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Research Article

Evaluation of Morphological, Quality and Yield Characteristics of Some Registered Chickpea (*Cicer arietinum* L.) Varieties in the Eastern-Mediterranean Region

Dürdane MART[1a*]
Ramazan AKIN[2a]
Meltem TÜRKERİ[1b]
Evren ATMACA[2b]
Sezgin MART[3a]

[1]Eastern Mediterranean Agricultural Research Institute, Adana

[2]Transitional Zone Agricultural Research Institute, Eskisehir

[3]Hohenheim University Faculty of Crop Sciences, Stuttgart

[1a]**ORCID**: 0000-0002-2944-1227
[2a]**ORCID**: 0000-0002-9955-9482
[1b]**ORCID**: 0000-0001-5225-967X
[2b]**ORCID**: 0000-0001-5072-8612
[3a]**ORCID**: 0000-0002-8597-6269

[*]Sorumlu yazar (Corresponding author):
durdanemart@yahoo.com

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Abstract
This research was conducted to evaluate regional adaptation of registered chickpea varieties, their yield and some yield related characteristics observed at field experiments under winter growth conditions in Eastern Mediterranean region of Turkey in Adana location during 2014 and 2015. The experiments were conducted in fields of Eastern Mediterranean Agricultural Research Institute. During this study, the varieties were evaluated in Adana location for their fitness to winter growth conditions. In research, it was tested in total 20 varieties as 17 registered varieties and three control and examined yield, quality, disease, and pest tolerance parameters. The results of research was showed that the highest and the lowest yield resulted in 2014 for Adana location were 3.89 t/ha and 0.82 t/ha for experiment, respectively. In 2015, the highest and the lowest yield was 4.42 t/ha and 2.6 t/ha for experiment in Adana location, respectively. Akça variety, which based on the average values for the experiment prominent variety, produced highest values compared to other varieties in terms of fresh weight, water uptake capacity, wet volume and swelling capacity for quality values for both growing seasons of 2014 and 2015.

INTRODUCTION

The edible seed legumes are important source of plant-derived protein, which is widely consumed in Turkey. It is an important basic nutrient in human and animal nutrition in terms of its average protein richness varied between 22-26% (Kokten et al., 2018a; Kokten et al., 2019). Besides, nutritional value, it has positive contributions to the soil due to their symbiotic relations with rhizobia bacteria's. In Turkey, the chickpea production was 630.000 tons with a sowing area of 517.785 ha while the seed yield was 1220.00 kg ha^{-1} (FAO, 2021). The legume industry in Turkey gains importance every day. Legume processing, packaging industry and the production of various chickpea-based nuts (roasted chickpea) are also developing industries that increase the importance of chickpeas. As the most important problem in chickpea cultivation is *Ascochyta blight* in chickpea planting, it is aimed to breed for varieties that are tolerant against *Ascochyta blight*, suitable for mechanized cultivation and harvest, and offer them to the farmers as promising varieties. The purpose of chickpea production is to obtain seed products of high yield and quality, thus it is an important step that suitable varieties develop for reach the target regions where they will be grown. This study aimed to develop a list of recommended chickpea varieties for different regions and stimulate an increase in cultivation area without decreasing yield performance.

MATERIALS and METHODS

The research was performed under winter growth conditions in Eastern Mediterranean region of Turkey in Adana location during 2014 and 2015. In the study, the adaptation studies were carried out using 17 registered varieties and 3 registered varieties as a control group in the province of Adana. The experiment was designed according to randomized block, and arranged in four rows (parcels area: 9 m^2) of 5 m length with 45 cm inter rows and 8 cm above rows. Before sowing, the fertilization was applied at a rate of 20-30 N, 50-60 P_2O_5 kg/ha^{-1}. The disease scorings (1-9) were made to determine tolerance to *Ascochyta blight* disease (Şehirali, 1988). It was taken the samples for quality analysis in chickpea genotypes in both growing seasons of 2014 and 2015 from the combined and thoroughly blended repetitions in the post-harvest experiments. The statistical analysis of all data was made according to One Way ANOVA together with Tukey's B analyses at the significance level of 0.05.

RESULTS and DISCUSSION

The average values and the groups formed regarding the yield experimental results of registered varieties conducted in Adana location in 2014 and 2015 years was presented in Table 1, Table 2 Table 3 and Table 4.

Table 1. Results of registered varieties experiment performed during 2014-2015 period performed in Adana province

	Days to flowering (day)			Days to pod setting (day)			First pod height (cm)		
Varieties	**2014**	**2015**	**Mean**	**2014**	**2015**	**Mean**	**2014**	**2015**	**Mean**
Canıtez	56. 6ab	113.0ab	83.83a-c	69.6 ab	132.0a	100.53a-c	23.8 b	25.0ab	24.44b
Yaşa	59.6 ab	110.7a-c	85.33a-c	74 ab	130.0a-c	101.5a-c	27.2 ab	35.0ab	31.11ab
Işık	54.3 b	112.0a-c	83.23bc	66 b	131.0ab	98.44a-c	26.6 ab	24.2ab	25.41ab
Hisar	56 ab	111.0a-c	83.32bc	74 ab	130.0a-c	102.7a-c	29.9 ab	38.0ab	34.41ab
Azkan	59.6 ab	111.7a-c	86.5a-c	75.3 ab	130.7a-c	103.5a-c	26.6 ab	46.1ab	36.36ab
Çakır	60 ab	111.7a-c	85.67a-c	72 ab	131.3ab	101.33a-c	28.3 ab	31.6ab	29.96ab
Akca	58.6 ab	111.3a-c	84.5a-c	72.6 ab	130.7a-c	100.83a-c	28.8 ab	35.5ab	32.19ab
Ilgaz	60 ab	112.3ab	86a-c	74.6 ab	131.3ab	102.67a-c	30.5 ab	27.2ab	28.85ab
Ilc 482	58.3 ab	111.0a-c	83.67bc	70 ab	131.0ab	98.33b-c	26.1 ab	23.1ab	24.60b
Diyar-95	64 a	112.0a-c	89.32a	78 a	131.0ab	105.69a	28.8 ab	25.3ab	27.07ab
Arda	60.3 ab	112.3ab	85.83a-c	72.6 ab	131.3ab	101a-c	28.8 ab	53.3a	41.07a
Akçin	58.3 ab	112.7ab	85.79a-c	70.6 ab	130.0a-c	101.02a-c	26.1 ab	22.2b	24.15b
Gökçe	54 b	112.7ab	82c	66.3 b	133.9a	97c	22.2 b	37.2ab	29.67ab
Küsmen	57.6 ab	111.7a-c	84.65a-c	70.6 ab	131.3ab	100.95a-c	23.3 b	21.5ab	21.58b
Uzunlu	59.3 ab	113.3a	86.29a-c	73.3 ab	112.9d	102.35a-c	34.4 a	24.4ab	28.87ab
Er	59.3 ab	110.7a-c	86.5a-c	74 ab	130.0a-c	103a-c	26.1 ab	23.3ab	24.70b
Dikbaş	58 ab	108.7c	85a-c	72 ab	127.3c	100.7a-c	23.8 b	46.1ab	34.99ab
Hasanbey	60.3 ab	110.3a-c	85.67a-c	74.6 ab	130.0a-c	102.17a-c	27.2 ab	41.1ab	34.14ab
Seçkin	64.3 a	109.7b-c	87.17ab	77.3 a	128.3bc	103a-c	28.3 ab	43.8ab	36.08ab
İnci	62.3 ab	112.7ab	87.5ab	76.6 ab	131.3ab	104.17ab	24.9 ab	43.9ab	34.43ab
F values	**	**	**	**	**	**	**	**	**
V.K. (%)	4.65	0.9	5.12	4.78	0.8	6.77	12.36	29.3	15.69
Tukey (0.05)	8.52			10.80			10.41		

The differences among the means denoted by the same letters are not statistically significant. **: There is significant difference at 0.05 levels.

It was found statistically significant difference between the varieties for the day to flowering and days to pod setting. According to the cultivars, these values varied between 54-64.3 days for days to flowering and 66-78 days for the days to pod setting. Among the varieties, Diyar and Seckin varieties entered flowering at the last among all the varieties, while Işık and Gökçe varieties have flowered in the short time. The cultivars Diyar and Seçkin, which showed the highest performance for the days to flowering, took first place in terms of days to pod setting. Ozcan and Yücel (2022) reported that because early flowering helps chickpeas to escape from abiotic stress conditions such as drought, high temperature. For the first pod height, Uzunlu variety had the highest value with 34.4 cm, while Canıtez, Dikbaş, Gökçe, and Küsmen varieties had the lowest values. It was observed statistically significant difference among varieties for plant height values. The highest plant height value was obtained from the Akça variety with 92.7 cm, while the lowest value was observed for the Canıtez variety with 56.6 cm (Table 1). Bejiga and Tollu (1982) stated that the days to flowering and plant height decreased with the delay in the sowing time and the yield varied in coherence with rainfall and soil moisture and might differ over the years. The other researchers reported that one hundred seed weight and yield values varied between 270.2-480.9 g and 820.4-380.0 kg ha^{-1}, respectively (Saxena et. al 1980; Slim et. al 1993). Among the varieties, Ilgaz variety experienced the highest 100/seed weight among all varieties, while Işık and ILC-482 varieties had the lowest value. Canitez, Azkan, Akça, Ilgaz, Küsmen, Uzunlu, Er and Dikbaş varieties was higher values than the control varieties in terms of 100-seed weight. The control varieties in the yield experiment were also in the first place and the same group in terms of mentioned parameters. It was not detected adverse effect of Ascochyta blight on yield in the Adana location due to the low disease incidence (Table 2). Tivoli and Banniza (2007) stated that Ascochyta spp. was causative agent of *Ascochyta blight*. Additionally, They found that the symptoms of *Ascochyta blight* seen

in chickpeas was seen similarly on all aboveground parts of the plant and that the disease differs depending on several factors such as seasons, climatic conditions, and geographic area (Açıkgöz, 1987; Şehirali, 1988). Gül et. al. (2006) conducted a study to investigate the possibilities of growing chickpea plants under winter conditions, and reported that the resistance/tolerance to *Ascochyta blight* disease rated as 55.42% in standard varieties and varied between 70.91 and 78.75% in other lines. In addition, they stated that many features related to the winter grown chickpea, especially seed yield, are more advantageous than for summer plantings and that winter sowing may be more advantageous in terms of its characteristics and suitability for machine harvesting. Because of the yield trial of registered varieties conducted in 2015 in the Adana location, a significant difference was observed between the varieties in terms of days to flowering stage, pod podding stage, and plant height. The highest and the lowest values for mentioned parameters varied between 108.7 -113.3 days, 133.9-112.9 days, and 45.3-93.3 cm, respectively. Uzunlu has entered the flowering stage in the latest, while Dikbaş has entered in the shortest time. In terms of the days to pod podding, Gökçe and Uzunlu had the longest and shortest time, respectively. For the first pod height, Arda had the highest value with 53.3 cm, while Akçin had the lowest value with 22.2 cm. In 2015 year, it was observed significant difference between the varieties for 100 seed weight and seed yield value 280.0-420.3 g and 20.6-4410.8 kg ha-1, respectively. Among the varieties, Er variety had the highest 100 seed weight, while Diyar95 had the lowest value. As can be seen from Table 1 and Table 2, the control varieties also had the highest values and clustered in the same group. Mart *et al*. (2003), have conducted a study to characterize the collected 170 chickpea population. They were detected that there was components consisting of the number of branches and days to flowering, the number of pods in the plant, and leaflet length and pod size, and that the characteristics determined in the three main components emerged as characters that can be fundamental in the discrimination of populations. The average values and groups formed regarding the yield test results of registered varieties in 2014 and 2015 were given in Table 1and Table 2. It was determined statistically significant difference between cultivars in terms of days to flowering and pod pod podding stage, plant height, 100-seed weight and seed yield at 99% significance level. According to the two-year average values, there was significant difference between the varieties in terms of days to flowering and pod podding stage, and these values varied between 82-89.32 days and 97-105.69 days, respectively. Gökçe and Diyar-95 varieties entered flowering and pod podding stages at the first and the last places, respectively. There was statistically significant difference between the cultivars for first pod height and plant height values, and these values varied between 24.44-41.07 cm. The plant height values ranged from 56.25-83.59 cm. It was detected statistically significant differences for two-year average 100/seed weight and yield values. The lowest and the highest values for the investigated traits were obtained from ILC 482 and Dikbaş varieties with 25.13-42.75 g, respectively, and Işık and Arda varieties with 500.0 and 4110.78 kg ha^{-1} values. Arda, İnci, Seçkin, Hasanbey, and Azkan varieties exhibited better performance in the "Registered Varieties-II" yield test in terms of seed yield, disease tolerance, and other trait values according to two-year averages. Arda variety had higher seed yield values in both years compared to other varieties (Table 2). Zirek ve Togay (2021) stated that Inci variety was found to have the lowest 100 seed weight (32.00 g), the highest value from Azkan variety (39.66 g) in Van ecological conditions performed experiment. However, Ipekeşen and Biçer (2021) reported that local chickpea variety performed the highest seed yield in maturity stage in greenhouse conditions.

Table 2. Results of registered varieties experiment performed during 2014-2015 period performed in Adana province

	Plant height (cm)			100 Seed weight (g)			Yield (kg/da)			*Ascochyta blight* scores (1-9)	
Varieties	**2014**	**2015**	**Mean**	**2014**	**2015**	**Mean**	**2014**	**2015**	**Mean**	**2014**	**2015**
Canıtez	56.6 c	81.6	56.25c	42.2 ad	31.9ab	36.91a-f	266.3 ae	107.0bc	186.67c-f	1-3	3
Yaşa	72.2 ac	71.1	74.42a-c	39.8 ce	40.1a	36.27b-f	274.3 ae	278.2a-c	276.26a-d	2-3	3
Işık	72.7 ac	74.4	60.95bc	29.8 g	40.5a	28.75gh	82.4 e	17.6c	50.04f	4-4	3
Hisar	77.2 ac	77.2	73.92a-c	41.2 bd	28.2b	35.10b-g	265.3 ae	7.2c	136.26d-f	2-2	4
Azkan	88.8 ab	83.3	83.75a	44.2 ad	36.9ab	41.14a-c	323.8 ad	277.3a-c	300.56a-d	1-2	6
Çakır	79.4 ac	80.5	79.44ab	41.7 bd	35.9ab	38.30a-d	198.3 ae	113.6bc	155.96c-f	3-4	7
Akca	92.7 a	72.7	83.59a	46.3 ac	38.0ab	41.78ab	352.7 ac	167.6a-c	260.19a-e	1-2	7
Ilgaz	89.9 ab	78.9	82.24ab	48.9 a	37.7ab	39.30a-d	345.3 ad	91.6bc	218.41b-f	1-2	6
Ilc 482	64.4 bc	75.1	64.14a-c	27.2 g	38.5ab	25.13h	191.6 be	80.9bc	136.26d-f	4-4	6
Diyar-95	84.4 ab	78.7	76.94a-c	32.2 fg	28.0b	30.44gh	203.9 ae	71.5bc	137.37d-f	3-3	6
Arda	73.3 ac	71.1	81.09ab	39.3 ce	32.6ab	37.02b-e	382.1 ab	441.5a	411.78a	1-2	4
Akçin	69.9 ac	45.3	64.58a-c	39.7 ce	---	34.55d-g	324.9 ad	11.1c	168c-f	2-3	8
Gökçe	84.4 ab	63.0	70.82a-c	33.7 eg	30.6ab	30.80f-h	189.9 be	60.5bc	125.22d-f	3-3	8
Küsmen	68.3 ac	69.6	63.54a-c	42.3 ad	34.8ab	37.29a-f	154.2 de	4.1c	79.19ef	2-3	7
Uzunlu	69.4 ac	86.9	69.50a-c	43.3 ad	28.8ab	36.05b-f	179.3 ce	2.6c	90.96ef	1-3	9
Er	72.7 ac	83.2	67.50a-c	42.6 ad	42.3a	36.02c-f	263.3 ae	70.4bc	166.85c-f	1-3	5
Dikbaş	78.3 ac	70.5	70.81a-c	47.6 ab	28.0b	42.75a	209.7 ae	285.1a-c	247.41a-e	3-4	6
Hasanbey	82.2 ac	84.7	77.21a-c	41.22 bd	40.5a	38.63a-d	333.3 ad	278.7a-c	306.04a-d	1-3	4
Seçkin	83.8 ab	93.3	78.31ab	38 df	40.6a	37.73a-e	222.7 ae	441.8a	332.26a-c	1-2	4
İnci	74.9 ac	81.1	77.215a-c	33.4 eg	31.4ab	32.74e-g	389 a	370.4ab	379.74ab	1-3	4
F Values	**	ns	**	**	**	**	**	**	**		
V.K. (%)	11.01	18.8	21.61	5.68	10.3	5.56	24.43	29.6	66.3		
Tukey (0.05)	26.26			7.02			195.39				

The differences among the means denoted by the same letters are not statistically significant. **: There is significant difference at 0.05 levels, ns: no significant.

Tripathi and Singh (1985) reported that the seed yield and the number of pods plant^{-1} might changed depending on varieties and sowing date. They determined that the seed yield ranged between 28 kg and 106 kg and the number of pods per plant varied between 28 and 47. In Adana Location, it was not observed negative effect of *Ascocyhta blight* due to disease incidence was low in the first year. However, 100 seeds and yields parameters were negatively affected in the second year. Anlarsal et al. (1999) pointed that plant height (67.9-84.2 cm), number of pods per plant (15.8-27.3), 100-seed weight (26.7-37.5 g) and yield (1780.6-2710.9 kg ha^{-1}) varied between varieties.

Quality studies on registered varieties

The quality values of the seeds obtained from registered varieties yield experiment performed in Adana Location during 2014 period were analyzed. The highest and the lowest values for all parameters analyzed were 52.81-32.95 g for dry weight, 105,28-66,21 g for wet weight, 0.52-0,33 g/seed for water intake capacity, 1,10-0,92 % for water intake index, 90-75 ml for dry volume, 193-158 ml for wet volume, 0.53-0.33 ml/seed for swelling capacity and2.38-2.11 % for swelling index. Among the varieties included in the registered varieties yield trial in Adana location, the Akça variety came to the fore with the highest value for wet weight, water intake capacity, dry volume, wet volume and swelling capacity (Table 3 and Table 4).

Table 3. Results of quality traits analysis from registered variety trial performed during 2014-2015 period performed in Adana province

	Dry weight (100 seed)(g)			Wet weight (g)			Water intake capacity (g/seed)			Water intake index (%)		
Varieties	**2014**	**2015**	**Mean**	**2014**	**2015**	**Mean**	**2014**	**2015**	**Mean**	**2014**	**2015**	**Mean**
Canıtez	42.23	37.88	40.06	90.30	73.89	82.10	0.45	0.36	0.41	0.99	0.95	0.97
Yaşa	45.53	34.57	40.05	85.14	68.06	76.60	0.43	0.33	0.38	1.02	0.97	1.00
Işık	44.93	-	-	93.98	-	-	0.48	-	-	1.06	-	-
Hisar	45.78	-	-	86.43	-	-	0.42	-	-	0.92	-	-
Azkan	46.96	42.48	44.72	92.04	84.86	88.45	0.46	0.42	0.44	1.01	1.00	1.01
Cakır	52.81	43.72	48.27	94.49	85.95	90.22	0.48	0.42	0.45	1.01	0.97	0.99
Akca	48.85	40.99	44.92	105.28	90.12	97.70	0.52	0.49	0.51	0.99	1.20	1.10
Ilgaz	32.95	40.23	36.59	100.28	87.25	93.77	0.51	0.47	0.49	1.05	1.17	1.11
ILC 482	37.97	32.7	35.34	66.21	67.28	66.75	0.33	0.35	0.34	1.01	1.06	1.04
Diyar-95	38.29	34.83	36.56	75.00	69.42	72.21	0.37	0.35	0.36	0.98	0.99	0.99
Arda	42.04	36.62	39.33	77.99	73.48	75.74	0.40	0.37	0.39	1.04	1.01	1.03
Akçin	44.01	-	-	83.54	-	-	0.42	-	-	0.99	-	-
Gökçe	41.51	34.3	37.91	87.73	75.04	81.39	0.44	0.41	0.43	0.99	1.19	1.09
Küsmen	45.05	-	-	86.97	-	-	0.45	-	-	1.10	-	-
Uzunlu	44.36	-	-	92.35	-	-	0.47	-	-	1.05	-	-
Er	46.95	37.5	42.23	85.33	80.22	82.78	0.41	0.43	0.42	0.92	1.14	1.03
Dikbaş	46.55	42.2	44.38	98.71	89.56	94.14	0.52	0.47	0.50	1.10	1.12	1.11
Hasanbey	43.97	37.94	40.96	93.49	79.27	86.38	0.47	0.41	0.44	1.01	1.09	1.05
Seçkin	39.15	41.92	40.54	90.60	84.34	87.47	0.47	0.42	0.45	1.06	1.01	1.04
İnci	-	37.7	-	76.06	72.34	74.20	0.37	0.35	0.36	0.94	0.92	0.93

Table 4. Results of quality traits analysis from registered variety trial performed during 2014-2015 period performed in Adana province

	Dry volume (ml)			Wet volume (ml)			Swelling capacity (ml/seed)			Swelling index (%)			Protein (%)		
Varieties	**2014**	**2015**	**Mean**	**2014**	**2015**	**Mean**	**2014**	**2015**	**Mean**	**2014**	**2015**	**Mean**	**2014**	**2015**	**Mean**
Canıtez	85	79	82.00	180	165	172.5	0.45	0.36	0.41	2.29	2.24	2.27	20.84	17.90	19.37
Yaşa	83	77	80.00	176	162	169.0	0.43	0.35	0.39	2.30	2.30	2.30	20.53	17.85	19.19
Işık	85	-	-	182	-	-	0.47	- 0.50	-0.02	2.34	2.00	2.17	21.28	0.00	10.64
Hisar	84	-	-	176	-	-	0.42	- 0.50	-0.04	2.24	2.00	2.12	20.51	0.00	10.26
Azkan	85	83	84.00	182	176	179.0	0.47	0.43	0.45	2.34	2.30	2.32	20.60	17.38	18.99
Cakır	86	84	85.00	184	178	181.0	0.48	0.44	0.46	2.33	2.29	2.31	20.59	18.62	19.61
Akca	90	80	85.00	193	182	187.5	0.53	0.52	0.53	2.33	2.73	2.53	21.750	19.77	20.76
Ilgaz	87	82	84.50	188	178	183.0	0.51	0.46	0.49	2.38	2.44	2.41	20.41	18.88	19.65
ILC 482	75	71	73.00	158	160	159.0	0.33	0.39	0.36	2.32	2.86	2.59	21.02	17.67	19.35
Diyar-95	79	77	78.00	166	162	164.0	0.37	0.35	0.36	2.28	2.30	2.29	21.48	18.78	20.13
Arda	79	78	78.50	169	166	167.5	0.4	0.38	0.39	2.38	2.36	2.37	23.20	19.72	21.46
Akçin	82	-	-	174	-	-	0.42	- 0.50	-0.04	2.31	2.00	2.16	21.30	-	-
Gökçe	84	77	80.50	178	168	173.0	0.44	0.41	0.43	2.29	2.52	2.41	20.16	19.64	19.90
Küsmen	83	-	-	178	-	-	0.45	- 0.50	-0.03	2.36	2.00	2.18	26.42	-	-
Uzunlu	84	-	-	180	-	-	0.46	- 0.50	-0.02	2.35	2.00	2.18	20.43	-	-
Er	85	80	82.50	174	172	173.0	0.39	0.42	0.41	2.11	2.40	2.26	20.24	18.89	19.57
Dikbaş	87	84	85.50	188	181	184.5	0.51	0.47	0.49	2.38	2.38	2.38	23.29	18.44	20.87
Hasanbey	85	80	82.50	183	170	176.5	0.48	0.40	0.44	2.37	2.33	2.35	23.63	20.17	21.90
Seçkin	84	83	83.50	180	174	177.0	0.46	0.41	0.44	2.35	2.24	2.30	23.46	19.72	21.59
İnci	80	79	79.50	166	166	166.0	0.36	0.37	0.37	2.20	2.28	2.24	21.67	19.68	20.68

The quality values of the seeds obtained from registered varieties yield experiment performed in Adana location during 2015 period were analyzed. The highest and the lowest values were 43.72-32.7 g for dry weight, 90.12-67.28 g wet weight, 0.49-0.3 g/seed water intake capacity, 1.20-0.92 % water intake index, 84-71 ml dry volume, 182-160 ml wet volume, 0.52-0.35 ml/seed swelling capacity and 2.86-2.00% swelling index. Among the varieties included in the registered varieties yield experiment in Adana location, the Akça variety came to the fore with the highest values for wet weight, water intake capacity, water intake index, wet volume and swelling capacity. It was calculated two years averages from registered varieties. The highest and the lowest values for all parameters analyzed were 48.27-35.34 g for dry weight , 97.70-66.75 g wet weight, 0.51-0.34 g/seed water intake capacity, 1.11-0.93 % water intake index, 85.50-73.00 ml dry volume, 187.5-164.0 ml wet volume, 0.53-0.36 ml/seed swelling capacity and 2.59-2.12 % swelling index. The highest and the lowest average

protein values were obtained for Hasanbey (21.90 %) and Hisar varieties (10.26 %), respectively. Atikyılmaz (1997) found that the protein ratio also changed according to the climatic events that occurred during the growing season. Additionally, Ipekeşen et al. (2022) stated that the differences in the protein content among chickpea cultivars might attributed to differences in their genetic background and this parameter was low found in Diyarbakir ecological conditions. The other researcher reported that chickpea protein content (23.8%) changed depending on environmental factors (Soysal ve Erman, 2020). In our research, among the varieties included in the registered varieties yield experiment in Adana location, the Akça variety came to the fore with the highest values in terms of wet weight, water intake capacity, wet volume and swelling capacity (Table 4). Amir et al. (2006) stated that the chickpea, lentil, and bean products grown under agro climatic conditions of Algeria had high protein ratio, total sugar amount and other traits in low rainfall conditions.

CONCLUSION

In this study, the regional adaptations of registered chickpea varieties under different climatic conditions and their tolerance/resistance to *Ascochyta blight* were investigated. It was observed negative effects of *Ascochyta blight* disease on the 100/seeds and the yields in the Adana location, negative effects were observed. Among the registered varieties, which is regional varieties, İnci, Hasanbey and Seçkin exhibited the highest performance. It was found that the seed yield varied between 4110.78-500.04 kg ha-1according to two-year averages. Arda, Inci, Seçkin, Hasanbey, Azkan, Akça, and Dikbaş varieties has been came to the fore in the yield test of registered varieties yield test. The regional varieties had higher seed yield values in both years compared to other varieties. In both growing seasons, the average protein values were the highest for the Hasanbey variety (21.90 %) and the lowest for the Azkan variety (18.99 %). It had higher seed yield values in both years compared to other varieties. Additionally, the Akça variety came to the fore with higher values compared to other varieties for wet weight, water intake capacity, wet volume and swelling capacity.

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