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Characterization Of Turkey Local Winter Sown Chickpea (*Cicer arietinum* L.) Populations Using Principle Component Analysis

Abstract
A total of 170 different the local chickpea (*Cicer arietinum* L.) genotypes collected from the Mediterranean and Central Anatolian regions, Adana, Hatay, Osmaniye, Maraş, Mersin, Karaman provinces were studied in order to evaluate in breeding studies and to determine some impmedium wident agronomic and morphological characteristics. Characterizations of genotypes at the time of winter sowing were investigated qualitatively and quantitatively. Morphological characterization studies were carried out according to the definition list published by IPGRI for chickpea and the UPOV feature document of this species. In this study, the characteristics of the chickpea plant and its seed were examined and the differences between these examined characteristics were determined. It is seen that the canopy height and hundred seed weight have the highest values on the First Main Component in terms of weights and contribution margins in the first three main components of the characteristics evaluated in winter agriculture. When the Second Main Component values were examined, it was determined that the number of leaflets and the first branch had the highest values. In the third main component, the values of flower color and pigmentation were determined to be the highest. Among the three main components, the determined features were determined as the characters that could be the basis for the differentiation of the populations.

INTRODUCTION

In Turkey, chickpea cultivation area is 517,785 ha, 630,000 tons of production, and the grain yield per unit area is 122 kg da^{-1} (FAO, 2021). Chickpea, which was cultivated in very wide and different areas 7-8 thousand years ago, has an important place in the nutrition of humanity. Chickpea is an important legume in terms of health and nutrition due to its high protein content and high fiber level in its structure (Singh et al., 2003). Despite the increase in the world population, the decrease in our production resources that can be used, the uneven distribution of food production and ecological conditions are among the most important reasons for unbalanced nutrition. Climate change changes abiotic and biotic stress factors and threatens agricultural productivity worldwide (Shahzad et al., 2015). As biotic stresses, fungal diseases such as rust, powdery mildew, root rot, common root rot, wilt and ascochyta blight are common and severe for legume crop at different growth stages. Abiotic stresses include heat, drought and frost, which reduce the quantity and quality of the product. For this, genetic improvement is important and necessary. Conventional and molecular breeding approaches can accelerate breeding programs for improvements (Parihar et al., 2020). Local varieties that grow naturally in nature for many years are of great importance for selection. Landraces have great genetic diversity; It is of great importance to collect and preserve these varieties before they are lost (Demir, 1975). There are differences in many features such as grain color, flower color and disease resistance. There are genotypes that can adapt to climatic changes between years, various conditions and can withstand diseases. In this research, by determining the characteristics of landraces, characterization and selection; It is important to determine the materials that are suitable for the regional conditions, winter, anthracnose resistant/tolerant, which can be the basis for the breeding of high yielding varieties.

MATERIAL and METHOD

A total of 170 local chickpea (*Cicer arietinum* L.) genotypes collected from the Mediterranean, Transition zone and Central Anatolia regions were used in this study (Table 1).

Table 1. Information on the province and region where the local chickpea populations used in the study were collected

Turkey	Regions	Locations	No of Samples
Mediterranean Region	Adana	Tufanbeyli-Saimbeyli-Pozantı-Kamışlı-Aladağ	44
Mediterranean Region	Osmaniye	Hasanbeyli-Bahçe-Çelikler	16
Mediterranean Region	Mersin	Gülnar-Silifke	18
Mediterranean Region	Hatay	Central-Altınözü-Yayladağ-Kırıkan-Belen	20
Passage belt Region	Kahramanmaraş	Central-Göksun-Elbistan-Afşin	29
Central Anatolia	Karaman	Central-Ayrancı-Ermenek	43
Sum	6	22	170

The collected local chickpea populations were sown in winter (in December) in four-row plots with 5 m row length, 0.45 m row spacing and 10 cm row spacing on the Eastern Mediterranean Agricultural Research Institute trial field. Fertilization was done on 3 kg da^{-1} pure nitrogen and 5 kg/da pure phosphorus in the experimental area and necessary maintenance and observations were made since the emergence. Morphological characters with high heritability were observed in the characterization of the legume species, and observations and measurements were made according to IBGR (Anonymous, 1993) and UPOV (Anonymous, 2003) Chickpea Identification List. In order to determine the different form groups of the samples produced in augmented design in detail, the observed character data were evaluated using the Principal Component Analysis (PCA), one of the multivariate analyzes (Sneath and Sokal, 1973; Clifford and Stephenson, 1975; Tan, 1983).

RESULTS and DISCUSSION

The distribution of quantitative and qualitative trait values in winter sowing in local genotypes was evaluated by examining their frequencies and percentages according to the established intervals. Climatic factors increase or decrease the interaction by having significant effects on the development and maturation of plants (Singh, 1999). The most important feature in determining the effects of characters with each other is considered to be climatic features (Ülker and Ceyhan, 2008). The distribution of quantitative trait values examined in genotypes, their frequencies and percentage values according to the established ranges are given in Table 2. The samples were analysed in terms of distribution of quantitative trait values and leaflet length and it was determined that 88.2% of them were large and 11.8% of them had medium length. (Table 2.1) In terms of leaflet width, it was determined that 95.4% were medium wide and 4.6% were wide. (Table 2.2). It was determined that 100% of all samples examined had large pod type (Table 2.3). The majority of the first branch number of the genotypes varied between 1.00 and 2.39 (Table 2.4). The second branch number in the majority of genotypes varied between 1.74 and 5.21 (Table 2.5). The number of third branches varied between 3.46 and 10.37. (Table 2.6). The canopy height of 68.6% of genotypes were between 49.02 and 65.35 cm (Table 2.7). The canopy width was between 24.00 and 31.99 cm for 55.9% of genotypes (Table 2.8). The first pod height was 25.02-33.35 cm in 56.7% of the genotypes (Table 2.9). It is seen that 66.8% of of the genotypes reached a flowering period between 91.40 and 95.59 days (Table 2.10). The Flowering Period in 62.2% of the samples varied between 14.80 and 22.19 days. (Table 2.11). The maturity of 95.88% of landraces was between 72.50 and 82.99 days, and between 62.00 and 72.49 days for the rest 4.12% genotypes (Table 2.12). All genotypes had one flower and one pod on every stalk (Table 2.13 and Table 2.14). It has been reported that when the number of pods increases, it causes decrease in terms of the seed weight and the yield per plant (Amini et al., 2002). When the values related to the number of pods in a plant, which is directly related to the yield, are examined, it is observed that the majority of the values vary between 15.60 and 46.79 intervals (Table 2.15). The relations between the characters come to the fore in the emergence of the characteristics that affect the yield values (Bozoğlu and Sözen, 2007). When the values related to the number of seeds in a plant were examined, it was determined that 69.4% of the samples were between 1.0 and 29.9 intervals (Table 2.16). When the values of 100 seed weight are examined, it is seen that 55.4% of the samples have values between 29.40 and 39.19, 29.8% have values between 19.60 and 29.39, and 14.8% have values between 39.20 and 48.99. (Table 2.17). Singh et al. (2003) reported that they similar results in the characterization of Indian chickpeas. They reported that considering the characters that affect the yield the most, instead of considering the yield directly in agricultural production programs, especially in breeding studies, will give more useful results (Cinsoy and Yaman 1998).

Table 2. Distribution of quantitative characteristics of local populations in winter sowing, their frequencies and percentage values according to the established intervals

Table 2.1. Distribution of values for leaflet length, frequencies and percentages according to established intervals

Interval No	Interval Values	No of Samples	Frequence %
5	Medium wide	27	11.8
7	Wide	145	88.2

Table 2.2. Distribution of values for leaflet width, frequencies and percentages according to established intervals

Interval No	Interval Values	No of Samples	Frequence %
5	Medium wide	156	95.4
7	Wide	16	4.6

Table 2.3. Distribution of values for pod size, frequencies and percentages according to established ranges.

Interval No	Interval Values	No of Samples	Frequence %
3	Small	-	-
5	Medium wide	-	-
7	Large	170	100

Table 2.4 The distribution of values for the first branch number, their frequencies and percentages according to the intervals created.

Interval Values	No of Samples	Frequence %
1.00 – 1.59	58	35.4
1.60 – 2.39	86	54.4
2.40 – 3.19	19	8.8
3.20 – 3.99	9	1.4

Table 2.5. The distribution of the values of the second branch number, their frequencies and percentages according to the intervals created.

Interval Values	No of Samples	Frequence %
1.00 – 1.73	5	5.8
1.74 – 3.47	60	33.5
3.48 – 5.21	84	41.4
5.22 – 6.95	17	15.8
6.96 – 8.69	6	3.5

Table 2.6. The distribution of the values of the third branch number, their frequencies and percentages according to the established intervals.

Interval Values	No of Samples	Frequence %
1.00 – 3.45	7	2.1
3.46 – 6.91	61	37.5
6.92 – 10.37	85	53.7
10.38 – 13.83	15	6.0
13.84 – 17.29	4	0.7

Table 2.7. Distribution of values related to plant canopy height, frequencies and percentages according to established intervals.

Interval Values	No of Samples	Frequence %
49.02 – 65.35	114	68.6
65.360 – 81.69	58	31.4

Table 2.8. Distribution of values for plant canopy width, frequencies and percentages according to established intervals

Interval Values	No of Samples	Frequence %
24.00 – 31.99	94	55.9
32.00 – 39.99	78	44.1

Table 2.9. Distribution of values related to first pod height, frequencies and percentages according to established intervals.

Interval Values	No of Samples	Frequence %
16.68 – 25.01	18	5.9
25.02 – 33.35	87	56.7
33.36 – 41.69	67	37.4

Table 2.10. The distribution of the values for the number of flowering days, their frequencies and percentages according to the established intervals.

Interval Values	No of Samples	Frequence %
83.00 – 87.19	1	0.6
87.20 – 91.39	1	0.6
91.40 – 95.59	115	66.8
95.60 – 99.79	32	18.6
99.80- 103.99	23	13.4

Table 2.11. Distribution of values related to flowering time, frequencies and percentages according to established intervals.		
Interval Values	No of Samples	Frequence %
1.00 – 7.39	19	10.6
7.40 – 14.79	38	21.7
14.80 – 22.19	103	62.2
22.20 – 29.59	11	4.9
29.60 – 36.99	1	0.6
Table 2.12. Distribution of values related to the number of maturity days, frequencies and percentages according to the established intervals.		
Interval Values	No of Samples	Frequence %
62.00 – 72.49	8	4.12
72.50 – 82.99	164	95.88
Table 2.13. The distribution of values for the number of flowers in a flower stalk, their frequencies and percentages according to the established intervals.		
Interval Values	No of Samples	Frequence %
1.00	172	100
Table 2.14. The distribution of the values of the number of pods in a flower stalk, their frequencies and percentages according to the established intervals.		
Interval Values	No of Samples	Frequence %
1.00	172	100
Table 2.15. The distribution of the values of the number of pods in a plant, their frequencies and percentages according to the established intervals.		
Interval Values	No of Samples	Frequence %
1.00 – 15.59	28	17.1
15.60 – 31.19	75	47.5
31.20 – 46.79	45	27.2
46.80 – 62.39	18	7.5
62.40 – 77.99	6	0.7
Table 2.16. The distribution of values for the number of seeds in a plant, their frequencies and percentages according to the established intervals.		
Interval Values	No of Samples	Frequence %
1.0 – 14.9	49	29.9
15.0 – 29.9	63	39.5
30.0 – 44.9	40	23.8
45.0 – 59.9	13	5.4
60.0 – 74.9	7	1.4
Table 2.17. Distribution of values for 100 seed weight, frequencies and percentages according to established intervals.		
Interval Values	No of Samples	Frequence %
19.60 – 29.39	52	29.8
29.40 – 39.19	89	55.4
39.20 – 48.99	31	14.8

The distribution of qualitative feature values examined in landraces, their frequencies and percentage values according to the established intervals are given in Table 3. When the distribution of qualitative values in winter planting was examined, in terms of plant type, 90.7% of the samples were semi-erect, 8.7% were erect and 0.6% were semi-spreading (Table 3.1). The presence of pigmentation was observed in 98.3% of the genotypes, the stem and leaves were green, 1.2% of the stems and leaves were dull green, and 0.5% of the stems and leaves were partially light purple (Table 3.2). When we classify the genotypes in terms of hairiness, 81.4% of the genotypes were in the hairy group, and no hairs were found in 18.6% of the genotypes (Table 3.3). In the grouping made in terms of the number of leaflets in the leaf, 53.6% of the samples were between 11 and 13, while 42.5% had a leaflet number greater than 13, only 3.9% of them were between 9 and 11. (Table 3.4) It will always be beneficial and efficient to adjust the planting time, where the plants will be least affected by the summer heat and winter cold; otherwise, it is necessary to be prepared for reductions in yield, especially the characters that affect yield (Mart, 2000; Sözen, 2006). As a result of the observations made in terms of flower color, pink flower color was found in 4.1%, and the flower color was determined as white in 95.9% in other genotypes (Table 3.5). No pod cracking was observed at all (Table 3.6). The observed seed color were as follows: 1.2% was red-brown, 0.6% is yellowish-pink-brown, 24.8% was brown-beige, 68.7% was beige, 0.6% was yellowish-brown, 2.4% was yellowish-beige and 1.8% was ivory white (Table 3.7). In terms of the presence of small black spots, no black spots were found in 100% of the genotypes (Table 3.8). When the genotypes are classified in terms of seed shape, 30% of them are ram head, angular long grains; In 68.8% of the population, cubed, non-round grain shape; In 1.2%, it was determined as pea-like full round. (Table 3.9). When genotypes were examined in terms of testa structure, it was determined that 96.5% were rough and 3.5% smooth (Table 3.10). The first fruit height was found in the range between 25.02-33.35 with 56.7% of the genotypes (Table 3.11). Cinsoy et al. (1997) and Mart (2000) obtained similar results with grain size, plant height and first pod height.

Table 3. The distribution of the values of qualitative characteristics in winter sowing, their frequencies and percentages according to the established intervals

Table 3.1. Distribution of values related to plant type, frequencies and percentages according to established ranges

Interval No	Interval Values	No of Samples	Frequence %
1	Erect	15	8.7
2	Semi erect	156	90.7
3	Semi spreading	1	0.6

Table 3.2. Distribution of values related to plant pigmentation, frequencies and percentages according to established ranges.

Interval No	Interval Values	No of Samples	Frequence %
1	No antosion (branch and leaves are mat green)	2	1.2
2	No antosion (branch and leaves are green)	169	98.3
3	Moderate antosion (branch and leaves are light purple)	1	0.5

Table 3.3. Distribution of plant hairiness values, frequencies and percentages according to established ranges.

Interval No	Interval Values	No of Samples	Frequence %
3	No hair	32	18.6
5	Hairy	140	81.4

Table 3.4. The distribution of values for the number of leaflets in a leaf, their frequencies and percentages according to the intervals created.

Interval No	Interval Values	No of Samples	Frequence %
1	Between 3 – 9	-	-
3	Between 9 – 11	12	3.9
5	Between 11 – 13	89	53.6
7	>13	71	42.5

Table 3.5. Distribution of values for flower color, frequencies and percentages according to established ranges.

Interval No	Interval Values	No of Samples	Frequence %
4	Pink	7	4.1
9	White	165	95.9

Table 3.6. Distribution of values for pod cracking, frequencies and percentages according to established intervals..

Interval No	Interval Values	No of Samples	Frequence %
0	No Pod cracking	172	100

1	< %10 Pod cracking	-	-
2	> %10 Pod Cracking	-	-

Table 3.7. Distribution of values for seed color, frequencies and percentages according to established ranges.

Interval No	Interval Values	No of Samples	Frequence %
5	Red - brown	2	1.2
7	Yellowish pink brown	1	0.6
9	Brown beige	42	24.8
10	Beige	119	68.7
13	Yellowish brown	1	0.6
16	Yellowish beige	4	2.4
17	Ivory white	3	1.7

Table 3.8. The distribution of values for the presence of small black dots in the seed, their frequencies and percentages according to the established intervals

Interval No	Interval Values	No of Samples	Frequence %
0	No black spots	172	100
1	Small black spots	---	---

Table 3.9. Distribution of values related to seed shape, frequencies and percentages according to established ranges.

Interval No	Interval Values	No of Samples	Frequence %
1	Ram head, angular long grain	51	30
2	Cubed, non-round grain shape	119	68.8
3	Pea-like full round	2	1.2

Table 3.10. Distribution of values related to Testa structure, frequencies and percentages according to established intervals.

Interval No	Interval Values	No of Samples	Frequence %
1	Rough	166	96.5
2	Smooth	6	3.5

Table 3.11. Distribution of values related to first pod height, frequencies and percentages according to established intervals.

Interval Values	No of Samples	Frequence %
16.68 – 25.01	18	5.9
25.02 – 33.35	87	56.7
33.36 – 41.69	67	37.4

When the minimum, maximum and average values of the features discussed are examined, it is noteworthy that the variations of the features are high (Table 4).

Table 4. Minimum, maximum and average values of some traits examined in winted planting

Feature	**Minimum**	**Maximum**	**Mean**
First branch number	1.0	4.0	1.79
Second branch number	1.7	8.7	3.84
Third branch number	3.3	17.3	7.51
Plant canopy height	51.7	81.7	62.74
Plant canopy width	25.0	40.0	32.26
Days until flowering	83.0	104.0	95.06
Flowering days	9.0	37.0	16.09
Number of flowers on a flower stalk	1.0	1.0	1.0
Number of pods on a flower stalk	1.0	1.0	1.0
Biological yield (gr/plant)	0.0	2.2	1.327
100 seed weight	0.004	0.068	0.068
	21.0	49.0	33.97

The eigen values for the first three main components ranged between 2.0960-10.7906. The first three main components accounted for 55.46% of the total variance (Table 5).

Table 5. Eigen and variance values calculated in chickpea samples in winter sowing

Principal Component	Eigen Values	Variance Percentage	Stacked Variance
1	10.7906	35.97	35.97
2	3.7522	12.51	48.48
3	2.0960	6.99	55.46

When the weights and contribution margins of the quantitative properties in the first three main components are examined, it is seen that the canopy height values on the first main component and the weight of 100 grains have the highest values, respectively. When the second main component values were examined, it was determined that the first branch number and leaflet width had the highest values. In the third main component, the values of the number of flowering days and 100 seed weight were determined as the highest values, respectively. Among the three main components, the determined features emerge as the character that can be the basis for the differentiation of populations (Table 6).

Table 6. Distribution of quantitative characteristics in the principal components in winter sowing

Feature	1. Principal Component	2. Principal Component	3. Principal Component
Leaflet length	0.2103*	0.0669	-0.2381
Leaflet width	0.1945	0.0691	-0.2729
1st branch	0.2349*	0.0856	-0.1435
2nd branch	0.2530*	0.0323	-0.1201
3rd branch	0.2497*	-0.0611	-0.1078
Canopy height	0.2731*	0.0365	0.0358
Canopy width	0.2705*	0.0361	0.0204
Days until flowering	-0.1729	-0.0223	0.1139
Total flowering days	0.2488*	0.0185	0.0080
Pod number per plant	0.2349*	-0.0530	0.0810
100 seed weight	0.2706*	0.0402	0.0816

When the weights and contribution margins of the considered qualitative characteristics in the first three main components are examined, it is seen that the number of leaflets and plant type have the highest values on the first main component, respectively. When the second main component values were examined, it was determined that the number of leaflets and plant type characteristics had the highest values. In the third main component, the values of flower color and pigmentation were determined as the highest values, respectively. Among the three main components, the determined features emerge as the character that can be the basis for the differentiation of populations (Table 7).

Table 7. Distribution of qualitative characteristics in winter sowing in principal components

Feature	1. Principal Component	2. Principal Component	3. Principal Component
Number of leaflets	0.2156	0.0980	-0.1628
Plant type	0.0219	0.0631	0.0528
Pigmentation	0.0106	-0.0543	0.1465
Hairiness	-0.0875	-0.0290	-0.2336
Flower color	-0.0109	0.0545	0.2795*
Seed color	-0.0112	-0.4464	0.0070
Seed shape	-0.0019	-0.0838	-0.4795
Testa structure	-0.0382	-0.0313	-0.3676

According to the correlation analysis results, the relationships between the Quantitative and Qualitative Characteristics Examined in Winter Sowing were determined by the number of leaflets, their length and width on the number of pods per plant and the number of seeds per pod; branch numbers; canopy height and width; flowering period; Positive among 100 seed weight; hairiness in the plant; It was determined that there was a negative relationship between the number of flowering days. In the breeding studies on the number of pods and the number of seeds per pod to increase the grain yield of the chickpea plant as a result of winter sowing, the number, length and width of the leaflets, which had a positive relationship with the correlation analysis result; branch numbers; canopy height and width; flowering period; It has been determined that 100 seed weight will be the priority selection criteria (Table 8).

Table 8. Correlation table of quantitative and qualitative characters in winter sowing

Correlation Chart of Characters in 2003 Winter Sowing.

	Pigmentation.	Hairiness	Leaflet no	Leaflet Length	Leaflet Width	1st branch	2nd branch	3rd branch	Cnp height	Cnp width	Days until flowering	Flowering days	Pod per plant	Seed per pod	Yield (gr/plant)	100 Seed weight
Pigmentation		0.205**														0.201**
Hairiness	0.205**		-0.176*				-0.181**	-0.155*	-0.267**	-0.247**		-0.261**	-0.275**	-0.287**	-0.176*	-0.202**
Leaflet no		-0.176*		0.817**	0.758**	0.534**	0.567**	0.566**	0.530**	0.527**	-0.278**	0.459**	0.547**	0.495**		0.630**
Leaflet Length			0.817**		0.781**	0.552**	0.577**	0.588**	0.530**	0.530**	-0.284**	0.450**	0.480**	0.413**	0.169*	0.599**
Leaflet Width			0.758**	0.781**		0.508**	0.537**	0.571**	0.509**	0.503**	-0.258**	0.435**	0.396**	0.339**		0.556**
1st branch			0.534**	0.552**	0.508**		0.868**	0.637**	0.686**	0.680**	-0.443**	0.646**	0.488**	0.329**	0.162*	0.767**
2nd branch		-0.181**	0.567**	0.577**	0.537**	0.868**		0.757**	0.715**	0.719**	-0.417**	0.687**	0.607**	0.466**		0.733**
3rd branch		-0.155*	0.566**	0.588**	0.571**	0.637**	0.757**		0.649**	0.667**	-0.411**	0.574**	0.789**	0.724**	0.138**	0.676**
Cnp height		-0.267**	0.530**	0.530**	0.509**	0.686**	0.715**	0.649**		0.980**	-0.536**	0.771**	0.594**	0.519**	0.157*	0.803**
Cnp width		-0.247**	0.527**	0.530**	0.503**	0.680**	0.719**	0.667**	0.980**		-0.533**	0.754**	0.605**	0.526**	0.164**	0.790**
Days until flowering			-0.278**	-0.284**	-0.258**	-0.443**	-0.417**	-0.411**	-0.536**	-0.535**		-0.702**	-0.350**	-0.288**		-0.428**
Flowering days		-0.261**	0.459**	0.450**	0.435**	0.646**	0.687**	0.574**	0.771**	0.754**	-0.702**		0.506**	0.432**		0.697**
Pod per plant		-0.275**	0.547**	0.480**	0.396**	0.488**	0.607**	0.789**	0.594**	0.605**	-0.350**	0.506**		0.933**		0.641**
Seed per pod		-0.287**	0.495**	0.413**	0.339**	0.329**	0.466**	0.724**	0.519**	0.526**	-0.288**	0.432**	0.933**			0.590**
Yield (gr/plant)		-0.176*		0.169*		0.162*		0.138*	0.157*	0.164*						
100 Seed weight	0.201**	-0.226**	0.502**	0.518**	0.494**	0.676**	0.733**	0.676**	0.803**	0.790**	-0.428**	0.697**	0.641**	0.590**		0.350**

*: 1% and 5% significance of relationships between characters

CONSLUSION

In this study, when the weights and contribution margins of the quantitative characteristics in the first three main components are examined, the highest value is the canopy height, width and number of second branches on the first main component, the number of first branches on the second main component, leaflet width and length, and the number of flowering days on the third main component. , the number of pods in the plant and the weight of one hundred grains were determined. In this study, when the weights and contribution margins of the qualitative characteristics in the first three main components are examined, the highest value is the number of leaflets, plant type and pigmentation on the first main component, the number of leaflets, plant type and flower color on the second main component, and flower color, pigmentation and pigmentation on the third main component. plant type characteristics were determined. Among the three main components in winter planting, the determined characteristics emerge as the character that can be the basis for the differentiation of populations. As a result, this study, which was carried out with samples collected from the Mediterranean Region and Central Anatolia Region, is important in terms of revealing the breadth of variation in the chickpea gene sources material, both between the provinces and the populations within the same province. As a breeding resource, landraces are used especially for the transmission of disease resistance and other quantitative and qualitative characteristics and for the expansion of genetic variation. When the features that predominantly affect the formation of the groups in the main component analysis are examined; it is known that the correlations of these features with each other and with grain yield are significant, and their direct and indirect effects on yield are high (Açıkgöz et al., 1994). Here, the important thing for the breeder is to determine the populations with high values in these characteristics, which are the basis for the differentiation of the populations in terms of the features they benefit from in the breeding program, and present them to the breeder's use. As a breeding resource, landraces are used especially for the transmission of disease resistance and other quantitative and qualitative characteristics and for the expansion of genetic variation. When the features that predominantly affect the formation of the groups in the main component analysis are examined; It is known that correlations between these characteristics and grain yield are significant, and their direct and indirect effects on yield are high (Mart et al., 2003-2007), (Cinsoy et al., 1997 1 and 2).

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