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Some Agricultural Characteristics of the New *Cephalaria syriaca* L. Genotypes Developed for Arid Areas

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ABSRACT

Cephalaria syriaca L., in Turkish pelemir, is one of crops grown in arid areas as an alternative to other oilseed crops. The purpose of this study carried out to determine some agricultural features of 33 pelemir lines selected from Sivas-Turkey population. This study was conducted in research area of Selcuk University, Faculty of Agriculture. The study was made according to "Augmented Experimental Design" during the years of 2010 and 2011. In this study, the observations were in between as following range: plant height 20.0- 87.0 cm, height of the first branch 3.7- 19.3 cm, number of branch per plant 3.5-16.4, number of heads per plant 7.3-93.4, 1000 seed weight 11.8-16.4 g, seed yield 296.8- 1910.8 kg ha^{-1}, oil ratio 19.75- 33.72 % and oil yield 75.1-588.8 kg ha^{-1}. According to the results, the developed lines through the selection of population showed a significant achievement in terms of the seed yield and oil ratio.

1. Introduction

Turkey has been facing a recurring shortage of vegetable oils for many years due to fluctuations in the production of oil seeds (Kıllı and Altunbay, 2005). From an exporter/importer of oilseeds and vegetable oils, it became a net importer of these relevant commodities (Semerci et al., 2007). To provide the demand for oil, especially alternative oil crops grown are needed in arid areas. *Cephalaria syriaca* L., in Turkish pelemir, is one of these crops.. Pelemir is a good oil seed crop for climate and soil conditions in arid areas where the other oil seeds can not be grown (Atakişi, 1991).

Pelemir types are a good source of antioxidants for human nutrition (Karel 1955; İncekara, 1964; Yazıcıoğlu et al., 1978). The genus *Cephalaria* (belongs to the plant family, Dipsacaceae) comprises about a total of 93 species which are common in Europe, East Asia, East Mediterranean, North and Central Africa. *Cephalaria* species are widely distributed in Turkey and 23 of them are endemic plants (Davis, 1972). Today, the number of *Cephalaria* species is a total of 35 in Turkey (Göktürk and Sümbül, 2003).

Cephalaria syriaca L. which was imported from Turkey was successfully grown in Pakistan. The oil content was obtained as 23%, the seed yield per hectare was determined as 1600 kg. The fatty acid composition of the locally grown seed oil consists from lauric acid (1.20%), myristic acid (18.10%), palmitic acid (9.40%), stearic acid (2.80%), oleic acid (24.20%), linoleic acid (35.8%) and epoxy oleic acid (7.30%) (Hamid et al., 1988). For this reason, they are utilized for medical, agricultural and veterinary purposes (Kayce and Kırmızıgül, 2010). Furtheremore, pelemir types are a good source of antioxidants for human nutrition (Kırmızıgül et al.,2007; Kırmızıgül et al.,2012).

Plant breeding is the art of developing plants in terms of the desired properties. Genotypes which are developed for a better understanding of these features, must be made adaptation studies. The purpose of this study carried out to determine some agricultural features of Pelemir (*Cephalaria syriaca* L.) lines which were selected from population.

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2. Material and Methods

This study was conducted in research area of the Selcuk University, Faculty of Agriculture during the years of 2010 and 2011. In the study, a total of 33 pelemir lines which were selected from Sivas-Turkey population and 1 population (land race) were evaluated. The study was set up according to "Augmented Experimental Design". The current population was divided into three for not having a registered pelemir cultivars, and in each block it was sown in three replications. In the research area, long period (1991-2009; April-August) total precipitation is 104.6 mm, avarage temperature is 19.0 ºC. Related to the years of 2010 and 2011, the total precipitations were 103.1 and 202.0 mm, average temperature was 21.3 ºC and 18.3 ºC in the first and the second vegetation periods, respectively.

Research area soils had a pH of 8.03 and soil characteristics were as following: phosphorus, potassium, iron, zinc, calcium and organic matter were 55.9 kg ha^{-1}, 17.9 kg ha^{-1}, 14.74 ppm, 0.32 ppm, 37.6% and 2.25% respectively.

Pelemir (*Cephalaria syriaca* L.) seeds were sown 25th of April 2010 and 07th of April 2011. Each row was 4 m longitude and rows were spaced with 50 cm apart. During the seedling stage, the plants were thinned by hand to a uniform density in both years. The Diamonnium phosphate (DAP 18-46-0 %) and urea (46 %) were applied at the rates of 40 kg ha^{-1} and 40 kg ha^{-1} respectively, in both years. The entire dose of nitrogen and phosphorus were applied as basal at planting.

Data were collected on plant height (cm), height of first branch (cm), number of branch (number $plant^{-1}$), number of head (number $plant^{-1}$), 1000 seed weight (g), seed yield (kg ha^{-1}), oil ratio (%) and oil yield (kg ha^{-1}).

The data were analyzed by using the GLM procedure in SAS computerize based program.

3. Results

Table 1 and 2 show that the mean square, some of the research data (minimum, maximum and mean values) while the Table 3 and 4 show the importance level of probability among the pelemir genotypes.

Both of two years in the research, plant height did not show statistically difference for the used population and the majority of the lines. (Table 3).

Table 1
Mean squares of the *Cephalaria syriaca* genotypes

Year	Degree of Freedom	Plant Height	First Branch Height	Number of Branch	Number of Head	1000-Seed Weight	Seed Yield	Oil Content	Oil Yield
2010	35	108.59	16.69	6.701	72.62	1.08	769.73	34.70	48.57
2011	35	50.44	194.08	3.41	254.50	0.49	2101.90	5.52	141.75

Table 2
Some agricultural values of the Pelemir (*Cephalaria syriaca*) genotypes

Year		Plant Height (cm)	First Branch Height (cm)	Number of Branch	Number of Head	1000-Seed Weight (g)	Seed Yield kg ha^{-1}	Oil Content (%)	Oil Yield kg ha^{-1}
					Lines				
2010	Min	20.0	3.7	3.5	7.3	11.8	296.8	19.75	75.1
	Max	63.3	19.3	11.5	49.0	16.4	1466.3	33.20	358.9
	Mean	40.7	10.5	6.7	20.8	13.4	750.5	24.15	180.9
					Population				
	Min	39.0	4.6	4.4	9.6	13.2	455.5	22.43	111.1
	Max	56.0	8.8	7.0	21.0	14.2	704.4	26.32	173.0
	Mean	48.3	6.3	5.1	16.1	13.8	553.3	24.51	135.8
					Lines				
2011	Min	56.0	4.0	8.2	18.8	11.3	328.8	20.90	87.9
	Max	87.0	18.0	16.4	93.4	14.5	1910.8	33.72	588.8
	Mean	73.3	12.4	10.9	46.4	13.4	1162.2	24.24	281.2
					Population				
	Min	65.0	4.4	7.8	33.0	12.7	984.0	23.06	238.2
	Max	78.0	12.0	11.6	57.6	14.4	1425.5	25.50	348.4
	Mean	72.1	9.4	9.5	42.8	13.4	1151.8	24.23	279.2

Table 3

The importance level of probability among the genotypes of the pelemir in 2010-2011 years

		Genotypes																
		Plant Height																
Yıllar		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	A	ns	ns	ns	ns	ns	-5	-5	ns	ns	ns	ns	ns	-5	ns	ns	ns	ns
2010	B	ns	ns	ns	ns	ns	-5	-5	ns	ns	ns	ns	ns	-5	ns	ns	ns	ns
	C	ns	ns	ns	ns	ns	-5	-5	ns	ns	ns	ns	ns	-5	ns	ns	ns	ns
	A	ns	ns	ns	ns	ns	+5	ns	ns	+5	ns	ns	ns	ns	ns	ns	+5	ns
2011	B	ns	ns	ns	ns	ns	+5	ns	ns	+5	ns	ns	ns	ns	ns	ns	+5	ns
	C	ns	ns	ns	ns	ns	+5	ns	ns	+5	ns	ns	ns	ns	ns	ns	+5	ns
		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
	A	ns	ns	ns	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
2010	B	ns	ns	ns	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
	C	ns	ns	ns	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
	A	ns	ns	+5	ns	ns	ns	ns	ns	-5	ns	ns	-5	ns	-5	ns	ns	
2011	B	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	ns	-5	ns	-5	ns	ns	
	C	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
		First Branch Height																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	A	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	+5
2010	B	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	+5
	C	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	+5
	A	ns	ns	ns	ns	ns	ns	ns	ns	ns	-1	ns	ns	ns	ns	ns	ns	ns
2011	B	ns	ns	ns	ns	ns	ns	ns	ns	ns	-1	ns	ns	ns	ns	ns	ns	ns
	C	ns	ns	ns	ns	ns	ns	ns	ns	ns	-1	ns	ns	ns	ns	ns	ns	ns
		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
	A	ns	ns	ns	+1	ns	ns	ns	+5	ns	ns	ns	ns	+1	ns	+5	ns	
2010	B	ns	ns	ns	+1	ns	ns	ns	+5	ns	ns	ns	ns	+1	ns	+5	ns	
	C	ns	ns	ns	+1	ns	ns	ns	+5	ns	ns	ns	ns	+1	ns	+5	ns	
	A	ns	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
2011	B	ns	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
	C	ns	ns	ns	+1	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
		Number of Branch																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	A	+1	ns	+1	+1	+1	+1	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
2010	B	+1	ns	+1	+5	+1	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	C	+1	ns	+1	+5	+1	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	A	ns	+5	+5	ns	+5	ns	+1	+5	+5	ns	ns	+5	ns	ns	ns	+5	ns
2011	B	ns	ns	ns	ns	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	ns	+1	ns
	C	ns	ns	+5	ns	+5	ns	+5	ns	+5	ns	ns	+5	ns	ns	ns	+5	ns
		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
	A	ns	ns	ns	ns	ns	+1	+1	+1	+1	ns	+1	ns	+1	+1	+1	+1	
2010	B	ns	-5	ns	ns	ns	+5	+1	+1	+1	ns	+5	ns	+1	+1	+1	+1	
	C	ns	ns	ns	ns	ns	+5	+1	+1	+1	ns	+1	ns	+1	+1	+1	+1	
	A	ns	ns	+5	ns	ns	ns	ns	ns	+1	ns	ns	ns	ns	ns	ns	+1	
2011	B	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	+5	
	C	ns	ns	ns	ns	ns	ns	ns	ns	+1	ns	ns	ns	ns	ns	ns	+5	
		Number of Head																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	A	+5	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	+1	ns	ns	ns
2010	B	+5	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	+1	ns	ns	ns
	C	+5	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	+1	ns	ns	ns
	A	ns	+5	+1	+5	+1	+1	+1	ns	ns	ns	ns	ns	ns	+5	ns	+1	ns
2011	B	ns	ns	+1	ns	+5	+5	+1	ns	ns	ns	ns	ns	ns	ns	-5	+1	ns
	C	ns	ns	+5	ns	+5	+5	+1	ns	ns	ns	ns	ns	ns	ns	-1	+5	ns
		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
	A	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
2010	B	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
	C	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
	A	ns	ns	+5	+5	+5	ns	ns	ns	ns	ns	+5	ns	ns	-5	ns	+1	
2011	B	ns	ns	+1	+1	ns	-5	ns	ns	ns	ns	ns	-5	ns	-5	ns	+1	
	C	-5	ns	ns	+1	ns	-1	ns	-5	ns	ns	ns	-1	ns	-1	ns	+1	

A, B, C: Same population but different block, 1-33: The newly developed pelemir genotypes; -1: p <0.01 and at low value from population, +1: p <0.01 and at high value from population, -5: p <0.5 and at low value from population, +5: p <0.5 and at high value from population, ns: no significant.

Table 4

The importance level of probability among the genotypes of the pelemir in 2010-2011 years

		Genotypes																
		1000-Seed Weight																
Yıllar		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	A	ns	ns	ns	ns	ns	ns	ns	ns	ns	-1	ns	ns	ns	ns	ns	ns	ns
2010	B	ns	ns	ns	ns	ns	ns	ns	ns	ns	-1	ns	ns	ns	ns	ns	ns	ns
	C	ns	ns	ns	ns	ns	ns	+5	ns	ns	-1	ns	ns	ns	ns	ns	ns	ns
	A	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
2011	B	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-5	ns	+5
	C	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
	A	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
2010	B	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
	C	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
	A	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
2011	B	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	-5	ns	ns	ns	
	C	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
		Seed Yield																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	A	+1	ns	ns	ns	-1	ns	ns	ns	ns	ns	ns	ns	+1	+1	+1	ns	+5
2010	B	+1	ns	ns	ns	-1	+5	ns	ns	ns	+5	ns	ns	+1	+1	+1	ns	ns
	C	+1	ns	ns	ns	-5	+5	ns	ns	ns	ns	ns	ns	+1	+1	+1	ns	+5
	A	ns	ns	ns	+5	ns	ns	ns	ns	ns	ns	-5	+5	ns	ns	-5	+5	ns
2011	B	ns	ns	ns	+5	+5	ns	ns	ns	ns	ns	ns	+5	ns	ns	ns	+5	ns
	C	ns	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	+5	ns	ns	-5	+5	ns
		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
	A	ns	ns	ns	ns	+5	+1	+1	+5	+5	ns	ns	ns	ns	+5	ns	+5	
2010	B	ns	ns	ns	ns	+5	+1	+1	+5	+5	ns	ns	ns	ns	+5	ns	+5	
	C	ns	ns	ns	ns	-5	+1	+1	+5	+5	ns	ns	ns	ns	+5	ns	+5	
	A	ns	-5	ns	ns	-5	ns	ns	ns	ns	ns	ns	-5	ns	ns	ns	+5	
2011	B	+5	ns	ns	ns	-5	ns	ns	ns	ns	ns	ns	-5	ns	ns	ns	+5	
	C	ns	ns	ns	ns	-5	ns	ns	ns	ns	ns	ns	-5	ns	ns	ns	+5	
		Oil Content																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	A	ns	ns	ns	+1	+1	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
2010	B	ns	ns	ns	+1	+1	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	C	ns	ns	ns	+1	+1	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	A	-5	ns	-1	+5	+1	ns	-5	ns	ns	+5	+5	ns	ns	-1	-5	+5	ns
2011	B	-1	-5	-1	+5	+1	-5	-5	-5	ns	ns	ns	ns	ns	-1	-5	ns	ns
	C	ns	ns	ns	+1	+1	ns	ns	ns	ns	+5	ns	ns	ns	+5	ns	+5	ns
		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
	A	ns	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
2010	B	ns	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
	C	ns	ns	ns	+5	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
	A	-5	+5	ns	+5	ns	+5	-5	ns	ns	ns	ns	+1	ns	ns	-5	ns	
2011	B	-1	ns	ns	ns	ns	+1	-1	-5	ns	ns	ns	+5	-5	ns	ns	ns	
	C	ns	+5	ns	+5	ns	+5	ns	ns	ns	ns	ns	+1	ns	+5	ns	ns	
		Oil Yield																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	A	+1	ns	ns	+5	-5	+5	ns	ns	ns	ns	ns	ns	+1	+5	+5	ns	ns
2010	B	+1	ns	ns	+5	-5	+5	ns	ns	ns	ns	ns	ns	+1	+5	+5	ns	ns
	C	+1	ns	ns	+5	-5	+5	ns	ns	ns	ns	ns	ns	+1	+5	+5	ns	ns
	A	ns	ns	ns	+5	+1	ns	ns	ns	ns	ns	ns	+5	ns	ns	-5	+5	ns
2011	B	ns	ns	ns	+5	+1	ns	ns	ns	ns	ns	ns	+5	ns	ns	-5	+5	ns
	C	ns	ns	ns	+5	+1	ns	ns	ns	ns	ns	ns	+5	ns	ns	ns	+5	ns
		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
	A	ns	ns	ns	ns	ns	+1	+1	+5	+5	ns	ns	ns	ns	ns	ns	ns	
2010	B	ns	ns	ns	ns	ns	+1	+1	ns	+5	ns	ns	ns	ns	ns	ns	ns	
	C	ns	ns	ns	ns	ns	+1	+1	ns	+5	ns	ns	ns	ns	ns	ns	ns	
	A	ns	ns	ns	ns	-5	ns	ns	ns	ns	ns	ns	-5	ns	ns	ns	ns	
2011	B	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-5	ns	ns	ns	+5	
	C	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-5	ns	ns	ns	+5	

A, B, C: Same population but different block, 1-33: The newly developed pelemir genotypes; -1: $p < 0.01$ and at low value from population, +1: $p < 0.01$ and at high value from population, -5: $p < 0.5$ and at low value from population, +5: $p < 0.5$ and at high value from population, ns: no significant.

Height of the first branch, the lines of number 17, 25, 32 ($p < 0.05$) and 21, 30 ($p < 0.01$) in 2010 showed the values over the population in the year of 2011, the only line of 21 passed the population. The line with number 10 lagged behind the population (Table 3).

As shown in Table 3, 13 pieces of the lines (1, 3, 4, 5, 23, 24, 25, 26, 28, 30, 31, 32 and 33) statistically in each of the three blocks hovered above the values of the population in terms of number of branches in 2010. In each block in 2011 only 7, 16 and 33 numbered lines passed the population.

While in the first year of research in terms of number of heads 1, 2 ($p < 0.05$) and 14 ($p < 0.01$) numbered values had values over the population, in the second year 3 5, 6, 7, 16, 21 and 33 numbered lines, they took values over the population, but 31 numbered line had a value below (Table 3).

In 2010 in terms of 1000-seed weight, while 10 numbered line remained behind the population, in 2011, only 20 numbered line had a value over the population. Statistically between all other lines and population did not have any difference (Table 4).

As shown in Table 4, 2010 in terms of seed yield, in each of the three blocks 1, 13, 14, 15, 23, 24, 25, 26, 31 and 33 numbered lines, were over the population, 5 numbered line has lagged behind. In 2011 which is the second year of the research, statistically significant 4, 12, 16 and 33 numbered lines were over the population, 22 and 29 numbered lines had have the values under.

In 2010 in terms of oil content, statistically 4, 5 ($p < 0.01$) and 21 ($p < 0.05$) numbered took place over the population. In 2011, while in each of the three blocks 4, 5, 23 and 29 numbered lines, were over the population, 1, 3, 7, 15, 18 and 24 numbered lines remained under the population.

When oil yield values are analyzed in Table 2 in 2010, 1, 13 and 23 numbered lines were at a significance level of 1%, 4, 6, 14, 15 and 26 numbered lines had have the values over the population level of 5% 5 numbered line remained under the population. In each of the three blocks in 2011, when 5 numbered line was at a significance level of 1%,and 4 and 16 numbered lines had have values over the population at a significance level of 5%, 29 ($p < 0.05$) numbered line remained below the population (Table 4).

4. Discussion

In this study, as it can be seen in Table 2, the determined values were in between as following: 20.0- 87.0 cm for plant height ranged, 3.7- 19.3 cm for height of the first branch, 3.5-16.4 for number of branch, 7.3-93.4 for, 11.8-16.4 g for 1000 seed weight, 296.8-1910.8 kg ha^{-1} for seed yield, 19.75-33.72% for oil ratio and 75.1-588.8 kg ha^{-1} for oil yield. In the previous studies, plant height, number of branches, number of heads, 1000 seed weight were reported by Kara (1990) as 63.0-92.3 cm, 6.7-11.4, 40.7-130.2, 11.0-12.5 g respectively. Seed yield was found by Kara (1990) in the range of 886.0 and 1402.0 kg ha^{-1}, Katar et al. (2011) was found from 923.3 to 1106.9 kg ha^{-1}. They reported that the oil content in *Cephalaria syriaca* was determined by İncekara (1964) as 26%, Yazıcıoğlu et al. (1978) reported as 25.3%, Atakisi (1991) obtained as 20-30%, Kara (1990) expressed as 22.3-25.5%. Kırmızıgül et al. (2012) reported that oil ratio was changed from 17.0% to 36.0% in different species of pelemir. For machine harvest, height of the first branch is an important criterion in oil crops which are grown in arid areas. Nevertheless, the mentioned researchers did not give information about the height of the first branch.

Oil yield with a combination of oil content and seed yield, is under the influence of ecological factors and all the growing conditions that affecting the seed rate and oil yield as emerged a genotype features. Economically, the most important yield criterion is oil yield for all of the oil crops. According to İlisulu (1970), oil yields of the used genotypes should be determined in the researches. Because, a genotype which oil content is low in the seeds, seed yield may be higher, and consequently, the oil can be obtained much more from the unit area. In the previous research, oil yield was found by Kara (1990) in between 235.0 and 312.0 kg ha^{-1}, Katar et al. (2011) obtained from 189.4 to 221.6 kg ha^{-1}. The plant height, number of branches, number of heads, 1000 seed weight, seed yield and oil content of pelemir are influenced by year, climate and soil conditions. There is also a positive correlation between plant height and seed yield, and oil yield is directly affected by seed yield (Kara, 1990).

In the above-mentioned studies, the values of the features that determined in this study are in parallel with the data which was reported by Kara (1990) except for plant height. Some of the differences may be due to the differences of especially genetically, climatically, soil characteristic and cultural practices.

5. Acknowledgements

Examined the values obtained from the lines used in this study, developed with the selection from population which some of the lines are a significant achievement passing to population in terms of especially the seed yield and oil content. Furthermore, *Cephalaria syriaca* plant is highly resistant to arid conditions, which carried out breeding studies; it would be a benefit to ponder over especially for seed and oil yield-enhancing features.

6. References

Atakişi IK (1991). Yağ Bitkileri Yetiştirme ve Islahı. *Trakya University, Faculty of Agriculture*, Press no: 148, Lesson book number: 10. (Tr)

Davis PH (1972). Flora of Turkey and The East Aegean Islands. *University Press* pp: 585-597, Dinburgh, Scotland.

Göktürk RS, Sümbül H (2003). *Cephalaria aytachii (Dipsacaceae*), a new species from central Anatolia, Turkey. *Annales Botanici Fennici* 40: 123-127.

Hamid S, Sabir AH, Khan S, Khan SA (1988). *Cephalaria syriaca* - an oilseed crop for the arid and semi arid areas of Pakistan. *Pakistan Journal Science Industrial Research* 31(3): 212-215.

İlisulu K (1970). Fransa ve Almanya'dan getirilen kolza çeşitlerinin Ankara iklim ve toprak şartları altında adaptasyon durumları, tohum verimleri ve diğer bazı özelliklerinin tespiti. *Ankara University Yearbook of Faculty of Agriculture* 20 (1): 132-157. (Tr)

İncekara F (1964). Yağ Bitkileri ve Islahı, In: Endüstri Bitkileri ve Islahı (2). *Ege University, Faculty of Agriculture*, Press Number: 83, 185 pages, Izmir, Turkey. (Tr)

Kara K (1990). The effect of different row spacings on the yield and yield components of syrianacabious (*Cephalaria syrica* L.) plant grown in Erzurum. *Ataturk Universitesi, Journal Faculty of Agricultry.* 21(1): 83-93. (Tr)

Karel G (1955). Pelemir otu ve mücadelesi. *Ankara Ziraat Mücadele Enstitüsü Müdürlüğü*, Number 3, 15 pages. (Tr)

Katar D, Arslan Y, Kayaçetin F, Bayramin S, Karahan Y (2011). The determination of different row spacing effects on yield and yield components of pelemir plants (*Cephalaria cyriaca* (sisjaca) L.) in Ankara ecological conditions. Proceedings: *1st National Congress and Exposition on Behalf of Ali Numan Kıraç with Internation Participation* 27-30 April, pp 931-940, Eskişehir, Turkey. (Tr)

Kayce P, Kırmızıgül N (2010). Chemical constituents of two endemic *Cephalaria* species. *Records of Natural Products* 4(3): 141-148.

Kıllı F, Altunbay SG (2005). Seed yield, oil content and yield components of confection and oilseed sunflower (*Helianthus annuus* L.) cultivars planted in different dates. *International Journal of Agriculture and Biology* 7(1): 21-24.

Kırmızıgül S, Böke N, Sümbül H, Göktürk RS, Arda N (2007). Essential fatty acid components and antioxidant activities of eight *Cephalaria* species from Southwestern Anatolia. *Pure and Applied Chemistry* 79 (12): 2297-2304.

Kırmızıgül S, Sarıkahya NB, Sümbül H, Göktürk RS, Yavaşoğlu NÜK, Pekmez M, Arda N (2012). Fatty acid profile and biological data of four endemic *Cephalaria* species grown in Turkey. *Records of Natural Products* 6 (2): 151-155.

Semerci A, Kaya Y, Durak S (2007). Economic analysis of sunflower production in Turkey. *Helia* 30(47): 105-114.

Yazıcıoğlu T, Karaali A, Gökcen J (1978). *Cephalaria syriaca* seed oil. *Journal of the American Oil Chemısts Society* 55(4): 412-415.