

## Şanlıurfa'da Tescilli Bazı Nohut (*Cicer arietinum* L.) Çeşitlerinin Verim, Morfolojik ve Kalite Özelliklerinin Değerlendirilmesi

Dürdane MART<sup>1</sup>, Gülgün ÖKTEM<sup>2</sup>, Ramazan AKIN<sup>3</sup>, Meltem TÜRKERİ<sup>1</sup>, Evren ATMACA<sup>3</sup>, Sezgin MART<sup>4</sup>, Nejda ÇANKAYA<sup>5</sup>, Süreyya Emre DUMRUL<sup>6</sup>, Derya YÜCEL<sup>7</sup>, Tolga KARAKÖY<sup>8</sup>

<sup>1</sup>Eastern Mediterranean Agricultural Research Institute-ADANA,

<sup>2</sup>Harran University Faculty of Agriculture -URFA

<sup>3</sup>Passage Zone Agricultural Research Institute-ESKİŞEHİR,

<sup>4</sup>Hohenheim University Faculty of Crop Sciences -STUTTGART

<sup>5</sup>Black Sea Agricultural Research Institute-SAMSUN,

<sup>6</sup>Eastern Anatolia Agricultural Research Institute-ERZURUM,

<sup>7</sup>Şırnak University Faculty of Agriculture-ŞIRNAK

<sup>8</sup>Cumhuriyet University, Faculty of Science Technology –SIVAS

Sorumlu yazar: [durdanemart@yahoo.com](mailto:durdanemart@yahoo.com)

**Geliş Tarihi: 21.11.2022 Düzeltme Geliş Tarihi: 07.12.2022 Kabul Tarihi: 07.12.2022**

### ÖZ

Şanlıurfa ekolojik koşullarında bazı nohut çeşitlerinin tarımsal özelliklerinin belirlenmesi amacıyla 2014-2015 yıllarında yürütülen bu çalışma GAP Tarımsal Araştırma Enstitüsüne ait deneme arazilerinde yürütülmüştür. 3'ü kontrol çeşidi olmak üzere toplam 20 tescilli nohut çeşidi ile yürütülen çalışma tesadüf blokları deneme desenine göre üç tekrarlamalı olarak kurulmuştur. Araştırmada nohut bitkisinde %50 çıkış sağlandıktan sonra çiçeklenmeye kadar geçen gün sayısı, bakla bağlama, çıkış sağlandıktan sonra kadar geçen gün sayısı ve vejetasyon süresi gibi fenolojik özellikler ile bitki boyu, ilk bakla yüksekliği, hasat olgunluğu, yüz tane ağırlığı, dekara verim gibi agronomik özellikler incelenmiştir. Çalışma süresince nohut çeşitlerinin iklim koşullarına bağlı olarak Ascochyta solgunluk hastalığı kontrolleri de yapılmıştır. Araştırmada Şanlıurfa ekolojik koşullarında tane verimi bakımından en yüksek değeri 202.32 kg/da ile Sezenbey çeşidinden, en düşük tane verimini ise 117.58 kg/da ile Seçkin çeşidinden elde edilmiştir. Her iki yetiştirme sezonunda ortalama ham protein oranı ise en yüksek Seçkin çeşidinden (%26.45), en düşük oran ise İnci-K çeşidinden (%21.66) elde edilmiştir.

**Anahtar kelimeler:** Şanlıurfa, Tescilli Nohut Çeşitleri, Verim, Kalite

## Evaluation of Yield, Morphological and Quality Characteristics of Some Registered Chickpea (*Cicer arietinum* L.) Varieties in Şanlıurfa

### ABSTRACT

This study, which was carried out in 2014-2015 to determine the agronomic characteristics of some chickpea varieties under Şanlıurfa ecological conditions, was conducted in the experimental plots of GAP Agricultural Research Institute. 20 registered chickpea genotypes and 3 control varieties were used in the study,

which was established according to the randomized block design with three replications. In the study, phenological traits such as the number of days until flowering after 50% emergence, the number of days until pod tying, the number of days after emergence and vegetation duration and agronomic traits such as plant height, first pod height, harvest maturity, hundred grain weight and yield per decare were examined in chickpea plants. Ascochyta blight disease controls of chickpea varieties were also carried out during the study depending on climatic conditions. In the study, the highest value in terms of grain yield was obtained from Sezenbey variety with 202.32 kg/da and the lowest grain yield was obtained from Seçkin variety with 117.58 kg/da at Şanlıurfa location. In both growing seasons, the highest crude protein rate was obtained from Seçkin variety with 26.45% and the lowest rate was obtained from İnci-K variety with 21.66%.

**Key words:** Şanlıurfa, Registered Chickpea Varieties, Yield, Quality

---

## INTRODUCTION

Legumes have an important place in human nutrition because they are rich in protein. Our main sources of protein are animal and plant products. In terms of human nutrition in the world and in our country, edible grain legume plants are rich in protein (22-28%). It constitutes 22% of vegetable proteins and 7% of carbohydrates in human nutrition. It is also very important in terms of animal nutrition and 38% of proteins and 5% of carbohydrates are provided from edible grain legumes. With the inclusion of edible grain legumes in the crop rotation, it increases the deep aeration of the soil and soil fertility thanks to the taproots of legumes. In addition, legume roots have the ability to improve soil layers. Because they enrich the soil in terms of nitrogen by fixing the nitrogen of the air into the soil with the nodosities in their roots. They are also grown in saline soils and provide versatile use in agriculture by improving these soils. Legumes are planted in the fallow areas and these areas are brought to the economy. The expected benefits (water accumulation, enrichment of the soil in terms of nutrients, etc.) in fallow lands can also be achieved by planting edible legumes in these areas. Even soil erosion is prevented in this way. The edible legumes produced commercially in our country are lentils, chickpeas, beans, broad beans and peas. The importance of edible legumes in human nutrition is an indisputable fact. In addition, the ability of these plants to fix the free nitrogen of the air increases their importance in these days of increasing popularity of environmentalism and sustainable agriculture. Chickpea, one of the edible grain legumes, has a cultivation area of 511.493 ha, a production of 630.000 tons and a grain yield of 12.317 kg/ha (Anonymous, 2022). It was aimed to determine the genotypes suitable for the ecological conditions of the region by revealing the yield performance of registered chickpea varieties within the scope of dry grain production in Şanlıurfa ecological conditions, to contribute to the expansion of chickpea cultivation in the region more than the current situation and thus to increase the amount of production.

The aim of this study was to determine the performance of some registered chickpea varieties in terms of yield and yield components under Şanlıurfa ecological conditions for two years and to determine the suitable chickpea genotypes that can be adapted to the region.

## MATERIAL AND METHOD

Field trials were conducted in 2014-2015 growing seasons in the research trial plots of GAP Agricultural Research Institute of Şanlıurfa. A total of 20 chickpea genotypes including 17 registered varieties (İnci, Seçkin, Hasanbey, Damla, Gülümser, Çağatay, Sezenbey, Zuhul, İzmir-92, Menemen, Aydın, Sarı-98, Cevdetbey, Aziziye, TAEK-Sağel, Aksu, Eser ) and 3 control varieties (Hasanbey, Seçkin, İnci) were used in the experiment. In this study, sowing was done in 4 rows of 5 m length (9 m<sup>2</sup> plots) with 45 cm between rows and 8 cm above rows. Before sowing, fertilization was applied at the rate of 2-3 kg N and 5-6 kg P<sub>2</sub>O<sub>5</sub> per decare. In terms of the climatic characteristics of the research site, the meteorological values of the growing season in which the experiment was conducted are given in Table 1 for Şanlıurfa location. In the first year for the Şanlıurfa region, the total precipitation during the growing season was below the long-term average. Temperature data, on the other hand, were close to the long-term average. Precipitation was below the long-term average especially in May. According to the observations, chickpea plants showed normal development during the growing season and no pests and diseases that would significantly affect yield were observed. In the second year, although rainfall was higher than the long-

term average, it was below the long-term average in April and May. Low precipitation, especially in April and May, was not very effective on *Ascochyta* blight disease due to the flowering period (Table 1).

Table 1. Climatic data of Şanlıurfa province for the 2014-2015 growing season

| Months   | Temperature (°C) |           |           |           | Precipitation (mm) |            |           | Relative humidity (%) |            |           |           |
|----------|------------------|-----------|-----------|-----------|--------------------|------------|-----------|-----------------------|------------|-----------|-----------|
|          | Long Years       | 2013-2014 | 2013-2014 | 2014-2015 | 2014-2015          | Long Years | 2013-2014 | 2014-2015             | Long Years | 2013-2014 | 2014-2015 |
|          | Average          | Min.      | Max.      | Min.      | Max.               |            |           |                       |            |           |           |
| November | 13.1             |           |           | -3.1      | 17.2               | 24.4       |           |                       | 60.8       |           |           |
| December | 7.8              | 2.5       | 9.5       | -0.6      | 18.2               | 49.9       | 55.4      |                       | 68.3       |           |           |
| January  | 6.3              | 2.4       | 18.0      | 2.5       | 24.8               | 83.9       | 44.3      | 82.5                  | 70.6       | 65.6      | 68.8      |
| February | 7.5              | -1.1      | 22.1      | 4.7       | 29.9               | 68.4       | 20.8      | 100.8                 | 67.0       | 44.0      | 74.3      |
| March    | 11.6             | 2.2       | 24.7      | 11.8      | 36.9               | 52.5       | 91.6      | 79.0                  | 60.8       |           | 58.9      |
| April    | 16.4             | 3.6       | 30.8      | 16.7      | 38.4               | 45.5       | 33.3      | 24.3                  | 57.2       | 47.5      | 49.7      |
| May      | 23.1             | 12.4      | 38.7      | 21.4      | 42.8               | 21.6       | 6.0       | 10.3                  | 45.4       |           | 38.0      |
| June     | 29.0             | 15.3      | 40.1      |           |                    | 4.0        | 20.6      | 0.7                   | 34.8       |           | 35.3      |

Disease readings for tolerance to anthracnose blight disease were taken on a scale of 1-9 (1=resistant, 9=very susceptible) (Reddy and Singh, 1985; Chen et al., 2004). The sowing of the trials was done in December in both years (2014 and 2015) and the harvest of the trials was done in June. After harvesting, necessary observations, measurements and analyzes were made and the materials were evaluated.

## RESULTS AND DISCUSSION

In the yield trials of varieties conducted at GAP Agricultural Research Institute-Şanlıurfa in the 2014-2015 growing season, as can be seen in Table 2, the highest grain yield was 202.4 kg/da from Sezenbey chickpea variety and the lowest grain yield was 98.3 kg/da from Seçkin-K variety in the first year growing season, although the statistical difference between the varieties was significant. Number of days to flowering varied between 93-83.3 days, plant height 53.3-48.1 cm, first pod height 43-35.4 cm, hundred grain weight 49.9-27.8 g. In Şanlıurfa location, the intensity of *Ascochyta* blight disease in the varieties under natural conditions was evaluated according to the 1-9 scale and given in Table 2. Mart et al. (2015), in the evaluation carried out for chickpea (*Cicer aritinum* L.) variety breeding under Çukurova climate conditions as winter sowing, determined the hundred grain weights between 42.87-31.77 g. Şanlı and Kaya (2008), in his study conducted in Kahramanmaraş, determined that there was 25-30% yield loss in summer sowing compared to winter sowing and recommended winter sowing.

Table 2. Results of Some Registered Varieties Trial Conducted at Şanlıurfa (2014-2015)

| NO           | Varieties  | Number of Flowering Days (day) |         |          | Ascochyta Blight (1-9) |      | Number of Days for Pods (day) | First Pod Height (cm) |        |               | Plant Height (cm) |         |          | 100 Grain Weight (gr) |         |          | Grain Yield (kg/da) |               |           |
|--------------|------------|--------------------------------|---------|----------|------------------------|------|-------------------------------|-----------------------|--------|---------------|-------------------|---------|----------|-----------------------|---------|----------|---------------------|---------------|-----------|
|              |            | 2014                           | 2015    | Average  | 2014                   | 2015 |                               | 2014                  | 2015   | Average       | 2014              | 2015    | Average  | 2014                  | 2015    | Average  | 2014                | 2015          | Average   |
| 1            | İnci       | 92.6 A                         | 83.3A   | 88AB     | 1                      | 1    | 92.0                          | 40.9 AB               | 19.7AB | 30.32         | 50.2              | 44.9B-D | 47.58BC  | 30.6 HJ               | 32.0GH  | 31.33IJ  | 107.11              | 200.2         | 153.64A-C |
| 2            | Seçkin     | 83.3 B                         | 82.7AB  | 83D-G    | 1                      | 1    | 92.0                          | 37.7 AB               | 24.6AB | 31.17         | 49.5              | 45.2A-D | 47.33BC  | 37.2 DF               | 37.7C-G | 37.48EF  | 124.81              | 189.1         | 156.94A-C |
| 3            | Hasanbey   | 84.0 B                         | 78.3EF  | 81.17FG  | 1                      | 1    | 90.3                          | 41.5 AB               | 24.9AB | 33.22         | 51.4              | 49.5AB  | 50.45AB  | 36.9 EF               | 40.0B-E | 38.47D-F | 152.26              | 205.2         | 178.73A-C |
| 4            | Damla      | 83.3 B                         | 80.3B-E | 81.83FG  | 1                      | 3    | 92.0                          | 35.8 AB               | 26.7A  | 31.23         | 49.2              | 51.1AB  | 50.15A-C | 31.4 HJ               | 31.0H   | 31.23IJ  | 165.52              | 208.5         | 187.03AB  |
| 5            | Gülümser   | 89 AB                          | 79.0D-F | 84C-G    | 1                      | 1    | 91.0                          | 40 AB                 | 22.4AB | 31.22         | 53.1              | 51.6A   | 52.35A   | 32.6 GI               | 35.2E-H | 33.92G-I | 171.63              | 187.6         | 179.61A-C |
| 6            | Çağatay    | 86.0 AB                        | 80.3B-E | 83.17D-G | 1                      | 4    | 92.0                          | 38.7 AB               | 25.1A  | 31.93         | 49.6              | 48.4A-D | 49.02A-C | 40.6 CE               | 42.2B-D | 41.43B-D | 154.19              | 189.2         | 171.71A-C |
| 7            | Sezenbey   | 84.0 B                         | 80.0B-E | 82E-G    | 1                      | 3-4  | 92.3                          | 35.4 B                | 26.0A  | 30.72         | 48.1              | 48.3A-D | 48.23A-C | 41.4 BD               | 43.2BC  | 42.34BC  | 202.41              | 202.2         | 202.32A   |
| 8            | Zuhal      | 88.6 AB                        | 80.0B-E | 84.33B-F | 1                      | 3    | 92.0                          | 38.2 AB               | 26.0A  | 32.15         | 50.2              | 50.6AB  | 50.4A-C  | 41.7 BC               | 37.8C-G | 39.78C-E | 188.26              | 183.9         | 186.08AB  |
| 9            | İzmir-92   | 92.3 A                         | 80.7A-E | 86.5A-D  | 1                      | 3    | 92.0                          | 38.2 AB               | 25.5A  | 31.9          | 52.1              | 50.0AB  | 51.07AB  | 37.3 DF               | 37.1D-G | 37.2E-G  | 132.78              | 184.8         | 158.79A-C |
| 10           | Menemen    | 92.0 A                         | 81.0A-E | 86.5A-D  | 1                      | 4    | 91.7                          | 43 A                  | 22.3AB | 32.65         | 53.3              | 50.0AB  | 51.67AB  | 37.2 DF               | 37.5C-G | 37.36E-G | 168.70              | 182.7         | 175.74A-C |
| 11           | Aydın      | 93.0 A                         | 81.0A-E | 87A-C    | 1                      | 4    | 91.7                          | 40.7 AB               | 21.1AB | 30.92         | 50.2              | 48.9A-C | 49.57A-C | 31.5 HJ               | 33.0F-H | 32.28H-J | 147.19              | 212.0         | 179.61A-C |
| 12           | Sarı       | 93.0 A                         | 83.3A   | 88.17A   | 1                      | 1    | 92.0                          | 41 AB                 | 22.1AB | 31.58         | 49.7              | 46.1A-D | 47.92A-C | 49.9 A                | 51.3A   | 50.62A   | 143.70              | 140.0         | 141.85A-C |
| 13           | Cevdetbey  | 92.0 A                         | 82.7AB  | 87.33A-C | 1                      | 1    | 91.3                          | 42.7 AB               | 22.6AB | 32.68         | 51.0              | 45.1A-D | 48.07A-C | 44.9 B                | 43.9B   | 44.46B   | 126.22              | 195.6         | 160.89A-C |
| 14           | Aziziye    | 92.6 A                         | 79.7C-E | 86.17A-D | 1                      | 1    | 91.3                          | 40.8 AB               | 23.3AB | 32.07         | 52.0              | 47.3A-D | 49.67A-C | 34.8 FH               | 38.2B-F | 36.53E-G | 189.81              | 165.2         | 177.51A-C |
| 15           | TAEK-Sağel | 89.3 AB                        | 83.3A   | 86.33A-D | 1                      | 3    | 91.3                          | 39.9 AB               | 21.5AB | 30.72         | 50.9              | 47.2A-D | 49.05A-C | 36.9 EF               | 35.4E-H | 36.18FG  | 167.56              | 170.5         | 169.04A-C |
| 16           | Aksu       | 88.3 AB                        | 79.0D-F | 83.67C-G | 1                      | 1    | 91.7                          | 39 AB                 | 20.5AB | 29.8          | 49.7              | 47.3A-D | 48.52A-C | 37.1 EF               | 40.7B-E | 38.95C-F | 120.85              | 163.3         | 142.09A-C |
| 17           | Eser       | 84.0 B                         | 76.6F   | 80.33G   | 1                      | 3    | 91.3                          | 37.3 AB               | 16.5B  | 26.9          | 48.7              | 42.7CD  | 45.72C   | 27.8 J                | 30.0H   | 28.94J   | 136.85              | 170.4         | 153.63A-C |
| 18           | Hasanbey-K | 92.6 A                         | 78.7EF  | 85.67A-E | 1                      | 3    | 91.3                          | 38.9 AB               | 21.7AB | 30.32         | 50.1              | 49.9AB  | 50A-C    | 36.3 FG               | 38.4B-F | 37.33E-G | 129.93              | 200.0         | 164.96A-C |
| 19           | Seçkin-K   | 91.6 A                         | 82.3A-C | 87A-C    | 1                      | 1    | 92.0                          | 41.6 AB               | 22.7AB | 31.83         | 52.1              | 42.2D   | 47.13BC  | 44.9 B                | 37.3D-G | 35.58F-H | 98.30               | 136.9         | 117.58 C  |
| 20           | İnci-K     | 92.3 A                         | 81.7A-D | 87A-C    | 1                      | 1    | 91.7                          | 41.6 AB               | 21.2AB | 31.4          | 48.9              | 47.1A-D | 47.97A-C | 29.2 IJ               | 33.2F-H | 31.22IJ  | 117.74              | 147.2         | 132.49BC  |
| F            |            | **                             | **      | **       |                        |      | not important                 | **                    | **     | not important | not important     | **      | **       | **                    | **      | **       | not important       | not important | *         |
| CV.(%)       |            | 2.67                           | 1.15    | 1.53     |                        |      | 1                             | 6.16                  | 12.11  | 0.84          | 3.78              | 4.50    | 1.10     | 3.77                  | 4.94    | 0.61     | 23.28               | 14.89         | 52.31     |
| Tukey (0.05) |            |                                |         |          |                        |      |                               |                       |        |               |                   |         |          |                       |         |          |                     |               |           |

As a result of the evaluations made in the trial conducted in the second year growing season, although the statistical differences between the varieties in terms of grain yield were not significant; the highest value was obtained from Aydın variety with 212.0 kg/da and the lowest value was obtained from Seçkin-K variety with 136.9 kg/da. The number of days to flowering was 83.3-76.6 days, the number of days to pod setting was 90.3-92 days, first pod height was 16.5-26.7 cm, plant height was 42.2-51.6 cm, and 100 grain weight was between 30.0-51.3 g (Table 2). Gül et al. (2006) reported that winter hardiness varied between 55.42% and in the standard variety and between 70.91% and 78.75% in other lines, and that winter sowings may be more advantageous than summer sowings in terms of many characteristics related to winter chickpea, especially grain yield, and also in terms of yield characteristics and suitability for machine harvesting.

In 2014 and 2015 growing seasons, according to the results of some registered cultivars trials conducted at Şanlıurfa location, there were statistical differences at 1% significance level among the cultivars in terms of days to flowering, first pod height, plant height, 100 grain weight, while there was a difference at 5% significance level among the cultivars in terms of grain yield. The number of days to flowering varied between 88.17-80.33 days. The variety with the longest flowering time was Sarı, while the variety with the shortest flowering time was Eser. The highest and lowest values varied between 33.22-26.9 cm for first pod height and 52.35-45.72 cm for plant height. In terms of 100 grain weight, 50.62-28.94 g were obtained from Sarı and Eser varieties. In terms of grain yield, the highest grain yield value was obtained from Sezenbey variety with 202.32 kg/da and the lowest grain yield value was obtained from Seçkin variety with 117.58 kg/da. Sezenbey, Zuhul, Damla, Gülümser, Aziziye varieties stood out in terms of grain yield (Table 2). In Şanlıurfa location, it was observed that Ascochyta blight was not very effective in registered varieties in the first year, but in the second year, there was an increase in the disease values in the varieties. In Şanlıurfa location, the intensity of Ascochyta blight disease in varieties under natural conditions was evaluated according to the 1-9 scale and given in Table 2. Anlarsal et al. (1999); in a chickpea population consisting of 23 lines grown as winter crops for two years under Çukurova conditions, plant height was 67.9-84.2 cm, number of pods per plant was 15.8-27.3, number of pods per plant 17.0-28.8, 100-grain weight 26.7-37.5 g, harvest index 28.37-34.93%, plant grain yield 5.3-8.6 g and grain yield 178.6-271.9 kg/da. It is of great importance that varieties with short plant height may cause significant grain losses in machine harvesting and that tall varieties should be preferred (Bakoğlu, 2009). In some regions of the Mediterranean, Aegean and Southeastern Anatolia, it was found that the average grain yield of chickpea can be as high as 250-300 kg/da in winter sowing (Engin, 1989; Özdemir et al., 1996; Anlarsal et al., 1999; Mart, 2000).

#### **Quality Results of Some Chickpea Varieties in Şanlıurfa**

In 2014 and 2015 growing seasons, quality values (Tables 3 and 4) were analyzed for some varieties of yield trials conducted at Şanlıurfa GAP Agricultural Research Institute. As it can be seen from Table 3-4 in 2014 growing season; the highest and lowest dry weight values of some registered varieties carried out in Şanlıurfa location in terms of quality values were 49.09-27.82 g, wet weight values were 98.69-63.68 g, water absorption capacity 0.50-0.31 g/grain, water absorption index 1.15-0.95%, dry volume values 88-71 ml, wet volume values 188-152 ml, swelling capacity 0.50-0.31 ml/grain, swelling index 2.55-2.28%. Sieve Analysis values were found to vary between 66.71-0.47 in sieve number 9, 76.83-12.75 in sieve number 8, 75.90-4.60 in sieve number 7. The highest value of 27.92% was obtained from Seçkin variety and the lowest value of 21.83% was obtained from İnci-K variety. Among the varieties in the trial conducted at Şanlıurfa location, Sarı variety stood out by giving the highest values in sieve number 9 in dry weight, wet weight, water absorption capacity, dry volume, wet volume and sieve analysis compared to other varieties (Table 3-4). Some researchers reported that early and late sowing dates affect yield and quality in chickpea plants (Ray et al., 2017; Ali et al., 2018; Varoğlu and Abak, 2019).

Table 3. Quality results of some registered varieties in Şanlıurfa (2014-2015)

| No | Varieties  | Dry Weight (100 grain weight) (g) |       |         | Wet Weight (g) |        |         | Water Absorption Capacity (g/grain) |      |         | Water Intake Index (%) |      |         | Dry Volume (ml) |      |         | Wet Volume (ml) |      |         | Swelling Capacity (ml/grain) |      |         | Swelling Index (%) |      |         |
|----|------------|-----------------------------------|-------|---------|----------------|--------|---------|-------------------------------------|------|---------|------------------------|------|---------|-----------------|------|---------|-----------------|------|---------|------------------------------|------|---------|--------------------|------|---------|
|    |            | 2014                              | 2015  | Average | 2014           | 2015   | Average | 2014                                | 2015 | Average | 2014                   | 2015 | Average | 2014            | 2015 | Average | 2014            | 2015 | Average | 2014                         | 2015 | Average | 2014               | 2015 | Average |
| 1  | İnci       | 31.14                             | 32.47 | 31.81   | 63.68          | 67.89  | 65.79   | 0.33                                | 0.35 | 0.34    | 1.04                   | 1.09 | 1.07    | 74              | 72   | 73.00   | 156             | 158  | 157.00  | 0.32                         | 0.36 | 0.34    | 2.33               | 2.64 | 2.49    |
| 2  | Seçkin     | 38.19                             | 34.92 | 36.56   | 80.49          | 74.19  | 77.34   | 0.42                                | 0.39 | 0.41    | 1.11                   | 1.12 | 1.12    | 80              | 75   | 77.50   | 172             | 164  | 168.00  | 0.42                         | 0.39 | 0.41    | 2.40               | 2.56 | 2.48    |
| 3  | Hasanbey   | 35.28                             | 39.57 | 37.43   | 72.93          | 82.45  | 77.69   | 0.38                                | 0.43 | 0.41    | 1.07                   | 1.08 | 1.08    | 77              | 80   | 78.50   | 165             | 172  | 168.50  | 0.38                         | 0.42 | 0.40    | 2.41               | 2.40 | 2.41    |
| 4  | Damla      | 31.42                             | 28.31 | 29.87   | 65.25          | 59.05  | 62.15   | 0.34                                | 0.31 | 0.33    | 1.08                   | 1.09 | 1.09    | 74              | 68   | 71.00   | 158             | 149  | 153.50  | 0.34                         | 0.31 | 0.33    | 2.42               | 2.72 | 2.57    |
| 5  | Gülümser   | 33.96                             | 34.54 | 34.25   | 70.95          | 70.34  | 70.65   | 0.37                                | 0.36 | 0.37    | 1.09                   | 1.04 | 1.07    | 76              | 74   | 75.00   | 163             | 160  | 161.50  | 0.37                         | 0.36 | 0.37    | 2.42               | 2.50 | 2.46    |
| 6  | Çağatay    | 41.02                             | 41.63 | 41.33   | 86.26          | 89.04  | 87.65   | 0.45                                | 0.47 | 0.46    | 1.10                   | 1.14 | 1.12    | 82              | 82   | 82.00   | 178             | 179  | 178.50  | 0.46                         | 0.47 | 0.47    | 2.44               | 2.47 | 2.46    |
| 7  | Sezenbey   | 43.15                             | 43.09 | 43.12   | 92.28          | 90.81  | 91.55   | 0.49                                | 0.48 | 0.49    | 1.14                   | 1.11 | 1.13    | 83              | 84   | 83.50   | 183             | 181  | 182.00  | 0.5                          | 0.47 | 0.49    | 2.52               | 2.38 | 2.45    |
| 8  | Zuhal      | 41.78                             | 43.13 | 42.46   | 89.72          | 92.12  | 90.92   | 0.48                                | 0.49 | 0.49    | 1.15                   | 1.14 | 1.15    | 82              | 83   | 82.50   | 180             | 182  | 181.00  | 0.48                         | 0.49 | 0.49    | 2.50               | 2.48 | 2.49    |
| 9  | İzmir-92   | 36.43                             | 37.49 | 36.96   | 74.51          | 76.89  | 75.70   | 0.38                                | 0.39 | 0.39    | 1.05                   | 1.05 | 1.05    | 78              | 78   | 78.00   | 166             | 167  | 166.50  | 0.38                         | 0.39 | 0.39    | 2.36               | 2.39 | 2.38    |
| 10 | Menemen    | 39.19                             | 36.12 | 37.66   | 79.91          | 74.89  | 77.40   | 0.41                                | 0.39 | 0.40    | 1.04                   | 1.07 | 1.06    | 80              | 76   | 78.00   | 170             | 165  | 167.50  | 0.4                          | 0.39 | 0.40    | 2.33               | 2.50 | 2.42    |
| 11 | Aydın      | 32.78                             | 32.03 | 32.41   | 66.52          | 67.21  | 66.87   | 0.34                                | 0.35 | 0.35    | 1.03                   | 1.10 | 1.07    | 75              | 72   | 73.50   | 160             | 158  | 159.00  | 0.35                         | 0.36 | 0.36    | 2.40               | 2.64 | 2.52    |
| 12 | Sarı       | 49.09                             | 44    | 46.55   | 98.69          | 89.07  | 93.88   | 0.50                                | 0.45 | 0.48    | 1.01                   | 1.02 | 1.02    | 88              | 84   | 86.00   | 188             | 179  | 183.50  | 0.5                          | 0.45 | 0.48    | 2.32               | 2.32 | 2.32    |
| 13 | Cevdetbey  | 47.52                             | 50.43 | 48.98   | 92.54          | 102.44 | 97.49   | 0.45                                | 0.52 | 0.49    | 0.95                   | 1.03 | 0.99    | 86              | 89   | 87.50   | 182             | 192  | 187.00  | 0.46                         | 0.53 | 0.50    | 2.28               | 2.36 | 2.32    |
| 14 | Aziye      | 37.16                             | 33.9  | 35.53   | 77.04          | 69.83  | 73.44   | 0.40                                | 0.36 | 0.38    | 1.07                   | 1.06 | 1.07    | 78              | 74   | 76.00   | 170             | 160  | 165.00  | 0.42                         | 0.36 | 0.39    | 2.50               | 2.50 | 2.50    |
| 15 | TAEK-sağel | 37.65                             | 33.94 | 35.80   | 78.73          | 70.44  | 74.59   | 0.41                                | 0.37 | 0.39    | 1.09                   | 1.08 | 1.09    | 79              | 74   | 76.50   | 170             | 160  | 165.00  | 0.41                         | 0.36 | 0.39    | 2.41               | 2.50 | 2.46    |
| 16 | Aksu       | 38.55                             | 39.87 | 39.21   | 81.54          | 84.29  | 82.92   | 0.43                                | 0.44 | 0.44    | 1.12                   | 1.11 | 1.12    | 79              | 80   | 79.50   | 174             | 174  | 174.00  | 0.45                         | 0.44 | 0.45    | 2.55               | 2.47 | 2.51    |
| 17 | Eser       | 27.82                             | 28.67 | 28.25   | 58.40          | 59.4   | 58.90   | 0.31                                | 0.31 | 0.31    | 1.10                   | 1.07 | 1.09    | 71              | 69   | 70.00   | 152             | 149  | 150.50  | 0.31                         | 0.30 | 0.31    | 2.48               | 2.58 | 2.53    |
| 18 | Hasanbey-K | 38.57                             | 38.41 | 38.49   | 79.77          | 80.58  | 80.18   | 0.41                                | 0.42 | 0.42    | 1.07                   | 1.10 | 1.09    | 79              | 78   | 78.50   | 170             | 171  | 170.50  | 0.41                         | 0.43 | 0.42    | 2.41               | 2.54 | 2.48    |
| 19 | Seçkin-K   | 34.76                             | 35.05 | 34.91   | 73.45          | 74.46  | 73.96   | 0.39                                | 0.39 | 0.39    | 1.11                   | 1.12 | 1.12    | 77              | 75   | 76.00   | 168             | 164  | 166.00  | 0.41                         | 0.39 | 0.40    | 2.52               | 2.56 | 2.54    |
| 20 | İnci-K     | 31.28                             | 33.27 | 32.28   | 63.70          | 67.89  | 65.80   | 0.32                                | 0.35 | 0.34    | 1.04                   | 1.04 | 1.04    | 73              | 73   | 73.00   | 158             | 159  | 158.50  | 0.35                         | 0.36 | 0.36    | 2.52               | 2.57 | 2.55    |

Tablo 4. Sieve values of some registered varieties grown in Şanlıurfa (2014-2015)

| No | Varieties  | 2014 Sieve Values (%) |       |       |       | 2015 Sieve Values (%) |       |       |      | 2014-2015 Average Sieve Values (%) |       |       | Nitrogen (%) |      |         | Protein (%) |       |         |
|----|------------|-----------------------|-------|-------|-------|-----------------------|-------|-------|------|------------------------------------|-------|-------|--------------|------|---------|-------------|-------|---------|
|    |            | 9 mm                  | 8 mm  | 7 mm  | 6 mm  | 9 mm                  | 8 mm  | 7 mm  | 6 mm | 9 mm                               | 8 mm  | 7 mm  | 2014         | 2015 | Average | 2014        | 2015  | Average |
| 1  | İnci       |                       | 56.50 | 40.76 | 3.61  | 3.63                  | 54.9  | 40.1  | 1.37 |                                    | 55.70 | 40.43 | 3.68         | 3.47 | 3.58    | 23.04       | 21.71 | 22.38   |
| 2  | Seçkin     | 5.02                  | 72.73 | 21.94 | 0.59  | 10.39                 | 66.88 | 20.94 | 1.79 | 7.71                               | 69.81 | 21.44 | 4.46         | 4.00 | 4.23    | 27.92       | 24.97 | 26.45   |
| 3  | Hasanbey   | 2.50                  | 61.96 | 32.55 | 3.43  | 22.15                 | 66.29 | 11.66 |      | 12.33                              | 64.13 | 22.11 | 4.23         | 3.99 | 4.11    | 26.47       | 24.94 | 25.71   |
| 4  | Damla      | 1.01                  | 26.55 | 64.64 | 8.55  | 12.73                 | 31.34 | 55.94 |      | 6.87                               | 28.95 | 60.29 | 4.06         | 3.89 | 3.98    | 25.41       | 24.33 | 24.87   |
| 5  | Gülümser   |                       | 37.98 | 54.73 | 7.25  | 18.38                 | 49.15 | 32.6  |      |                                    | 43.57 | 43.67 | 4.21         | 3.50 | 3.86    | 26.32       | 21.85 | 24.09   |
| 6  | Çağatay    | 12.13                 | 76.83 | 10.97 | 1.03  | 20.39                 | 73.88 | 6.25  |      | 16.26                              | 75.36 | 8.61  | 4.39         | 3.17 | 3.78    | 27.44       | 19.84 | 23.64   |
| 7  | Sezenbey   | 20.27                 | 71.74 | 8.19  | 0.7   | 28.03                 | 64.89 | 7.2   |      | 24.15                              | 68.32 | 7.70  | 3.61         | 3.68 | 3.65    | 22.56       | 22.98 | 22.77   |
| 8  | Zuhal      | 12.18                 | 76.37 | 12.23 | 0     | 27.19                 | 64.28 | 8.66  |      | 19.69                              | 70.33 | 10.45 | 3.71         | 3.45 | 3.58    | 23.20       | 21.56 | 22.38   |
| 9  | İzmir-92   | 8.73                  | 62.70 | 25.42 | 3.71  | 32.24                 | 57.69 | 10.1  |      | 20.49                              | 60.20 | 17.76 | 3.89         | 3.49 | 3.69    | 24.34       | 21.79 | 23.07   |
| 10 | Menemen    | 8.64                  | 73.97 | 17.46 |       | 15.95                 | 59.29 | 23.35 | 2.28 | 12.30                              | 66.63 | 20.41 | 3.63         | 3.57 | 3.60    | 22.72       | 22.29 | 22.51   |
| 11 | Aydın      | 0.50                  | 49.86 | 45.26 | 5.29  | 20.97                 | 57    | 22.1  |      | 10.74                              | 53.43 | 33.68 | 4.07         | 2.99 | 3.53    | 25.47       | 18.67 | 22.07   |
| 12 | Sarı       | 66.71                 | 28.96 | 4.60  | 0.39  | 78.16                 | 20.02 | 1.41  | 0.41 | 72.44                              | 24.49 | 3.01  | 3.98         | 3.38 | 3.68    | 24.90       | 21.13 | 23.02   |
| 13 | Cevdetbey  | 35.00                 | 57.32 | 8.36  | 0     | 44.19                 | 49.32 | 6.55  |      | 39.60                              | 53.32 | 7.46  | 3.78         | 3.77 | 3.78    | 23.64       | 23.55 | 23.60   |
| 14 | Aziziye    | 9.29                  | 55.13 | 33.65 | 2.77  | 24.29                 | 47.75 | 27.96 |      | 16.79                              | 51.44 | 30.81 | 3.85         | 3.70 | 3.78    | 24.09       | 23.15 | 23.62   |
| 15 | TAEK-sağel | 1.86                  | 73.44 | 24.90 | 0.4   | 6.74                  | 60.56 | 30.1  | 2.74 | 4.30                               | 67.00 | 27.50 | 3.99         | 3.81 | 3.90    | 24.96       | 23.80 | 24.38   |
| 16 | Aksu       | 9.55                  | 71.46 | 18.28 | 1.47  | 21.48                 | 69.33 | 9.32  |      | 15.52                              | 70.40 | 13.80 | 3.78         | 3.64 | 3.71    | 23.63       | 22.74 | 23.19   |
| 17 | Eser       |                       | 12.75 | 75.90 | 11.53 | 36.24                 | 58.33 | 5.46  |      |                                    | 35.54 | 40.68 | 4.16         | 3.76 | 3.96    | 26.01       | 23.48 | 24.75   |
| 18 | Hasanbey-K | 8.75                  | 69.11 | 21.34 | 1.16  | 44.65                 | 44.41 | 8.57  | 2.79 | 26.70                              | 56.76 | 14.96 | 3.93         | 3.84 | 3.89    | 24.56       | 24.03 | 24.30   |
| 19 | Seçkin-K   | 0.47                  | 51.38 | 41.55 | 7.25  | 28.81                 | 52.75 | 16.87 | 1.57 | 14.64                              | 52.07 | 29.21 | 4.35         | 3.81 | 4.08    | 27.23       | 23.81 | 25.52   |
| 20 | İnci-K     |                       | 55.01 | 43.59 | 1.96  | 11.9                  | 57.55 | 30.68 |      |                                    | 56.28 | 37.14 | 3.49         | 3.44 | 3.47    | 21.83       | 21.49 | 21.66   |

In 2015 growing season, as can be seen in Table 3-4, the highest and lowest dry weight values 50.43-28.31 g, wet weight values 102.44-59.05 g, water absorption capacity 0.52-0.31 g/grain, water absorption index 1.14-1.02%, dry volume values 89-68 ml, wet volume values 192-149 ml, swelling capacity 0.53-0.30 ml/grain, swelling index 2.72-2.32%. Sieve analysis values were found to vary between 78.16-3.63 in sieve number 9, 73.88-20.02 in sieve number 8, 55.94-1.41 in sieve number 7. The highest protein analysis values were obtained from Seçkin variety with 24.97% and the lowest value was obtained from Aydın variety with 18.67%. Among the varieties in Şanlıurfa location, Cevdetbey variety stood out by giving the highest values in terms of dry weight, wet weight, water absorption capacity, dry volume, wet volume and swelling capacity. Çağatay variety came to the forefront by giving the highest values in sieve number 8 compared to other varieties (Table 3-4).

In 2014 and 2015 growing seasons, as can be seen from Table 3-4, the highest and lowest dry weight values in terms of average quality values were 48.98-28.25 g, wet weight values were 97.49-58.90 g, water absorption capacity 0.49-0.31 g/grain, water absorption index 1.15-0.99%, dry volume values 87.50-70.00 ml, wet volume values 187-150 ml, swelling capacity 0.50-0.31 ml/grain, swelling index 2.57-2.32%. When the average sieve analysis values were examined, it was determined that they varied between 72.44-4.30 in sieve number 9, 75.36-24.49 in sieve number 8 and 60.29-3.01 in sieve number 7. In both growing seasons, the highest protein analysis values were obtained from Seçkin variety with 26.45% and the lowest value was obtained from İnci-K variety with 21.66%. In this study, Cevdetbey variety stood out among the varieties by giving the highest values of dry weight, wet weight, water uptake index, dry volume, wet volume and swelling capacity in both growing seasons. In a study conducted by Atikyılmaz (1997), it was determined that the protein ratio also changed according to the climatic events occurring in the growing season. It was found that the water uptake capacity of chickpea varieties varied between 0.979-1.223 g/grain and the difference between the varieties was significant (Togay et al., 2001; Singh et al., 1995; Ağsakallı, 1995).

## CONCLUSION

In this study, some registered chickpea (*Cicer aritinum* L.) cultivars were tested under Şanlıurfa ecological conditions and their regional adaptability and tolerance/resistance to Ascochyta blight under different climatic conditions were investigated by considering important agronomic traits such as days to flowering, plant height, grain yield and hundred grain weight. Sarı (88.17 days) was late and Eser (80.33 days) was early; in terms of plant height, Gülümser variety stood out with 52.35 cm; in terms of 100 grain weight, the variety with the highest 100 grain weight was Sarı and the variety with the lowest 100 grain weight was Eser. In terms of grain yield, the variety Sezenbey (202.32 kg/da) gave the highest grain yield, while the variety Seçkin-K (117.58 kg/da) gave the lowest grain yield. Sezenbey, Zuhul, Damla, Gülümser, Aziziye varieties were the prominent varieties for cultivation in Şanlıurfa. In terms of quality values, Cevdetbey variety stood out by giving the highest values in both growing seasons with dry weight, wet weight, water uptake index, dry volume, wet volume, swelling capacity values compared to other varieties.

**Note:** This study was supported by TUBITAK 1003 Project, Project No. 113O070.

**Çıkar Çatışması Beyanı:** Makale yazarları aralarında herhangi bir çıkar çatışması olmadığını beyan ederler.

**Araştırmacıların Katkı Oranı Beyan Özeti:** Yazarlar makaleye eşit oranda katkı sağlamış olduklarını beyan ederler.

## YAZAR ORCID NUMARALARI

Dürdane MART  <https://orcid.org/0000-0002-2944-1227>

Gülgün ÖKTEM  <https://orcid.org/0000-0002-7669-5801>

Ramazan AKIN  <https://orcid.org/0000-0002-9955-9482>

Meltem TÜRKERİ  <https://orcid.org/0000-0001-5225-967X>

Evren ATMACA  <https://orcid.org/0000-0001-5072-8612>

Sezgin MART  <https://orcid.org/0000-0002-8597-6269>

Nejda ÇANKAYA  <https://orcid.org/0000-0001-5897-3583>

Süreyya Emre DUMRUL  <https://orcid.org/0000-0003-0154-8927>

Derya YÜCEL  <https://orcid.org/0000-0002-7865-9900>

Tolga KARAKÖY  <https://orcid.org/0000-0002-5428-1907>

## REFERENCES

- Ağsakallı, A. (1995). The Effects of Different Sowing Density and Fertilizer Doses on Yield, Yield Elements and Quality in Some Chickpea Genotypes. Doctoral Thesis (Unpublished). Atatürk University, 163 p., Erzurum.
- Ali, Y., Biswas, P. K., Shahriar, S. A., Nasif, S. O., Raihan, R.R. (2018). Yield and Quality Response of Chickpea at Different Sowing Dates. Asian Journal of Research in Crop Science, 1 (4), 1-8.
- Anlarsal, A.E., Yücel, C., Özveren, D. (1999). A research on determination of yield and yield related traits of some chickpea lines under Çukurova conditions. Turkey 3rd Field Crops Congress Volume III (Meadow Pasture Forage Crops and Edible Grain Legumes), pp.342- 347, November 15-18, Adana.
- Anonymous, 2022. FAO. <https://www.fao.org/faostat/>
- Atikyılmaz, N. (1997). A Research on the Relationships between Yield and Yield Components and Determination of Some Quality Characteristics in Winter and Summer Chickpea Cultivation. Master's Thesis (Unpublished). Dicle University, 53 p. Diyarbakır.
- Bakoğlu, A. (2009). A study on yield and yield components of some chickpea (*Cicer arietinum* L.) cultivars under Elazığ ecological conditions. Harran University Faculty of Agriculture Journal. 13(1): 1-6
- Chen, W., Coyne, C. J., Peever, T. L., Muehlbauer, F. J. (2004). Characterization of chickpea differentials for pathogenicity assay of *Ascochyta* blight and identification of chickpea accessions resistant to *Didymellarabiei*. Plant pathology, 53, 759-769.
- Engin, M. (1989). A Research on Determination of High Yielding Anthracnose Resistant Winter Chickpea (*Cicer arietinum* L.) Varieties Suitable for Çukurova Conditions. Ç.Ü. Zir. Fak. Journal, 4(6), 1-134.
- Gül, M. K., Egesel, C. Ö., Kahrıman, F., Tayyar, Ş., (2006). Possibilities of Winter Cultivation of Chickpea Crops in Çanakkale Region. Uludag. Univ. Zir. Fak. Derg., 20(1): 57-66
- Mart, D., Yücel, D., Türkeri, M. (2015). Evaluation of Yield and Morphological Characteristics of Chickpea (*Cicer arietinum* L.) Genotypes at Winter Sowing Time in Çukurova Region. 11th Field Crops Congress, 19-23 September 2015, Çanakkale.
- Mart, D. (2000). A Research on Determination of Genotype x Environment Interactions and Adaptability of Chickpea (*Cicer arietinum* L.) for Some Important Traits in Cukurova Conditions. Ç.Ü. Institute of Science and Technology, Doctoral Thesis, 220s.
- Özdemir, S., Mart, D., Anlarsal, A.E. (1996). Effects of Different Sowing Density on Yield and Yield Components of Three Chickpea Varieties. Ç.Ü. Zir. Fak. Journal, 11(1), 175-184.
- Ray, K., Singh, D., Laljat, B. (2017). Effect of Sowing Time and Seed Rate on Growth and Yield of Chickpea Cultivars. Advance Research Journal of Crop Improvement, 8 (1), 1-16.
- Reddy, M. V. and Sing, K. B. (1984). Evaluation of a world collection of chickpea germplasm accessions for resistance to *Ascochyta* blight. Plant Disease, 65, 586-587.
- Singh, I.S, Hussain, M.A, Gupta, A.K. (1995). Correlation Studies Among Yield and Yield Contributing Traits in F2 and F3 Chickpea Populations. International Chickpea and Pigeon pea Newsletter, 2, 11-13.
- Şanlı, A., Kaya, M. (2008). The Effects of Seed Treatments and Different Sowing Times on Some Agronomic Characteristics of Chickpea (*Cicer arietinum* L.). Journal of Süleyman Demirel University Faculty of Agriculture, 3(2), 42-51.
- Toğay, N., Toğay, Y., Çiftçi, V. (2001). A Research on Determination of Hydration Capacity and Hard Seed Shell Ratios of Chickpea Varieties Registered in Turkey. Turkey IVth Field Crops Congress, September 17-21, 2001, 377-379. Tekirdağ.
- Varoğlu, H., Abak, K. (2019). Effect of Sowing Dates on Yield and Quality Characteristics of Chickpea Varieties under Mediterranean Climate Conditions. Legume Research, 42 (3), 360-364.