addition, the splitting space of the nuts for the majority were large, and value of splitting space was between 2.25mm to 5.12mm. All selections but SF-26 had easy separated hulls. The shell separation in dehisced nuts was hard in all them except SF-20. Separation from cluster of nuts in-hull was easy for their majority.

Pistachio nuts are harvested in late August and September in Turkey, and from late August to late October in Iran, depending on cultivars and locations (10). The selections examined in this study were harvested from early September to mid-September.

The majority of pictacio cultivars described today have been found by selection (3). Tekin and Akkök (4) selected sixteen promising pistachios from Gaziantep, Sanlı Urfa, Kahraman Maras and Adı yaman provinces, and determined promising selections that have 37-94% splitting percentage and 38-47% kernel percentage. Karaca and Nizamoglu (11) reported 132.4g dry hulled weight, 86% splitting percentage and 44% kernel percentage for the cultivar 'Siirt'. Akkök and Karaca (12)

**Table 3. Data connected with hull, inshell and kernel properties of selections of 'Siirt' pistachio grafted onto *P. khinjuk* seedling rootstocks (1999-2000).**

| 'Siirt' Selections | Nut Length (cm) | Nut Width (cm) | Nut Thickness (cm) | Nut Numbers In Cluster | Weight of dry Hulled Nuts[x](g) | Weight Dehulled Nuts[x] (g) | Kernel Weight[x] (g) | Percentage of split Nuts (%) | Split Opening (mm) | Hull Separation | Shell Separation In Dehisced Nuts | Separation from Cluster of Nuts |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SF-1 | 1.94±0.04 | 1.25±0.02 | 1.16±0.05 | 18±0.6 | 145±1.1 | 115±1.8 | 57.8±0.5 | 93±1.7 | large-4.86±0.02 | easy | hard | easy |
| SF-4 | 1.94±0.02 | 1.24±0.03 | 1.10±0.03 | 15±1.5 | 134±1.5 | 111±1.0 | 55.2±0.9 | 73±1.2 | large-5.80±0.02 | easy | hard | easy |
| SF-5 | 1.88±0.05 | 1.18±0.02 | 1.12±0.05 | 16±0.8 | 125±1.1 | 104±1.4 | 50.7±0.5 | 71±1.3 | large-4.42±0.05 | middle | hard | easy |
| SF-7 | 1.93±0.04 | 1.15±0.06 | 1.10±0.06 | 16±0.6 | 126±1.4 | 103±1.6 | 51.5±0.6 | 72±1.6 | large-4.23±0.04 | easy | hard | easy |
| SF-8 | 2.04±0.05 | 1.08±0.04 | 1.07±0.04 | 15±0.6 | 130±1.7 | 107±1.1 | 54.4±0.5 | 77±1.2 | middle-2.74±0.03 | easy | hard | hard |
| SF-10 | 1.97±0.03 | 1.11±0.03 | 1.15±0.07 | 19±0.4 | 127±1.0 | 108±1.3 | 53.4±0.6 | 73±1.1 | large-4.56±0.02 | easy | hard | easy |
| SF-13 | 1.93±0.02 | 1.14±0.02 | 1.16±0.06 | 11±0.8 | 136±1.2 | 116±1.5 | 57.5±0.4 | 83±1.5 | middle-3.85±0.05 | easy | hard | easy |
| SF-14 | 1.96±0.06 | 1.75±0.05 | 1.15±0.02 | 10±0.7 | 132±1.6 | 109±1.2 | 54.2±0.8 | 75±1.2 | middle-3.36±0.03 | middle | hard | easy |
| SF-15 | 2.01±0.07 | 1.16±0.04 | 1.16±0.02 | 15±0.5 | 136±1.2 | 118±1.6 | 57.7±0.9 | 75±1.2 | large-4.39±0.04 | easy | hard | middle |
| SF-18 | 1.98±0.03 | 1.22±0.05 | 1.13±0.05 | 12±0.7 | 138±1.4 | 118±1.2 | 58.8±0.8 | 80±1.7 | large-5.26±0.03 | middle | hard | easy |
| SF-19 | 1.91±0.03 | 1.18±0.02 | 1.14±0.03 | 18±0.8 | 135±1.6 | 112±1.5 | 55.1±0.6 | 79±1.9 | large-4.76±0.06 | easy | hard | easy |
| SF-21 | 1.97±0.05 | 1.15±0.06 | 1.17±0.04 | 14±0.6 | 140±1.8 | 115±1.1 | 58.6±0.8 | 82±1.3 | middle-3.19±0.02 | easy | hard | easy |
| SF-22 | 1.96±0.04 | 1.13±0.02 | 1.12±0.06 | 14±0.7 | 138±1.2 | 114±1.3 | 56.8±0.7 | 89±1.1 | middle-2.96±0.06 | middle | hard | easy |
| SF-23 | 1.98±0.02 | 1.15±0.03 | 1.11±0.04 | 17±0.8 | 139±1.4 | 111±1.0 | 56.2±0.5 | 70±1.6 | large-4.30±0.04 | easy | hard | easy |
| SF-25 | 1.98±0.04 | 1.17±0.03 | 1.11±0.03 | 15±0.4 | 136±1.7 | 114±1.7 | 57.1±0.8 | 72±1.5 | middle-3.05±0.02 | middle | hard | easy |
| SF-27 | 1.91±0.06 | 1.10±0.05 | 1.10±0.07 | 14±0.6 | 145±1.3 | 116±1.3 | 59.4±0.5 | 83±1.2 | large-4.12±0.03 | easy | hard | middle |
| SF-28 | 1.90±0.03 | 1.13±0.04 | 1.13±0.05 | 15±0.3 | 136±1.3 | 110±1.2 | 55.6±0.7 | 84±1.6 | middle-3.33±0.03 | middle | hard | easy |
| SF-29 | 1.96±0.05 | 1.06±0.05 | 1.10±0.02 | 10±0.7 | 136±1.6 | 113±1.0 | 57.3±0.9 | 66±1.0 | middle-2.84±0.06 | easy | hard | easy |
| SF-30 | 2.03±0.06 | 1.15±0.03 | 1.21±0.03 | 12±0.5 | 134±1.3 | 109±1.2 | 53.6±0.7 | 84±1.2 | middle-2.46±0.04 | middle | hard | easy |

[x]The weight of 100 nuts.

determined 44.2cm trunk circumference, 2.91 m tree height, 2.10kg yield per tree, 105.3g dehulled weight, 53.1g kernel weight and 63% splitting percentage for 'Siirt'. Ak et all. (6) stated that 'Kırmızı', 'Siirt' and 'Ohadi' cultivars have given good results at the Ceyıanpınar State Farm and 'Siirt' cultivar will be expanded to growing areas under irrigated conditions. In addition, many researchers expressed an increase in demand for this cultivar in recent years due to its better characteristics compared to other Turkish cultivars (3, 5, 6, 7, 11, 12).

The yield, alternate bearing and splitting percentage are important characteristics for pistachios. Ak et al. (6) who studied Turkish pistachio cultivars, recorded that 'Siirt' resulted in the best yield, lowest amount of alternate bearing and best splitting percentage. Kasla (3) stated the mean yield per tree as approximately 10.6kg for the "on year" and 4kg "off year" in pistachios which are grown in

**Table 4. Data connected with hull, inshell and kernel properties of selections of 'Siirt' pistachio grafted onto *P. terebinthus* seedling rootstocks (1999-2000)**

| 'Siirt' Selections | Nut Length (cm) | Nut Width (cm) | Nut Thickness (cm) | Nut Numbers iin Cluster | Weight of Dry Hulled Nuts[x](g) | Weight of Dehulled Nuts[x] (g) | Kernel Weight[x] (g) | Percentage of Split Nuts (%) | Split Opening (mm) | Hull Separation | Shell Separation In Dehisced Nuts | Separation from Cluster of Nuts |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SF-2 | 1.95±0.02 | 1.15±0.02 | 1.11±0.03 | 14±0.6 | 125±1.3 | 105±1.6 | 53.6±0.8 | 91±1.6 | large-5.12±0.05 | easy | hard | easy |
| SF-3 | 1.94±0.05 | 1.15±0.04 | 1.13±0.02 | 16±0.4 | 129±1.7 | 104±1.2 | 53.4±0.5 | 86±1.3 | large-4.83±0.03 | easy | hard | easy |
| SF-6 | 1.95±0.02 | 1.17±0.02 | 1.12±0.02 | 14±0.8 | 130±1.0 | 108±1.0 | 54.8±0.5 | 86±1.5 | large-4.12±0.07 | easy | hard | easy |
| SF-9 | 1.95±0.03 | 1.90±0.02 | 1.12±0.06 | 13±0.7 | 132±1.2 | 109±1.5 | 54.4±0.7 | 80±1.9 | large-4.45±0.05 | easy | middle | middle |
| SF-11 | 1.85±0.03 | 1.12±0.04 | 1.10±0.03 | 13±0.2 | 122±1.1 | 98±0.9 | 49.6±0.9 | 75±1.4 | middle-3.80±0.02 | easy | hard | middle |
| SF-12 | 1.93±0.05 | 1.14±0.02 | 1.13±0.02 | 10±0.6 | 131±1.0 | 110±1.6 | 55.1±0.6 | 84±1.3 | large-4.15±0.05 | easy | hard | easy |
| SF-16 | 1.90±0.02 | 1.15±0.06 | 1.15±0.04 | 16±0.4 | 130±1.6 | 109±1.2 | 54.0±0.5 | 86±1.7 | large-4.87±0.03 | easy | hard | easy |
| SF-17 | 2.01±0.03 | 1.20±0.02 | 1.12±0.05 | 11±0.5 | 150±1.2 | 123±1.4 | 62.3±0.8 | 80±1.6 | large-4.65±0.07 | easy | hard | easy |
| SF-20 | 1.93±0.06 | 1.22±0.03 | 1.13±0.03 | 15±0.3 | 142±1.7 | 115±1.6 | 58.6±0.6 | 85±1.1 | large-4.34±0.05 | middle | hard | middle |
| SF-24 | 1.94±0.04 | 1.12±0.03 | 1.13±0.04 | 14±0.6 | 136±1.3 | 114±1.1 | 56.5±0.6 | 88±1.3 | large-4.04±0.03 | easy | hard | easy |
| SF.26 | 2.03±0.02 | 1.13±0.05 | 1.16±0.03 | 17±0.7 | 147±1.5 | 120±1.4 | 60.6±0.8 | 71±1.0 | narrow-2.25±0.02 | easy | hard | middle |

[x]The weight of 100 nuts.

California. Ferguson et al (8) recorded nut yield per tree from 1985 to 1991 to assess the effect of pruning in 14-year-old 'Kerman' pistachios, and determined a range of 0.1-22.1kg for nut yield per tree in hand-pruned control trees between 1985 and 1991. In this study, yield of selections not grown using optimum cultural practices had a range of 0.52-6.80kg on *P. khinjuk*, and 0.70-2.84kg on *P. terebinthus*. These yields should increase using better cultural practices. Turkish cultivars are reported to have a very low yield per tree, because of traditional growing techniques under unirrigated conditions (3, 5, 6, 12).

On the other hand, shape and size of nuts and kernels, kernel color and splitting percentage in pistachios are considerable traits for market. Californian and Iranian cultivars like 'Kerman' and 'Ohadi' have yellow kernels, large and attractive nuts with high splitting percentage. Turkish and Italian cultivars produce long small nuts with low splitting percentage and a green kernel with excellent taste and aroma. Due to excellent taste and uniform green kernels, Turkish cultivars are desired by the USA and several European markets. (3, 5).

According to results of this study, there appears to be obvious differences in nut characteristics and significant differences in yield characteristics of 'Siirt' selections although these characteristics may be considerably affected by different locations, gardens, tree sites and technical and cultural practices. Selections that have higher values in yield per tree, yield efficiency, kernel weight and split opening had the greatest promise, but their true values must be confirmed with replicated trials.

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