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Agronomic Characteristics of Domestic and Abroad Originated Lentil Genotypes

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ABSTRACT

This research was established under the ecological conditions of Nevşehir in the Central Anatolia Region, whereby lentil agriculture is practiced in Turkey. Research was carried out in order to reveal the important features of indigenous and exotic lentil genotypes which may be the basis for future breeding studies. A total of 220 domestic and foreign originated lentil genotypes and 4 varieties (Pul Mercimek, Yerli Kırmızı, Çağıl, Fırat-87) as standard were grown. Field trial was established on April 10, 2017 according to the Augmented trial design with 5 blocks. According to the results of the research, following ranges were determined; 50% flowering days 46.5-82.00 days, vegetation length 79.85-120.85 days, plant height 17.68-43.99 cm, number of pods per plant 9.21-440.62 pieces, weight of 1000 seed 12.92-78.31 g, seed yield 0.19 -35.88 g plant^{-1} were determined. As a result; the lentil genotypes were found on the morphological and agricultural characteristics of our selected varieties. These superior genotypes can be used as material in breeding studies for future programs.

1. Introduction

The rapid increase in the world population the decrease in production resources in line with this increase, the inability to use the technology in a favorable and efficient way, the negative environmental conditions and the regional domestic and foreign wars bring the problems of hunger and nutrition among the most important problems of humanity. To solve these problems, nutrient sources should be rich in properties such as energy, protein, vitamins and mineral substances and studies which increase nutrition, production and consumption of these foods should be carried out. In addition, due to the high costs of raising animal products, and because of the fact that their deterioration is quick and difficult to store and conserve, especially developing countries tend to plant herbal products which have higher amount of vegetable protein that can be stored for a longer period (Erkal 1981; Ceyhan et al 2014; Kahraman & Önder 2018). Edible legumes both have a rich structure in terms of nutritional elements, amino acid contents and cheaper than animal products significantly increased the importance of these plants (McPhee et al 2012; Kahraman 2016).

Lentil plants which have an important place in edible seed legume in terms of their values and properties with 23-31% protein content, vitamins A, B, C and K, as well as calories from soybeans (Akçin 1988; Ceyhan et al 2012). In addition, threonine and lycine amino acids, which are found in lentil plant proteins have an important role in human nutrition and these amino acids are almost closer to the values of beef (Aydoğan et al 2003). Lentil; high protein content and quality compared to cereals, 23-31% protein content, and rich in vitamins and minerals, and thereby improving amino acid balance when consumed alongside cereals (Baysal 1988; Pellet 1988; Özkaya et al 1998; Önder & Kahraman 2008), it is a legume having an important place in eliminating people's hunger due to high fiber content (Trowell et al 1985; Önder & Kahraman 2009).

Lentil is one of the oldest edible legumes that have an important place in both human and animal nutrition and its resistance has been known in agriculture dates back about 8000 years (Pellet 1988). The amount of nitrogen that is bound to soil symbiotically in edible seed leguminous plants varies according to plant spe-

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cies. This amount of lentils is about 8.4 kg da^{-1} (Sepetoğlu 2002; Önder et al 2013). Lentil; as it increases soil fertility, it is preferred to have an important place in animal nutrition since it contains the least cellulose in the stalk and straw compared to other plants (Aydoğan et al 2003; Kahraman 2017).

While no many issues encountered of lentil varieties in Turkey, major problems are faced in the supply of seed to be used. In the production of lentils in Fırat-87, Çağıl, Yerli Kırmızı and Pul Mercimek a variety of indigenous local village varieties are common, and the seeds of these varieties are absent or inadequate. The producer produces his own seed with the varieties in his hand, and local varieties are used in these places under the absence of these varieties. It is known that local varieties show very large genetic variability and are very well adapted to the changing conditions of the region (Lázaro et al 2001; Ceyhan & Kahraman, 2013; Kahraman et al 2015; Harmankaya et al 2016). However, due to their productivity stability, mechani-zation and other problems, production and yield values change continuously and sometimes become risk factors. Nevertheless, producers prefer these local varieties in small and especially stony areas. By evaluating the foreign origin varieties in terms of country and region, it is necessary to bring more modern varieties instead of old or local varieties, to create variability and to benefit from improved varieties with efficiency and other characteristics.

Lentils have an important part in human nutrition both in our country and in the world. The main purpose of this study is to determine the physiological characteristics (yield components) which have a positive effect on plant yield and to select the most efficient ones in domestic or foreign genotypes.

2. Materials and Methods

This research is a part of MSc thesis and was carried out in the farmer's fields in the Karapınar village of Acıgöl district of Nevşehir province, 220 indigenous and exotic lentils from Selcuk University, Faculty of Agriculture, and Field Crops Department were used as material. The origin of the 220 genotypes used in the experiment is shown in Table 3. As standard varieties; Fırat-87, Çağıl, Yerli Kırmızı, Pul Mercimek were used.

Table 1
Soil analysis of the experimental area.

Soil parameters	0-20 cm
Water at saturation (%)	45
Total salt (%)	0.001
Soil pH	7.05
Lime (%)	1.58
Plant available phosphorus (kg da^{-1})	17.26
Plant available potassium (kg da^{-1})	78.35

The study was planned as 5 blocks according to the Augmented trial design, and 4 standard cultivars of 44 genotypes + 4 rows of each were made to each block.

The length of each row is 1m, the distance between the rows is 40 cm, and the distance on the row is 5 cm (20 seeds per row) and the cultivation was by hand. In the light of this information, the length of our experiment [44 x 0.4 m] + [(4 standard x 4 rows) x 0.4m] = 26m length, 7m wide area including space, the total area was planted to 182 m_2 for the trial.

Regional climate data is presented in Table 2. While the average temperature was 17.3$_0$C for many years, it was 18.16 ^{0}C in 2017. When the average total rainfall was 31.04 mm according to the data of many years, it was determined as 27.58 mm in 2017. When the relative humidity was 51.74% for many years, it was determined at 49.02% in 2017.

In the analysis, it was determined that the soil structure was a sandy-loam and the soil reaction was neutral (pH: 7.05). The lime value was around 1.58% and very low range. In addition, it was found that there was no salt (0.001%) problem, and phosphorus (17.26 kg da_{-1}) and potassium (78.35 kg da_{-1}) were generally sufficient in the area of the experimental field (Table 1).

In the field where the experiment was established, it was plowed with rock plows with the beginning of autumn rainfall, and in early spring (in March) the crowbar + harrow was drawn. On 10 April 2017, the cultivation of the experiment was done by hand while the soil was mellowness. 20 kg da_{-1} DAP (Diammonium Phosphate: 18% N, 46% P) fertilizer was applied in all the tested blocks.

The trial area was surrounded by wire around the external damage. In order to avoid confusion in the lines, each row and block is indicated by labels. Sprinkler irrigation system was established as an irrigation system and irrigation was done according to water demand and precipitation regime of the plant. According to the weed population, weed was taken by hand 3 times in April and May, and observation checks were conducted by hand while fighting regularly with weeds. When 90% of the plants in the block are ready for harvest (when the color of the leaves was yellow and the lower leaves begin to fall off, when the pods and seeds are hardened), the seeds of the next plants were harvested manually so that the seeds of each plant were packaged separately and then they were mixed after waiting without heating.

On the 220 lentil genotypes; the values of 50% flowering days, vegetation length, plant height, number of pods in the plant, 1000 seed weight, seed yield were evaluated. Observations and measurements were made according to TTSMM (Ministry of Food, Agriculture and Livestock Seed Registration and Certification Center Directorate) (TTSM 2018).

Table 2
Climate data of the province of Nevşehir Acıgöl District of the vegetation period.

Months	Monthly average temperature (^{0}C)		Monthly total rainfall (mm)		Monthly average relative humidity (%)	
	Long time (30 years)	2017	Long time (30 years)	2017	Long time (30 years)	2017
April	10.1	10.1	50.1	38.9	57.8	50.3
May	14.6	14.4	57.9	33.5	56.0	55.3
June	18.6	19.3	33.9	32	51.7	53.0
July	21.8	23.9	8.4	12	46.6	37.4
August	21.4	23.1	4.9	21.5	46.6	49.1
Total Average	17.3	18.16	155.2	137.9	51.74	49.02

Table 3
The origin of lentil genotypes used in the research, local name.

ACCESS NO	ORIGIN	LOCAL NAME	ACCESS NO	ORIGIN	LOCAL NAME
PI 620882	CHİNA	LE-00-01	PI 533693	SPAİN	VERDİNA
PI 320936	FSU	DAGHESTANICA	PI 612310	PAKİSTAN	W6 19112
PI 320950	ARMENİA	ASTARAKSKAJA MESTNAJA	PI 612307	BULGARİA	8,60E+287
PI 345553	FSU	IRANSKAJA 6	PI 612282	SYRİA	HAREM 10
PI 343029	UKRAİNE	NEW MOOM	PI 612305	BULGARİA	84205001
PI 606604	BULGARİA	NASLADA	PI 631395	SYRİA	ALI DAYI
PI 319366	MEXİCO	LENTEJAS	PI 612300	TURKEY	WJK94-T51
PI 612280	SYRİA	EL-SUEYDA 8	PI 638619	SYRİA	GACHSARAN
PI 636683	ARMENİA	ARM 170	PI 612284	SYRİA	SAFEETA 12
PI 612287	SYRİA	VAN WİLSON 16	PI 308608	SYRİA	BALADI
PI 612299	TURKEY	WJK94-T50	PI 308611	SYRİA	NORTHERN RED
PI612285	SYRİA	HOMS 14	PI 606587	PAKİSTAN	LENTİL #2
PI 606603	NEPAL	MASURO (DHEAL)	PI 490289	FRANCE	MARIETIE
PI 643448	SYRİA	KEF	W6 27754	USA	1048-8R
PI 312175	MEXİCO	LENTEJA	PI 345640	FSU	ZELENAYA AHUN.
PI 636553	TURKEY	MP-10	PI 606637	CZECHOSLOVAK	LENKA
PI 635040	SYRİA	OZBEK	PI 379368	SERBİA	IVANKOVSKA
PI 636685	USA	ILL 9843	PI 543069	PAKİSTAN	MASOOR 9-6
PI 631396	SYRİA	IDLİB-2	PI 477290	PAKİSTAN	
PI 533691	SPAİN	LENTEJA VERDİNA	PI 606606	BULGARİA	STONKA-1
PI 312176	MEXİCO	LENTEJA	W6 27781	USA	PARDİNA
PI 606607	BULGARİA	STONKA-2	PI 577239	BULGARİA	STELA
PI 477298	PAKİSTAN	9+6	PI 345631	FSU	PENZENSKAYA 14
PI 636515	BULGARİA	N 440	PI 308609	SYRİA	HOMSI/KORDI
PI 612286	SYRİA	DOMMA 15	PI 339265	TURKEY	YERLİ KUQUK
PI 320949	FSU	TADJIKSKAJA 95	PI 612312	NEW ZEALAND	TİTORE
PI 343029	FSU	PETROV'S JUBILEE	PI 486127	USA	
PI 636685	USA	ILL 7502	PI 577238	BULGARİA	JANA
PI 357225	SERBİA	SVETI NIKOLSKA	PI 557499	USA	PALOUSE
PI 606589	SPAİN	LENTEJA PARDİNA DE LEON	PI 577237	BULGARİA	NASLADA
PI 606585	BULGARİA	NASLADA	PI 564719	USA	BENEWAH
PI 357224	MACEDONİA	LOKALNA EDRA	PI 298921	ITALY	ALTAMURA
PI 612281	SYRİA	HURAN 9	PI 477922	USA	TEKOA
PI 533692	SPAİN	CASTELLANA	PI 606643	UKRAİNE	KROKHMAL #6
PI 592998	SYRİA	ILL 5588	PI 379369	SERBİA	VELESKA
PI 320954	HUNGARY	SLOVENIAN KRAYODA	PI 344077	TURKEY	ILL 602
PI 606590	SPAİN	LEREN	PI 343026	FSU	TADZIR'S 95
PI 606638	CZECHOSLOVA-KİA	PLAJEVSKAJA	PI 612279	SYRİA	EDLAB 7
PI 339286	TURKEY	ALACA	PI 606646	UKRAİNE	NARJADNAİA
PI 634209	USA	PENNELL	PI 345635	ARMENİA	RISOVAYA
PI 518261	INDİA	MASOUR LENTİLS	PI 518733	BRAZİL	CNPH 84- 123
PI 577236	BULGARİA	OBRAZTZOV CHIFLIK 7	PI 612274	BULGARİA	SADOVO 1
PI 343023	UKRAİNE	NATIONAL 03	PI 565081	SPAİN	SPANISH BROWN
W6 27758	USA	CDC ROBİN	PI 601750	USA	LOLITA
W6 27782	USA	PENNELL	PI 345636	FSU	STEPNAYA 244
PI 368646	SERBİA	GRADSKA		FRANCE	ANICIA
PI 379370	MACEDONİA	PRILEPSKA	PI 345637	TAJİKİSTAN	TADZHIKSKAYA 95
PI 606639	GERMANY	STEPNAJA 244	PI 619099	USA	MASON
PI 612275	SYRİA	ALEPPO 1	PI 577235	BULGARİA	MIZIA
PI 343027	FSU	ASTARAR'S LOCAL	PI 368651	SERBİA	BRODSKA
W6 27756	USA	964A-46	PI 298924	ITALY	TIPO TURCHE NO.2
PI 636687	USA	ILL 9938	PI 606640	ALBANİA	963
PI 606641	SYRİA	ILL 5684	PI 339275	TURKEY	SULTANI
PI 606658	PAKİSTAN	PAK 20	PI 357227	MACEDONİA	LOKALNA S.
PI 533689	SPAİN	CASTELLANA	PI 620880	SYRİA	S114

Table 3 (Continuation)
The origin of lentil genotypes used in the research, local name.

PI 606648	ITALY	MOUNTAİN LENTİL #1	PI 345638	ARMENİA	TALINSKAYA 6
PI 311107	GUATEMALA	LENTOJA	PI 477299	PAKİSTAN	18+10
PI 494067	CHİLE		PI 476366	FSU	TALLINSKAJA 6
PI 612309	ALBANİA	VENDREZHA	PI 606586	PAKİSTAN	LENTİL #1
PI 368649	SERBİA	SITNA	PI 370481	SERBİA	EDRA
PI 345625	FSU	ILL 605	PI 343025	FSU	NOVOURENSK 3565
PI 606659	CANADA	INDIAN HEAD	PI 560159	USA	WH 2040
PI 533690	SPAİN	PARDINA	PI 508091	USA	EMERALD
PI 612308	NEW ZEALAND	W6 17279	PI 476367	FSU	PENZENSKO 14
PI 343022	UKRAİNE	STEPPE 244	PI 605356	SYRİA	BARIMASUR-4
PI 655566	TAJİKİSTAN	TJK2006:001	W6 27780	USA	MİLESTONE
PI 298923	ITALY	TIPO TURCHE NO.1	PI 368648	SERBİA	SITNA
PI 543070	PAKİSTAN	MASSOOR 18-10	PI 379372	SERBİA	GRADECKA
PI 547039	USA	WA8649041	PI 605355	SYRİA	BARIMASUR-2
PI 612276	SYRİA	ALEPPO 2	PI 339267	TURKEY	KIRMIZI
PI 612301	JORDAN	JORDAN 3	PI 547038	USA	WA8649085
PI 308610	SYRİA	KURD	PI 345552	FSU	DAGESTANSKAJA
PI 368645	SERBİA	SITNA	W6 27760	USA	GİZA-9
PI 644221	SYRİA	TESHALE	PI 636514	BULGARİA	N377
PI 368650	MONTENEGRO	PLASNICKA	PI 345625	UKRAİNE	LUNA 09
PI 518732	BRAZİL	CNPH 84-122	PI 508090	USA	BREWER
PI 612278	SYRİA	REEHA 6	W6 27759	USA	ESTON
PI 612306	BULGARİA	ZİMNA LESTA	PI 339292	TURKEY	SIYAH
PI 655571	GEORGİA	9092	PI 486288	FRANCE	DUPUY
PI 606660	SYRİA	FRENCH 3	PI 635041	SYRİA	KAFKAS
PI 620879	BULGARİA	NADEJDA	PI 620881	SYRİA	S119
PI 339270	TURKEY	AKCA MERCİMEĞİ	PI 320953	GERMANY	SCHWARZE LINSE
PI 606642	RUSSİAN	PENZENSKAİA	PI 345628	FSU	NOVAYA LUNA
PI 577240	RUSSİAN	TADJIKSKAYA 95	PI 641205	TAJİKİSTAN	TJK04:20-113
PI 643449	SYRİA	HALA	PI 27767	USA	ILL 8006 BM4
PI 368647	MACEDONİA	DUKATINSKA	PI 606650	SPAİN	SPANISH BROWN
PI 339266	TURKEY	YERLİ KUQUK	PI 343024	FSU	PETROV'S 4/105
PI 518731	BRAZİL	CNPH 84-021	PI 345634	FSU	PETROVSKAYA ZELENOZERNAYA
PI 612311	PAKİSTAN	W6 19113	PI 606649	ITALY	MOUNTAİN LENTİL 2
PI 515969	ARGENTİNA	PRECOZ	PI 345633	FSU	PETROVSKAYA JUBILEINAYA
PI 592997	SYRİA	ILL 5582	PI 477920	USA	CHILEAN 78
PI 643450	SYRİA	RACHAYYA	PI 345632	FSU	PETROVSKAYA 50
PI 543068	PAKİSTAN	MASOOR VM-3	PI 636542	TURKEY	KAYI 91
PI 641202	USA	ILL 9918	PI 476368	FSU	PETROVSKAJA YUBILEJNAJA
PI 606647	ITALY	CASTELLUCCİO LENTİL	PI 543067	PAKİSTAN	MASOOR DL-6
PI 477923	USA	BREWER	PI 606591	IRAN	LINE (HC393)
PI 643451	SYRİA	ALEM TİNA	PI 477300	PAKİSTAN	18+12
PI 641201	HUNGARY	B92-129	PI 477921	USA	REDCHIEF
PI 643452	SYRİA	ASSANO	PI 513253	PAKİSTAN	MASSAR
PI 561105	TURKEY	TU86-16-07	PI 606605	RUSSİAN	TADJISKUYA
PI 612303	JORDAN	JORDAN 2	PI 298922	ITALY	TIPO CASTELLUCCIO
PI 561087	TURKEY	TU85-083-01	PI 345627	UKRAİNE	NARIADNAYA 03
PI 612302	JORDAN	JORDAN 1	PI 339263	TURKEY	SULTANI
PI 612277	SYRİA	SULMİAH 5	PI 302398	JORDAN	ILL 486
PI 606661	SYRİA	FRENCH 4	PI 643453	SYRİA	SALIANA
PI 636684	ARMENİA	ARM 417	PI 476369	FSU	PETROVSKAJA
PI 547037	USA	WA8649090	PI 345630	FSU	NOVOURENSKAYA
PI 612283	SYRİA	EL-GHAB 11	PI 543920	USA	CRIMSON
PI 612304	BULGARİA	NPO-2	PI 345626	UKRAİNE	KRASNOGRADSKA-YA 460
PI 345629	FSU	NOVOURENSKAYA 3565	PI 606588	TURKEY	TU86-16-02
PI 518734	BRAZİL	CNPH 84-125	W6 27757	USA	BREWER
PI 631397	SYRİA	MEYVECI 2001	PI 634208	USA	MERRİT
PI 543066	PAKİSTAN	WKP-88-3		SERBİA	SITNA
PI 357226	SERBİA	LOKALNA SITNA		SERBİA	GRADECKA

3. Results and Discussion

The results of the variance analysis of the standard varieties used in the study are given in table 4 and the lowest and highest values for these standard varieties and genotypes are given in Table 5. As seen in Table 4, variance analysis of standard varieties was statistically significant at 1% probability limit ($p < 0.01$) in terms of all examined properties and it was determined that it was important at 5% probability limit ($p < 0.05$) in terms of vegetation length.

In terms of grain yield, in terms of yield, standard varieties were obtained from Çağıl with 188.80 kg da^{-1} and Pulse Lentil with 62.05 kg da^{-1}. In terms of genotypes used in the experiment, the highest seed yield was obtained from the genotype ASTA-RAKSKAJA MESTNAJA of 35.88 g / plant and the lowest seed yield was determined with genotype

TJK2006:001 of 0.19 g / plant. These results show that high yielding genotypes can be used to increase seed yield in future breeding studies. In the studies, seed yield between 75-258.3 kg / da (Alıcı 1997), 49.6-95.5 kg / da (Kaçar & Azkan 1997), between 156.5-247.4 kg / da (Türk & Atikyilmaz 1998), 89.1 -252.9 kg / da (Koç 2004) between 88.40-128.16 kg / da (Ölmez 2011), between 72.82-186.16 kg / da (Öktem 2016) and the highest seed yield in the studies between 258.8 kg / ha (Bozdemir & Önder 2009), 206.3 kg / da (Biçer & Şakar 2011) and 200.5 kg / da (Köse et al 2017) was observed. According to these results, similarities and genotypes were found.

Table 4
Analysis of variance of the properties examined in the research

Source of variation	DF	Seed Yield	Thousan of seed weight	Plant height	Number of pods per plant	Vegetation length	%50 Flowering days
Standard		3	**	**	**	*	**

*: p<0.05; **: p < 0.01

In the same way, the highest weight of one thousand of seed 41.98 g with Pul Mercimek variety, 31.88 g with Çağıl standard varieties were determined. When the genotypes were examined, the highest weight of one thousand of seed was obtained from genotype MASON of 162.31 g and lowest from genotype 9+6 of 12.92 g. The highest standard varieties were been identified from genotypes of course seeds. This result showed that there are probably successful genotypes in increasing the weight of one thousand seeds in breeding studies. In the conducted studies, weight of one thousand seeds between 38-50 g (Russell 1994), 24.75-35.75 g (Şakar et al 1997), between 38.1-72.4 g (Kaçar & Azkan 1997), 24.2-42.0 g (Türk & Atikyilmaz 1998), 34.86-48.26 g (Karadavut et al 1999), 36.6-45.1 g (Bildirici & Çiftçi 2001), 26.8-40.1 g (Sözen & Karadavut 2017) changes have been indicated. These results are consistent with our result.

The highest plant height among the standard varieties was measured with Pul Mercimek variety with 33.02 cm and the lowest plant height with 27.23 cm in Çağıl variety. The highest plant height of the genotypes used in the experiment was 43.99 cm with the number of genotypes of BRODSKA, and the lowest plant height was obtained from the genotype with 17.68 cm with the number of genotypes of ILL 486. 30 genotypes were identified higher than the standard varieties with the highest plant size.

Hopefully, genotypes have been found to increase plant height. In the studies, the plant height between 10-45 cm (Solh & Erskine 1984),28.7-33.9 cm (Erskine & Witcombe 1984), between 21-41 cm (Swarup & Lal 1987), 20.4-24.9 cm (Günel et al 1993), between 6.2-24.2 cm (Gupta et al 1996), 32-64

cm (Şakar et al 1997), between 19.9-27.9 cm (Kaçar & Azkan 1997), 30.0- 38.7 cm (Türk & Atikyilmaz 1998), 28.9-38.0 cm (Bozdemir & Önder 2009) changes have been determined. According to these results, our results are similar.

Pul Mercimek with the lowest standard of varieties in the number of pods was 59.87, and the highest standard was 167.49. In terms of genotypes, the highest number of pods in the plant was determined as STELA genotype with 440.62/ plant and the lowest genotype of 9.21 with ILL 605 genotype number were identified. 94 genotypes have higher values than standard varieties. In the studies, the number of pods in the plant between 8.92-13.88 (Günel et al 1993), 11-91 (Gupta et al 1996), 8.7-15.1 (Kaçar & Azkan 1997), 20.16 -33.90 (Karadavut et al 1999), 22.8 -44.3 units (Koç 2004) changes were observed and the highest unit of 66.95 (Çölkesen et al 2005) and 26.35 units (Biçer and Şakar 2011) were found. In our study, the number of pods in the plant was higher than the values in the other study. This shows that we can use these genotypes to increase the number of pods in breeding studies. In light of this information, these genotypes can be used in breeding studies to increase the number of pods.

Among the standard varieties, the shortest vegetation length was 96.3 days with Çağıl, and the longest vegetation length was 105.6 days with local red varieties. It was found that the shortest vegetation length of the genotypes was 79.85 days with genotype PAK20 and the longest vegetation length was 120.85 days with genotype PETROVSKAYA ZELENOZERNAYA. The vegetation length of the 61 genotypes used in the experiment was shorter than the standards. These genotypes can be used to develop early varieties in breeding studies. Vegetation length value between 80-89 days (Günel et al 1993), 85-152 days (Whitehead et al 2000) and 102.9-107.8 days (Bozdemir & Önder, 2009) were found.

Among the standard varieties, the shortest 50% flowering days were 62.2 days with Çağıl variety and 72.2 days with Pul Mercimek varieties. The genotypes included the genotypes with the shortest number of 50% flowering days of 46.5 with 18+12 genotypes, and the longest 50% flowering days of 82 with CNPH84-125 and ZELENAYA AHUNSKAYA genotypes were found. In the studies between 55-61 (Solh and Erskine, 1984), 41.8-64.6 (Erskine 1990), 55-61 (Günel et al 1993), 87-143 (Gupta et al 1996), 45-80 (Whitehead et al 2000), and 65.1-72.0 days (Bozdemir & Önder, 2009) changes were observed. Many of these studies are in parallel with our study.

Table 5
Standard types and genotypes according to the characteristics discussed in the minimum-highest values and lsd values.

Characteristics	Seed yield (g plant^{-1})	Thousand seed weight(g)	Plant height (cm)	Number of pods per plant	Vegetation length (days)	%50 flower-ing days
Min	0.19	12.92	17.68	9.21	79.85	46.50
Max.	35.88	78.31	43.99	440.62	120.85	82.00
Çağıl	188.80 a	31.88 b	27.23 c	167.49 a	96.2 b	62.2 b
Fırat	132.98 b	36.98 ab	30.68 b	135.91 a	100.2 a	69.2 a
Pul Mer.	62.05 c	41.98 a	33.02 a	59.87 b	103.4 a	72.2 a
Yerli Kır.	147.62 b	37.02 ab	29.48 bc	135.72 a	105.6 a	71.4 a
LSD (0.05)	16.26	5.76	1,61	46.87	6.50	3.97

In accordance with these results, genotypes used in the experiment can be utilized in the development studies of varieties suitable for the conditions of our region, in terms of seed yield and important agricultural characteristics.

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