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RESEARCH ARTICLE

Determination of Characteristics Properties of Some Sunflower Seed in Erzurum and Iğdır Irrigated Conditions

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ABSTRACT

This research was carried out between the years of 2015-2016 in order todetermine the seed properties of some sunflower genotypes in Erzurum and Iğdır irrigated conditions. In this study seven type of (Coral, P4Ll62, Pactol, Lg5580, Tarsan, 08Tr003, Cadix) sunflower cultivars were used and grain length, width, thickness, dehulled seed (internal rate of grain) and shell ratio of the samples were examined. In this study significant were found the other features except seed width and thickness where some sunflower of grown in different location. In the designed location in Erzurum; grain length, width, thickness, dehulled seed were determined as 11.8-13.4 mm (Coral: P4Ll62), 5.8-6.2 mm (Coral: Lg5580 and Tarsan), 3.5-4.4 mm (Coral and Pactol: Cadix), 16.3-21.3 mm (Cadix: P4Ll62 and Tarsan 1018) and 56.3-76.3 mm (Tarsan and Cadix: P4Ll62). In the designated location in Iğdır, these values ranged between 11.5-14.2 mm (Coral: P4Ll62), 5.5-6.5 mm (Pactol: Tarsan 1018 and Cadix), 3.6-4.1 mm (Coral and Pactol: Cadix), 16.7-26.7mm (P4Ll62 and Pactol: Cadix) and 66.7-81.7 mm (Pactol: Cadix) respectively. According to these results, the designated location for this research in Iğdır come in to prominence in terms of the investigated properties.

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Introduction

Sunflowers *(Helianthus annus* L.) is one of the world's leading oilseed crops that belongs to Asteracae (Compositae) family, which originated from North America (Bukhshet. al., 2011). Sunflower oil ranks second in the production of vegetable oil in the world. Sunflower is grown on 25.382 million ha in the world, producing 47.6 million tones of total grain yield (USDA, 2017) and so comprising an important part of the world oil industriy. Sunflower plants have great potential. It is first grown for oil, which is mainly used for human consumption, (bread, pastry, ice cream, chocolate, cookies) but it is also employed in the processing industry and the feding of livestock. In the last years, sunflower oil has been used for biodiesel production.

As in all cultivated plants, the characteristic properties of the grains sunflower are closely related to the yield. These characteristics vary between genotypes and locations.

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Therefore, cultivar selection in sunflower can have a considerable effect on the yield and yield components.

Therefore, in order to achieve high efficiency suitable varieties that have adaptations for the region conditions should be selected. The use of suitable cultivar and location are very important to increase the yield of the sunflower. Fick (1978) found out that the length of the seed changed between 6-25 mm and the width is around 3-13 mm in sunflower cultivar. Çoşge (2007) indicated that the length and width of the seed varied between 1.09-1.41 cm and 0.51 to 0.72 cm under Ankara conditions respectively. Özgödek (1993) detected that grain height changed from 1.41 to 2.8 cm, grain width was 0.6 to 0.8 cm and dehulled seed 46 to 57% under Erzurum condition. Seifi and Alimardini (2010) have displayed that the grain height, grain width and grain thicknesse of the sunflower cultivar varied from 1.21 to 1.25 cm, 0.58 to 0.64 cm ve 0.39 to 0.41 under Iran condtions respectively. The most important component providing high yield is to use the best adapted cultivars in any region.Cultivars may show highly different yield performances depending on soil and climatic conditions from one region to another, so the best cultivars should be

determined for any location. The objective of this study is to determine the effects of location and cultivar on some yield components of seven oil sunflower seeds.

Materials and Methods

The study was conducted in the irrigated experimental areas of Eastern Anatolia Agricultural Reaserch Institute (Erzurum) and Igdır station (Iğdır) in 2015-2016. Seven sunflower (*Heliannus Annus L.*) cultivars were evaluated in two different locations in terms of the determination of some characteristics properties of oil sunflower seed. The materials used in the experiments were provided by Trakya Agricultural Research Institute.

Field experiments were estabished on May 22th, 2015 and May 12th, 2016 in Erzurum; April 8th, 2015 and April 19th, 2016 in Iğdır. Seven sunflower cultivars were sown in a randomized complete blocks design with four replications. During the sowing, three seeds were sown in each hill with 70 cm row spacing by hand on parcel. Then the plots were hand-thinned to one plant per hill when the plants were at the four to six-leaf stage. Plot size was 4 rows, 2.8 m in width and 8.1 m long. Nitrogen as Ammonium sulfate was supplied at sowing (50kg N/ha) and again during vegetative growth before the achor (50kg N/ha) in both years. Phosphorus was applied in the doses of 80 kg ha^{-1} for once while preparing the seedbed.

The sunflower plants were harvested by hand on 26th September in Iğdır, 18th August in Erzurum when the back of the sunflower head had turned from green to yellow. At the harvest, 500 g samples were selected from each plot in order to determine grain length, width, thickness, dehulled seed (internal rate of grain) and shell ratio. Grain size, width and thickness were determined by measuring the caliper. Grain internal ratio = internal weight (g) / shell weight (g) x 100 calculated according to formula. The shell ratio was measured by proportioning the weight of the shell to the seed weight. The results were analyzed using the JMP 7,0 (Copyright © 2007SAS Institute Inc,) package program and values between the avereges were determined with the LSD multiple comperasion test. The results were presented as two-year averages in the article.

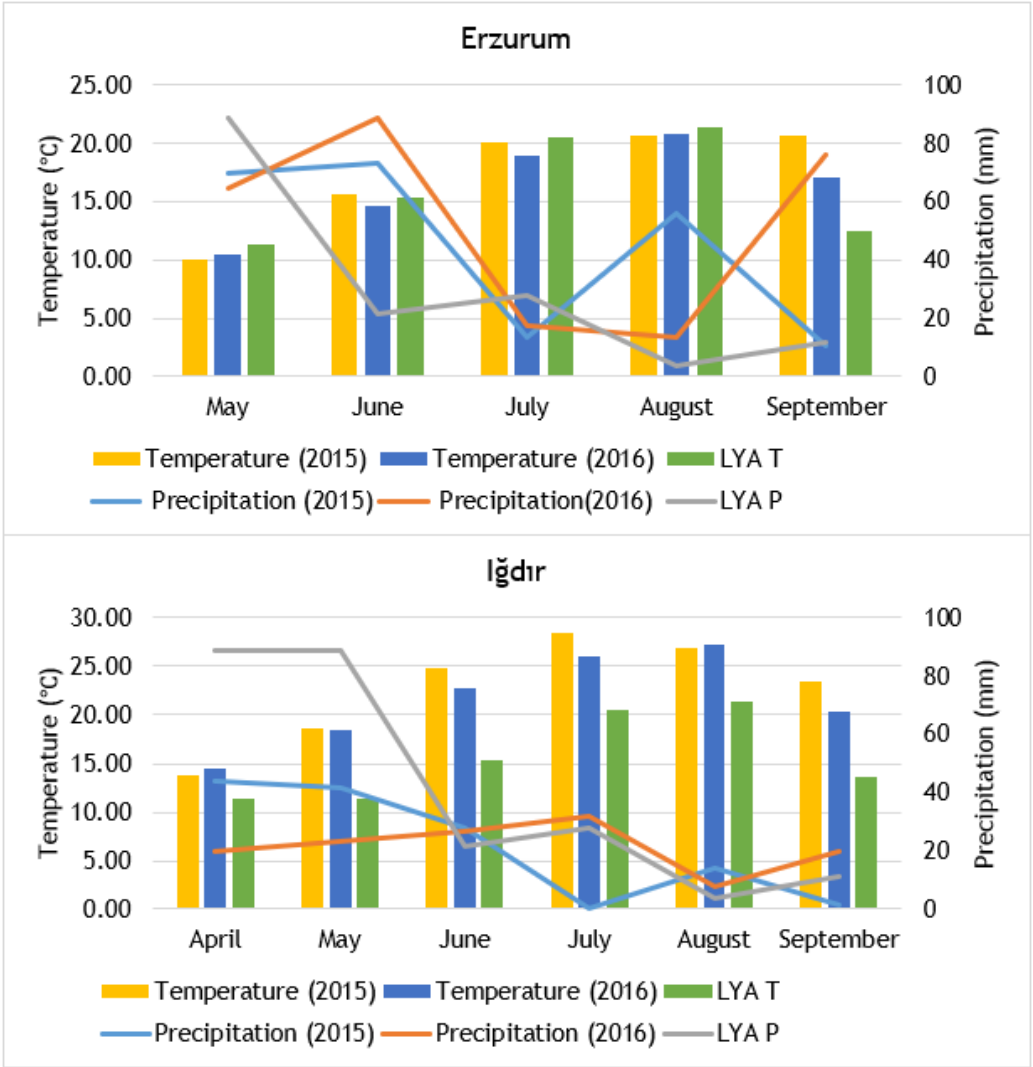

Figure 1. Monthly and growing season precipitation, temperatures of study months in Erzurum and Iğdır research area, 2015, 2016 and long years average (LYA)

Both locations are situated in the Eastern Anatolia Region; however, their characteristics are not smilar. Erzurum is the province which has the highest altitude in the Eastern Anatolia Region with its location 1860 m above sea level. Winter period is long, cold and snowy. Summer months are relatively cool and short. Last frosts of spring may extend to the month of May and first frosts of Autumn start in September. Therefore, the plant cultivation season is shorter in Erzurum than in other provinces. Iğdır is the province which has the lowest altitude in the region with its 876 m altitude. The plant cultivation season is long in Iğdır which has the characteristics of microclimate in the Eastern Anatolia Region. Summer months are hot and dry, and the evaporation is high. Thus, agricultural soils usually have salty characteristics.

The monthly rainfall, average temperatures, and relative humidity characteristic of Erzurum location, and in Iğdır data presented in Figure 1. The air temperatures between April and September was higher than the long-term average in both location. There was considerable variability in rainfall amounts and distribution from location to location and year to year. The total precipitation research years were found to be higher than long-term mean in Erzurum location. And in Igdır location it was lower. The average rainfall in Erzurum (138.8 mm) was higher than Iğdır (118.2 mm). When Figure 1 is examined, it is seen that Iğdır has a got hotter and drier condition when compared to Erzurum in every two yers.

Locations are alike in terms of the soil texture class (Clay Loamy). They are different with respect to electrical conductivity (EC), pH, $CaCO_3$ and available K_2O and P_2O_5 for plants. The soils in Erzurum location have the characteristics of being unsalted, small traces of alkaline and lime, differently from Iğdır location. From April to September, the temperature was slightly higher than LTA (long-term average).

Table 1. Some physcial and chemical properties of soils in the research areas

Soil Properties	**Erzurum**	**Iğdır**
Texture lass	Clay-Loamy	Clay-oamy
EC (ms cm^{-1})	0.5	3.1
pH	7.3	7.8
$CaCO_3$(%)	1.9	5.6
K (kg K_2O ha^{-1})	1200	1090
P (kg P_2O_5 ha^{-1})	64	74
Organic matter (%)	1.28	1.96

Results and Discussion

Grain Length

Sunflower cultivars average grain length of the seed examined in Erzurum and Iğdır, 12.3 mm and 12.7 mm respectively ($p>0.05$) and also results were presented at Table 2. This insignificant difference was earlier plantation and varying weather conditions (evaporation and temperature). The grain length of sunflower cultivars changed from 11.8 to 13.4 mm in Erzurum location and from 11.5 to 14.2 mm in Iğdır. Differences of the grain length between the oil sunflower cultivars were found to be significiant at two location. It was determined that cultivars had different grain lengths in both Erzurum and Iğdır. However, longer and shortest grain lenghts were measured P4L162 (13.4, 14.2 mm) and Coral (11.8, 11.5 mm) cultivars at two locations. Similarly, different studies where the grain length varied between 9.52 to 28.0 mm support these results (İncekara, 1973; Fick, 1978; Gupta and Das 1997; Duca and Glıjın, 2013; Gülve ark., 2017).

Grain Width

In the study, differences of grain width among the genotypes examined were significant $p<0.05$ in the Iğdır location, while in the Erzurum location was not statistically significant. The highest grain width was obtained from Lg5580 and Tarsan cultivars in both locations (Table 3). Lg5580 and Tarsan cultivars measured 6.2 mm grain width in Erzurum which was followed by Cadix, Pactol and Coral cultivars (5.9 mm). Tarsan and Cadix cultivars while taking to the first order (6.5 mm) it was followed by 08Tr003 (6.3 mm) in Iğdır. In Erzurum and Iğdır locations, the shortest grain width was measured in 08Tr003 and Pactol (respectively 5.8 and 5.5 mm) cultivars. The grain width values are very close to each other in Erzurum and Iğdır locations. Gupta and Das (1997), found that grain width average 5.12 mm, Seifi and Alimardani (2010) reported that the grain width was between 5.79-6.38 mm Gül et al. (2017)as a result of research the grain width shifted between 4.9-5.3 mm. The results obtained from the research are similar to the values reported by the above-mentioned researches.

Grain Thickness

Significant differences were not observed in the grain thickness of sunflower genotypes.Results show that grain thickness ranged from 2.5 mm to 3.6 mm between genotypes. Tarsan 1018 and, P4ll62 had higher grain thickness values than the others. In both locations, the mean grain thickness values of the genotypes (respectively 3.9 and 3.8 mm) were found to be very close to each other. Tarsan 1018 and P4ll62 which had a higher grain thickness

value in both locations (3.6 mm). Researchers such as Gupta and Das (1997), Jafari et al. (2011), Oraki et al. (2011), and Öztürk et al. (2017) determined that grain thickness were different in sunflower depending on genotypes and locations.

Table 2. Grain lenght, width and thickness of some sunflower cultivar in Erzurum and Iğdır conditions

Cultivar	Grain lenght (mm)			Grain width (mm)			Grain thickness (mm)		
	Erzurum	Iğdır	Mean	Erzurum	Iğdır	Mean	Erzurum	Iğdır	Mean
CORAL	11.8^{b}	11.5^{c}	11.6^{c}	5.9	5.8^{bc}	5.9	3.5^{c}	3.6	3.4
P4LL 62	13.4^{a}	14.2^{a}	13.8^{a}	6.1	6.1^{ac}	6.1	4.0^{ac}	3.9	3.6
PACTOL	12.4^{b}	11.9^{bc}	12.2^{bc}	5.9	5.5^{c}	5.7	3.5^{c}	3.6	3.0
LG5580	12.4^{b}	13.0^{ab}	12.7^{b}	6.2	6.2^{ab}	6.2	3.8^{bc}	3.9	3.5
TARSAN	12.0^{b}	12.9^{ab}	12.4^{b}	6.2	6.5^{a}	6.4	4.2^{ab}	4.0	3.6
08TR003	12.3^{b}	13.3^{ab}	12.8^{b}	5.8	6.3^{ab}	6.0	4.1^{ab}	3.8	2.5
CADİX	12.0^{b}	12.5^{bc}	12.2^{bc}	5.9	6.5^{a}	6.2	4.4^{a}	4.1	3.1
Cultivar (C)	**	*	**		**		**		
Location (L)			*						
*C*L*									
Mean	12.3b	12.7a	12.5	6.0	6.1	6.1	3.90	3.8	3.2 b
C.V (%)	4.2	7.30	5.8		6.7		1.92		
LSD (C)	0.8	1.4	0.73		0.6		0.5		
LSD(L)									
LSD (C*L)			0.4						

*: 0.05, ** 0.01, Capital letters within the same column and row are significaly different at 1%.

Shell Ratio

The little shell ratio rate is a desirable property in sunflower because it has a direct effect on the fat ratio. The shell ratio values varied between 10.0-21.3 mm in Erzurum, between 16.7-28.3 mm in Iğdır.

The differences between sunflower cultivar were not statistically significant for shell ratio values in both location and in a two location average. The differences between the locations were statistically significant. Since the grain length and grain thickness of sunflower cultivars were higher under the weather condition of Iğdır, dehulled seed values were found to be higher. P4ll62 (23.1 mm) cultivar, which has high grain length and grain thickness, has a higher shell ratio than shortest length and thickness genotypes in both two locations. Shell ratio was higher in Iğdır (23.2 mm) location than Erzurum (17.9 mm) location. This may be due to the better environmenteal conditions and earlier plantations. Yazıcıoğlu and Karaali (1983) 26-35%;Bayrak and Bayraktar (1995) 21.54-23.32%; Öztürk et al. (2008) 23.2-31.5%; Gül et al. (2017) 12.7-16.1% found that the dehulled seed percantage between among changed.

The Ratio of Dehulled

The high internal rate of the sunflower is its quality feature (Arıoğlu, 1999).As in the shell ratio, differences in genotypes ratio of dehulled in both locations were not statistically significant (Table 3). The impact of locations on the ratio of dehulled was insignificant (Table 3). Dehulledin Erzurum was 66.5%, while it was (74.5%) in Iğdır. Therefore 8.0% lower ratio of dehulled was determined.The highest ratio of dehulled in Iğdır location was determined in 81.7% Cadix variety and the lowest 66.7% in 16Tr60 and genotype (Table 3).

Table 3. Shell ratio and dehulled seed of some sunflower cultivar in Erzurum and Iğdır conditions

Cultivar	Shell ratio (%)			Dehulled seed (%)		
	Erzurum	Iğdır	Mean	Erzurum	Iğdır	Mean
CORAL	18.8	26.7	22.7	62.5	78.3	70.4
P4LL 62	21.3	25.0	23.1	76.3	73.3	74.8
PACTOL	17.5	16.7	17.1	66.3	66.7	66.5
LG5580	20.0	20.0	20.0	63.3	75.0	69.2
TARSAN	21.3	23.3	22.3	56.3	71.7	64.0
08TR003	10.0	23.3	16.6	65.0	75.0	70.0
CADİX	16.3	28.3	22.3	56.3	81.7	69.0
Cultivar (C)						
Location (L)			**			**
*C*L*						
MEAN	17.9^{b}	23.2^{a}	20.6	66.5^{b}	74.5^{a}	69.1
C.V (%)			13.4			10.2
LSD (C)						
LSD(L)						5.1
LSD (C*L)			0.4			

*: 0.05, ** 0.01, Capital letters within the same column and row are significaly different at 1%.

In Iğdır location, the highest and lowest ratio of dehulled were measured in Cadix (81.7%) and 16Tr60 cultivars (Table 3). The highest ratio of dehulled was obtained in P4Ll62 (76.3%) cultivar in Erzurum.This may be due to differences in the grain size of the cultivars different. The ratio of dehulled was higher in Iğdır (74.5%) location than Erzurum (66.5%) location. The differences between the locations were statistically significant. The studies conductud with different cultivars in different locations revealed that the ratio of dehulled sunflowers varies between 55.5-77.5% (Kara, 1991; Karaaslan et al., 2007; Gül et al., 2017).

Conclusion

In the research conducted in Erzurum and Iğdır ecological conditions in 2015-2016 statistically significant differences were found among the other characteristics except the grain width and thickness of the sunflower oil.The average grain size determined in oil sunflower genotypes was 12.5 mm, width was 6.1 mm, thickness was 3.3 mm, shell rate was 20.6% and the ratio of dehulled was 69.1%.According to these results, it was determined that sunflower grains had good properties at two locations while Iğdır location was especially superior in terms of the ratio of dehulled.

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