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Physıcochemıcal Properties Of Some Chıckpea Varıetıes (*Cıcer Arıetınum* L.) Cultıvated In Konya

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Abstract
This study was carried out in order to determine the quality characteristics of some chickpeas cultivated in Konya. Eight different types of chickpeas were used in the study (Azkan, Gökçe, Çağatay, Yaşa-05, Işık-05, Arjantin, İspanyol, Meksika). Physicochemical properties of chickpea varieties were based on quality parameters such as thousand grain weight, protein content, cookability, water uptake capacity, hydration coefficient and total defect. Variations were determined in the statistical analyses among the varieties according to the obtained values in terms of thousand grain weight, protein content, cookability, water uptake capacity, hydration coefficient and total defect properties. This variation also significantly affects the growth conditions of the chickpea grains in terms of genetic structure among varieties. The quality parameters in the study showed differences on the varieties. According to the results obtained from the study, the physicochemical characteristics of some chickpeas cultivated in Konya ecology were statistically significant ($p<0.01$).

Keywords: Chickpea, quality, physicochemical properties, protein

INTRODUCTION

In order to maintain balanced and sufficient nutrition of the country's population, edible grain legumes are important in herbal products. One of the edible grain legumes which contain 18.0-31.6 % of protein in their grains and which is rich in vitamins and minerals is chickpeas. Increasing plant production, in other words, getting more quality products from the unit area depends primarily on the level of land productivity as well as other applications and measures. Chickpea farming is generally carried out in our country with varieties of population characteristics. The yield, quality, disease and pest resistance of these populations are not clear. In developed agricultural countries, chickpea farming is done with standard varieties. However, the most suitable material that can be used in rehabilitation studies is the local varieties of that region. Because local varieties have been selected for many years, they are resistant to unfavorable environmental conditions. Since there are genotypes that can fit various conditions in populations, they easily adapt to climate changes over the years.

In a study on the quality characteristics of some chickpea varieties; it was found that there was no significant effect of inheritance on the protein ratio but there was an important effect on 100 grain weight. Environment x Genotype x, Genotype x Seasonal factors were also reported to be significantly more effective for hundred grain weight and cooking times [13].

Studies on the agronomic and technological characteristics of some chickpea varieties suggested that there was a positive relationship between water uptake capacity and hundred grain weights; there was a negative and significant relationship between protein ratio and cooking time and water index; and a positive and significant relationship between protein ratio and swelling capacity. A positive and significant relationship was discovered between oil ratios and cooking time, swelling capacity; and again a positive and significant relation was found between cooking time, water uptake capacity and water index [7].

In a study conducted with the aim of determining the effects of the environment on some chickpeas, it was found out that the varieties and the environment affected the values of dry weight, wet weight, dry and wet volume, water intake index, water uptake capacity and swelling capacity; and only environment had effect on dry cooking time and protein ratio. Besides, it was discovered that there was a positive relationship between cooking time and hundred grain weights [10].

In a study on chemical and physicochemical analyses of chickpea and lentil, it was determined that swelling index was 1.82% -2.27% and the swelling capacity was 0.094-0.255 ml / grain in chickpea [14]. It was reported that the difference in water intake rates according to chickpea variety, line and population depends on the grain characteristics of the genotype itself [14]. There is a significant relationship between the water absorption rate of the seed and the cooking time in legumes. Varieties with hard seed shells cannot draw as much water as those with normal shell hardness. In addition, factors such as growth environment, environmental conditions, maturity status of the product during harvest, temperature condition during harvest and harvesting methods (manual, machine) are effective on hard shell formation.

Some chickpeas cultivated in agriculture were collected in Konya to determine the problems caused by wrong seed selection in current chickpea agriculture and to investigate the solutions. Some quality characteristics of these chickpea varieties (Azkan, Gökçe, Çağatay, Yaşa-05, Işık-05, Argentina, Spanish and Mexico) were tried to be determined (thousand ground weight, protein content, cookability, water uptake capacity, hydration coefficient and total defect).

MATERIAL AND METHOD

In this study, eight different types of chickpeas (Azkan, Gökçe, Çağatay, Yaşa-05, Isik-05, Argentina, Spanish, Mexico) cultivated in Konya were used. Some quality characteristics of these chickpea varieties were determined (thousand grain weight, protein content, cookability, water uptake capacity, hydration coefficient, total defect).

Thousand Grain Weight: 100 seeds from each sample were counted in three replications randomly and their weights were recorded. This weight was multiplied by 10 to

find a thousand grain weights [5].

Protein content: Protein ratio was obtained by determining the amount of nitrogen in the seeds by the Kjeldahl method, multiplying by the constant coefficient of 6.25 and calculating as % [2].

Cookability: 20 grams of chickpeas are kept in autoclave for 30 minutes at 200 ° C in 200 ml of water. The sample from the autoclave is weighed again. Cookability is found by means of calculation [5].

Water Intake Capacity: 100 seeds randomly selected from each variety were soaked in a ratio of 1/4 and waited for 16 hours. The percentage of the seeds which are not swollen is found with calculation [5].

Hydration Coefficient: The swelling index is obtained by dividing the volume of the grain after soaking into the volume before soaking and this value indicates how many times the grain takes water according to its original volume.

Total Defect: The total defect is the sum of the abnormal seeds that are swollen, broken or physically damaged and initially very small [5]. The percentage of total defects is found with calculation.

Statistical Analyses

The test results were combined through environments, subjected to analysis of variance and Duncan multiple comparison test was applied to differences between the significant averages [4].

RESEARCH RESULTS AND DISCUSSION

Some quality characteristics of 8 different chickpeas cultivated in Konya region were investigated and the results were given in the headings below.

Thousand Grain Weight (g)

The results of variance analysis performed on the data of thousand grain weight which was dealt with in a study on 8 different chickpea varieties grown in Konya province were statistically significant. Thousand grain weights of the varieties vary between 388.33 and 540.33 g. The lowest thousand grain weight was in Gökçe (388.33 g) and the highest thousand grain weight was in Argentina (540.33 g). Environment x Genotype x, Genotype x Seasonal factors were reported to have a significant effect on the cooking time and thousand grain weight [13].

Protein ratio (%)

The effects of chick peas on the protein ratio varied among the varieties, and these differences were statistically significant. It was determined that the protein ratios between these chick peas varieties varied between 19.1% and 26.9%. The highest percentage of protein in chickpea varieties was found in the Yaşa-05 (26.9) and the lowest in the Mexican variety (19.1). It was determined as a result of the variation analysis that both the variety and the environmental conditions are effective on the protein ratio of chick peas.

Cookability

The cooking test is an indication of the quality and nutritional value of the grain. Cooked grain means the gelatinization of starch and also the softening of the grain, and dissolving in the mouth easily. This is affected by the ability of the grain shell to pass hot water, the chemical composition of the cell wall, the inherent stiffness of the cotyledon and the physical properties of the grain [14].

The cookability percentage of eight different chickpeas cultivated in Konya varies between 92 and 121%. The cookability was found to be 92% in Argentina variety and it was 121% in Işık-05. The percentage of cookability between the varieties of chickpeas varied, and this difference was statistically significant ($p < 0.01$). The Argentine variety, which had the highest thousand grain weight, was found to have the lowest percentage of cookability among the varieties of chickpeas. In general, varieties with smaller sizes tend to be cooked faster than the larger ones [15].

In addition to factors such as seed shell composition and environmental conditions, storage conditions and chemical composition also affect cooking time [7; 11]. Growing conditions, as well as genetic structure, significantly affect the cooking time of the grains. Factors such as growing Ca and Mg in high soil and storing them for a long time under conditions that are not suitable (higher than 13-14% humid and 10^0C warehouse temperature) also negatively affect cooking quality in edible grain legumes [1; 9].

Water Intake Capacity

The water intake capacities of chickpea grains differed between the varieties and these differences were statistically significant ($p < 0.01$). It was determined that the water uptake capacity of these varieties varied between 13.93% and 28.05%. The lowest water uptake capacity was determined in the Mexican variety (13.93) and the highest water uptake capacity was found in the Yaşa-05 (28.05).

The water uptake capacity varies depending on the composition of the seeds, the cell wall structure and the condition of the cells in the seed. There is a strong and positive relationship between seed mass and water uptake capacity [8]. It was reported that the difference in grain water intake rates according to chickpea variety, line and population depends on the grain characteristics of the genotype itself [12].

There are many factors affecting quality criteria in legumes such as variety, growing area, soil and climatic characteristics, maturity status, storage conditions, phytic acid ratio of the grain and the thickness of grain [3].

Hydration coefficient

The hydration coefficient of chickpea grains showed differences among the varieties and these differences were statistically significant ($p < 0.01$). The hydration coefficients of these varieties were found to vary between 119.3% and 142.6%. The species with the lowest hydration coefficient was Yaşa-05 and the highest was determined in the Mexican variety. The hydration coefficient is a very valuable parameter for both consumers and producers. Seeds with low hydration coefficient cannot absorb water efficiently [3].

Total Defect

The results of variance analysis according to the total defect data examined in the study on 8 different chickpea varieties grown in Konya region were statistically significant ($p < 0.01$). The total defects of the varieties range from 20.64% to 32.60%. The lowest total defect was determined in Argentina chickpea variety. The Argentina variety, which has the highest thousand grain weight, was found to have the lowest percentage of cookability and total defect among the varieties of chickpea.

CONCLUSION

In our study on 8 different chickpea varieties grown in Konya region, very important differences were determined between genotypes in terms of some quality criteria. As well as the genetic structure among the varieties of chickpea grains, the growing conditions also affect this variation significantly. However, the reasons for these differences in terms of quality characteristics of the varieties need to be fully explained. The fact that the materials are collected from different locations and the lack of knowledge on the applied cultivation techniques can affect the sensitivity of the results.

Table 1. Physicochemical properties of some chickpea varieties (*cicer arietinum* l.) cultivated in Konya

Genotype	g	%				
	Weight of 1000 seeds	Protein content	Cookability	Non-soaker	Hydration coefficient	Total defect
Azkan	411.67	24.06	104.65	19.25	132.97	23.29
Gökçe	388.33	22.02	108.48	26.27	138.56	32.00
Çağatay	434.00	20.66	99.50	19.91	130.75	23.52
Yaşa-05	396.33	26.88	108.90	28.05	119.53	32.60
Işık-05	412.00	19.69	121.00	19.77	140.01	28.82
Arjantin	540.33	20.75	91.97	15.80	133.71	20.64
İspanyol	467.00	22.60	100.75	20.18	141.86	31.23
Meksika	514.00	19.10	110.52	13.93	142.57	31.81

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