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Agronomic and Quality Parameters and Yield Interactions of Various Safflower (*Carthamus tinctorius* L.) Cultivars at Different Sowing Dates

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Abstract: Safflower (*Carthamus tinctorius* L.) is cultivated across numerous nations for its oilseed and flower, as well as its fabric and food coloring properties. In the plain circumstances of Mardin Province (Türkiye), this study was conducted to determine the best date to sow six different safflower cultivars in the vegetation years of 2018 and 2019. Six safflower cultivars (Asol, Balcı, Dinçer, Linas, Olas, and Remzibey-05) were planted in the main plots on four different sowing dates (February 06, February 16, February 26, and March 05), located in the sub-plots. Safflower characteristics, including plant height, first branch height, number of branches, number of heads, head diameter, seed yield, protein ratio, oil ratio, and oil yield, were examined in the study. The first sowing date of the Remzibey-05 cultivar yielded the most seeds (4118 kg ha^{-1}), and the second sowing date of the Remzibey-05 yielded the most oil (1197 kg ha^{-1}). The Asol cultivar exhibited the highest protein content, however, no discernible pattern of increase or decrease was observed with respect to sowing dates. Early sowing enhanced seed production, and as sowing time was delayed, yield significantly decreased (on average by 30%). Further comprehensive research is required to tackle the deficiencies in vegetable and oil materials, not only in this locality but also in areas expressing equivalent weather and ecological features.

Keywords: Oil content, oil yield, protein ratio, safflower, seed yield, sowing date

1. Introduction

Safflower (*Carthamus tinctorius* L.), a valuable oilseed plant that grows in Asia, North America, and South America, is a member of the Asteraceae family and requires more space to be grown in order to provide more edible oil (Mihaela et al., 2013). It is a xerophilic species that originated in Asia and the Mediterranean region and may grow everywhere with arid or semi-arid environments (Beyyavas et al., 2011; Abd El-Lattief, 2012). Due to its root system, it is a plant that thrives in arid or semi-arid climates. Flower colors range from yellow to orange and reddish, while plant heights range from 30 cm to 150 cm (Bart et al., 2010). Safflower oil has been shown to provide a number of health benefits in recent studies. Safflower oil, which has a balanced fatty acid profile, has been proven to prevent fat buildup in rats better than a diet high in beef tallow (Shimomura et al., 1990). The oil content of safflower seeds ranges between 13% and 46%, with 90% being unsaturated fatty acids (oleic and linoleic acids). Due to the tocopherols in the vitamin E it contains, which have an anticholesterol effect, it is also included in the diets of cardiovascular patients (Pongracz et al., 1995; Johnson et al., 1999). Due to the cartamine present in plant flowers, it was once employed in fabric dyes, but this is now hardly ever the case (Cho et al., 2000; Omidi et al., 2009). Safflower is used for food, cosmetics, industrial applications, paint, varnish, printing ink, protective acrylic resins, the soap industry, biodiesel production, pulp, medical, and edible oils (Corleto et al., 1997; Wolf, 2000; Nagaraj et al., 2001; Carvalho et al., 2006; Khan et al., 2009; Danieli et al., 2011; Rudolphi et al., 2012). Safflower oil's nutritional worth has risen recently as a result of its resemblance to olive oil and its ability to grow in arid and semi-arid environments (Ekin, 2005; de Oliveira et al., 2018).

Immigrants from Bulgaria were the first to bring safflower to Turkey. With the first breeding research, the Eskişehir Anadolu Agricultural Research Institute registered the Yenice, Dinçer, and Remzibey-05 varieties, and new varieties were registered by other Agricultural Research Institutes at a later date (Nas et al., 2001). It can be argued that safflower cultivars resistant to weeds, salinity, cold, heat, and drought should be developed for regions where more than 70% of Turkey's farmed land is used for dry farming and where annual rainfall is less than 500 mm. It is a suitable species to employ in irrigated agriculture as well (Baydar et al., 2003; Kıllı, 2007).

In and around Mardin Province, there are hundreds of thousands of hectares of land suited for intensive agriculture. The same kinds of plants are frequently planted on almost all of these lands (wheat and corn). These plants constantly take the same nutrients from the soil and impoverish the soil in terms of content. The incorporation of numerous new plants into the regional product model will assist in protecting natural resources in the soil.

In addition to the registration of approved safflower varieties with high oil content, identifying the proper sowing dates in other locations outside of the current production locations is critical for solving the developing edible oil shortages in Türkiye and the rest of the world. Taking all of this information into account, this study was conducted to establish the ideal sowing date for six Turkish-registered safflower (*C. tinctorius* L.) cultivars in the plain conditions of Mardin-Türkiye Province.

2. Materials and Methods

2.1. Experimental area and climate-soil conditions

Field trials were carried out for two years in the 2018 and 2019 vegetation seasons in the lowland regions of Mardin Province, Türkiye, at an altitude of 400 m, at latitude 37.131131N and longitude of 40.940215E.

In the lowland regions of Mardin Province, where the winters are rainy and warm and the summers are hot and arid, field experiments were conducted. Examining the climate data from the field trial and long years, it was observed that while the temperature and humidity levels were approximately the same in both years, the precipitation values in April and May of the second year slightly increased. Mardin Province is located in an area where winter precipitation exceeds summer precipitation (Table 1).

Table 1. Meteorological values of Mardin province for long years (2000-2019) and 2018-2019 vegetation periods (Anonymous, 2019)

Months	Precipitation (mm)			Temperature (°C)			Relative humidity (%)		
	2000-2019	2018	2019	2000-2019	2018	2019	2000-2019	2018	2019
February	33.5	94.3	27.4	8.8	10.2	8.8	56.6	70.9	71.3
March	59.7	7.2	95.8	12.4	14.3	10.7	59.3	64.1	75.1
April	35.1	32.5	79.7	15.9	17.7	13.9	53.8	53.0	70.9
May	34.7	26.6	49.2	21.7	21.8	22.7	40.5	60.8	29.1
June	3.0	28.5	16.3	28.4	28.1	29.5	24.5	33.9	24.0
July	0.9	0	1.7	32.4	30.9	30.8	21.0	31.3	21.8
Total/Mean	166.9	189.1	270.1	19.9	20.5	19.4	42.6	52.3	48.7

The experimental area's soil is clay-loam in structure and has very little organic matter. The amount of phosphorus (P) suitable for plant intake is insufficient, although the soil is rich in potassium (K), the lime content is average, and the pH is alkaline. There is no salinity problem in the soil (Table 2).

Table 2. Soil analysis values of the experimental area (0-20 cm)*

Parameters	Value
Texture class	CL (Clay/Loamy)
pH	8.03
Organic matter, %	1.11
Lime ($CaCO_3$), %	36.0
Total salt, %	0.031
Available P, kg P_2O_5 ha^{-1}	29.7
Available K, mg kg^{-1}	102.20

*: Soil analyses of the trial area were carried out in the MARTEST analysis laboratory.

2.2. Genetic material of the plants

Six different safflower (*C. tinctorius* L.) cultivars Asol, Balcı, Dinçer, Linas, Olas, and Remzibey-05 were utilized as genetic material in this study. The plant materials were obtained from the Transitional Zone Agricultural Research Institute, and from the GAP International Agricultural Research and Training Center.

2.3. Experiment treatments and agricultural processes

The experimental field design was a split-plot arrangement of the randomized complete blocks with three replications. The major plots included cultivars, whereas the subplots included sowing dates. The experiment was conducted over two years, with the first sowing taking place on February 6, the second on February 16, the third on February 26, and the fourth on March 5.

Trial plots were arranged in three replications, each 5 m long, with 5 cm rows and a total of 30 cm between each row. 2 meters separated the plots, while 3 meters separated the blocks. Seeds were sown at an average depth of 3-4 cm. N-P (20-20) compound fertilizer was applied at once with 60 kilograms of nitrogen and phosphorus per hectare. The sprinkler system was used to irrigate three times. The weeds in the rows were taken out in the experimental plots by hand and with a hoe. Manual reduction was performed as a maintenance procedure when the plants had grown to a height of 4-5 cm. When the majority of its leaves had dried and turned yellow, the plant was harvested.

The following variables were examined in this study: plant height, first branch height, number of branches and heads per plant, head diameter, thousand seed weight, seed yield, protein and oil contents, and oil yield values.

2.4. Statistical analyzes

The JMP package software was used to analyze the study's data in accordance with split plots in a randomized complete block design. The LSD (Least Significant Difference) multiple comparison test was used to determine the differences between the groups following the findings of the F test (Yurtsever, 1984).

3. Results and Discussion

3.1. Plant height

Looking at the variance analysis table, all factors of variation [year (Y), sowing date (S.Dt.), cultivar (C), CxS.Dt., YxS.Dt., and YxC], except for YxCxS.Dt. for the safflower plant's plant height, were significant at the 1% level (Table 3). Table 4 demonstrates the results on safflower cultivars' average plant heights. The second year witnessed an increase in the mean plant height compared to the first year. Remzibey-05 had the tallest-growing plants (119.6 cm) based on cultivar averages. All other cultivars belonged to the same group. Sowing dates affected plant height, and late sowings significantly decreased it. On average, the first sowing date exhibited the greatest value of 112.0 cm, while the fourth sowing date displayed the lowest value of 104.3 cm. The Remzibey-05 had the highest average in terms of YxC interaction (122.2 cm in the second year), while the Dinçer had the lowest average (99.5 cm in the first year). The highest plant height at the first sowing date was found in the Remzibey-05 (131.3 cm) when the CxS.Dt. interaction was investigated. At the fourth sowing date, the Olas had the lowest plant height (94.3 cm). The maximum values recorded for the YxS.Dt. interaction were 114.8, 113.3, 112.6, 111.5, and 109.7 cm, while the minimum value recorded was 98.9 cm (Table 4).

Plant height might be regarded as a morphological characteristic that is genetically determined. However, environmental factors including air temperature, solar radiation, altitude, and the relative humidity of the soil and air can have an impact on plant height. Since the sowing date was delayed, the height of the plants has dropped. Safflower plants sown earlier have longer days to grow the underground and above-ground parts than

Table 3. Results of variance analysis of some agronomic and yield-related characteristics determined as a result of various safflower cultivar sowing dates

Variation sources	F value									
	PH	FBHP	BNPP	NHPP	HD	TSW	SY	PR	OR	OY
Year (Y)	85.17**	2.23^{ns}	445.93**	302.75**	39.97**	41.43**	10.24**	2.72^{ns}	1.04^{ns}	6.03^{ns}
Error 1										
Cultivar (C)	30.92**	63.48**	10.20**	87.88**	13.56**	16.66**	31.41**	3.37*	19.89**	16.30**
YxC	3.14**	3.16**	26.77**	16.54**	11.22**	0.34^{ns}	50.69**	2.13^{ns}	1.75^{ns}	34.52**
Sowing date (S.Dt.)	11.82**	7.56**	6.03**	21.14**	2.64^{ns}	22.95**	85.91**	1.16^{ns}	1.07^{ns}	67.85**
CxS.Dt	9.29**	9.09**	3.90**	11.51**	2.57**	4.22**	1.60^{ns}	4.29**	3.36**	1.74^{ns}
YxS.Dt	4.61**	0.84^{ns}	1.80^{ns}	5.14**	0.88^{ns}	1.45^{ns}	0.80^{ns}	0.88^{ns}	4.33**	1.11^{ns}
Error 2										
YxCxS.Dt	1.62^{ns}	3.54**	2.12*	1.29^{ns}	2.69**	1.05^{ns}	1.44^{ns}	2.34**	4.38**	1.59^{ns}
Error										
CV (%)	5.79	14.5	11.54	12.13	8.27	6.02	11.87	2.46	4.95	12.74

PH: Plant height, FBHP: First branch height of plant, BNPP: Branches number per plant, NHPP: Number of head per plant, HD: Head diameter, TSW: Thousand seed weight, SY: Seed yield, PR: Protein ratio, OR: Oil ratio, OY: Oil yield, *: Statistically significant at 5% ($p<0.05$), **: Statistically significant at 1% ($p<0.01$), ns: Not significant, CV: Coefficient of variation safflower plants that were sown later. As a result, plants that were planted earlier might survive longer (Kızıl, 1997; İnan and Kırıcı, 2001; Özel et al., 2004).

3.2. First branch height of the plant

The height of the plant's first branch was determined as well because it is essential for reducing product loss during mechanical harvesting. Except for year and YxS.Dt., other sources of variation (cultivar, sowing date, YxC, CxS.Dt., YxCxS.Dt.) were found to be significant for the first branch height at the 1% level (Table 3). The Asol, Olas, and Linas cultivars exhibited the greatest values in terms of the first branch. The first sowing had the highest first branch (36.1 cm) value based on sowing date averages, and the third and second sowings (31.5 and 31.7 cm, respectively), had the lowest. Regarding the interaction between the year and cultivar, it was observed that the Olas and Asol cultivars exhibited the highest values (45.2 and 43.7 cm) in the first and second years, while the Balcı cultivar displayed the lowest value (20.1 cm) in the second year. The highest value for the CxS.Dt. interaction was observed in the Asol cultivar, at the first sowing date, where it reached 48.6 cm. The Balcı cultivar exhibited the lowest values on the 1st, 2nd, and 3rd sowing dates, measuring 16.4, 16.8, and 15.5 cm, respectively. Similarly, the Dinçer cultivar displayed the lowest values on the 3rd and 4th sowing dates, measuring 20.5 and 15.4 cm, respectively. With regard to the YxS.Dt.xC interaction, the Olas cultivar exhibited the highest value on the second sowing date of the first year (55.6 cm), while the Balcı cultivar displayed the lowest value on the second and third sowing dates of the same year (15.0 cm) (Table 5).

As the time that it takes the plant to reach maturity declines, plants that had to enter the generative phase before necessary complete their growth cycle earlier. Thus, this circumstance has an impact on the plant's first branch height. This study lends credence to the notion that environmental conditions affect first-branch height (Kızıl, 1997; Çamaş and Esendal, 2006; Ekin, 2016). Additionally, varying atmospheric factors (such as humidity, temperature, and oil) might affect a plant's first branch height (Özel et al., 2004; Kıral, 2014; Yılman, 2017).

3.3. Number of branches per plant

For the number of branches in the plant; year, cultivar, sowing date, YxC, and CxS.Dt. factors and interactions were significant at 1%, while YxCxS.Dt. interactions were significant at 5%. Regarding the Y x S.Dt. interaction, it was insignificant (Table 3). The value exhibited an increase in the second year. Late sowings were observed to cause significant reductions. Based on the sowing date averages, it was observed that the second sowing date had the highest value for branch number (15.6 per plant), while the third and fourth sowings had the lowest values (14.0 and 14.2, respectively). The cultivars Dinçer and Balcı displayed the highest values (16.6 and 15.8 number plant^{-1}) with regard to the number of branches per plant. The cultivar Asol exhibited a minimum value of 13.1 per plant. In relation to the interactions between the year and cultivar, it was observed that the Olas cultivar demonstrated the highest value of 20.0 per plant during the second year, whereas the Asol cultivar exhibited the lowest value of 6.9 per plant during the same year. The cultivar Dinçer exhibited the highest value for the interaction between the cultivar and sowing date, specifically at the second sowing date, with a recorded value of 17.8 per plant. On the first sowing date, the Olas cultivar demonstrated the least mean value, which was recorded as 12.2 per plant. The interaction between year, sowing date, and cultivar resulted in the highest value being observed during the second sowing date in the second year (22.7 per plant) for the Olas cultivar, while the lowest value was recorded in the third sowing date of the first year for the Olas and Asol cultivars (6.3 and 6.4 per plant, respectively). These results suggest that there is an interaction between year, sowing date, and cultivar (Table 6).

The aforementioned data has been computed as the number of branches per plant is a crucial factor that has a direct impact on the seed yield. The branching pattern of safflower is determined by both genetic and environmental factors (Deokar and Patil, 1975). The decrease in the mean number of branches per plant may be interpreted as the plant being compelled to enter the generative phase due to delayed sowing. Apart from the perspective that the sowing dates have no impact on the number of branches (Kıllı and Küçükler, 2005) and that environmental factors play a role (Çamaş and Esendal, 2006; Kıral, 2014), there exist alternative viewpoints that posit the trait to be primarily determined by the genotype (Kizil et al., 2008).

3.4. Number of the heads per plant

With the exception of YxCxS.Dt., all other determinants of variance were significant ($p<0.01$) for the number of heads per plant (Table 3). In terms of the number of tables, the differences between the vegetation years of the plant, the cultivars, and the sowing dates were found to be significant. The cultivars Dinçer and Remzibey-05 exhibited the greatest number of heads per plant, with 36.2 and 34.8 number plant^{-1}, respectively. Conversely, Asol

Tablo 4. Average plant height values and statistical groupings of safflower cultivars sown at different dates (cm)*

Cultivars	Year x Sowing Date x Cultivar								Year x Cultivar		Cultivar x Sowing Date				Mean
	2018				2019										
	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	S.Dt-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	2018	2019	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	(Cultivar)
Asol	104.3	105.0	106.3	102.9	100.6	108.4	115.5	110.8	104.6 def	108.8 cde	102.4 e-i	106.7 c-i	110.9 c-g	106.9 c-i	106.7 B
Balcı	115.2	108.4	93.6	93.6	115.0	115.5	113.3	98.4	102.7 ef	110.6 bcd	115.1 b-e	112.0 b-g	103.5 d-i	96.0 hi	106.6 B
Dinçer	111.5	101.6	96.9	88.0	115.0	115.6	111.8	108.4	99.5 f	112.7 bc	113.3 b-f	108.6 c-h	104.4 d-i	98.2 ghi	106.1 B
Linas	100.6	118.4	107.0	100.5	101.3	119.0	114.1	110.3	106.6 cde	111.2 bcd	100.9 f-i	118.7 abc	110.5 c-g	105.4 c-i	108.9 B
Olas	108.5	115.8	101.1	81.9	110.1	117.4	106.3	106.7	101.8 ef	110.2 bcd	109.3 c-h	116.6 bcd	103.7 d-i	94.3 i	106.0 B
Remzibey-05	128.8	101.5	111.4	126.6	133.8	112.8	118.9	123.3	117.1 ab	122.2 a	131.3 a	107.2 c-i	115.2 b-e	125.0 ab	119.6 A
	Year x Sowing Date								Year		Sowing Date				
Mean	111.5 A	108.5 AB	102.7 BC	98.9 C	112.6 A	114.8 A	113.3 A	109.7 A	105.4 B	112.6 A	112.0 A	111.6 AB	108.0 BC	104.3 C	

*: There is no statistically significant difference between the means represented by the same letter in the same column, same row, or same group

Tablo 5. Average first branch height values and statistical groupings of safflower cultivars sown at different dates (cm)*

Cultivars	Year x Sowing Date x Cultivar								Year x Cultivar		Cultivar x Sowing Date				Mean
	2018				2019										
	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	2018	2019	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	(Cultivar)
Asol	52.4 ab	34.4 d-j	37.6 b-i	41.1 a-f	44.7 a-e	40.9 a-f	42.4 a-e	46.7 a-d	41.4 ab	43.7 a	48.6 a	37.7 b-e	40.0 a-e	43.9 a-d	42.5 A
Balcı	16.2 m	15.0 m	15.0 m	38.2 b-h	16.7 lm	18.6 j-m	15.9 m	29.3 e-m	21.1 ef	20.1 f	16.4 h	16.8 h	15.5 h	33.8 d-g	20.6 C
Dinçer	29.6 e-m	21.6 i-m	17.9 klm	15.1 m	34.0 d-k	29.9 e-m	23.1 h-m	15.7 m	21.0 ef	25.7 def	31.8 efg	25.8 fgh	20.5 h	15.4 h	23.4 C
Linas	40.0 a-g	41.8 a-e	43.9 a-e	42.7 a-e	36.6 b-i	37.3 b-i	36.9 b-i	43.8 a-e	42.1 ab	38.7 ab	38.3 a-e	39.6 a-e	40.4 a-e	43.3 a-d	40.4 A
Olas	52.1 abc	55.6 a	42.8 a-e	30.4 d-m	38.1 b-h	35.7 c-i	40.4 a-g	39.5 a-h	45.2 a	38.4 abc	45.1 abc	45.7 ab	41.6 a-e	35.0 c-g	41.8 A
Remzibey-05	36.9 b-i	25.1 f-m	32.8 d-l	42.3 a-e	35.4 d-i	24.0 g-m	29.8 e-m	29.6 e-m	34.3 bcd	29.7 cde	36.1 b-f	24.5 gh	31.3 efg	36.0 b-f	32.0 B
	Year x Sowing Date								Year		Sowing Date				
Mean	37.9	32.3	31.7	35.0	34.2	31.1	31.4	34.1	34.2	32.7	36.1A	31.7B	31.5B	34.5AB	

*: There is no statistically significant difference between the means represented by the same letter in the same column, same row, or same group

Tablo 6. Average branch number values and statistical groupings of safflower cultivars sown at different dates (number plant^{-1})*

Cultivars	Year x Sowing Date x Cultivar								Year x Cultivar		Cultivar x Sowing Date				Mean
	2018				2019										
	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	2018	2019	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	(Cultivar)
Asol	6.8 op	7.2 n-p	7.0 op	6.4 p	21.5 abc	17.9 a-i	19.1 a-g	18.7 a-g	6.9 d	19.3 ab	14.2 a-f	12.6 ef	13.1 def	12.6 ef	13.1 C
Balcı	15.5 d-l	12.5 i-o	10.2 l-p	10.8 k-p	19.8 a-f	21.8 ab	16.4 b-k	19.1 a-g	12.3 c	19.3 ab	17.7 ab	17.2 abc	13.3 def	15.0 a-f	15.8 A
Dinçer	17.0 a-i	17.1 a-i	15.3 e-l	15.8 c-l	17.4 a-i	18.4 a-h	14.5 f-m	17.6 a-i	16.3 b	17.0 ab	17.2 abc	17.8 a	14.9 a-f	16.7 a-d	16.6 A
Linas	10.6 l-p	9.0 m-p	10.1 l-p	10.1 l-p	19.4 a-g	17.2 a-i	16.6 b-k	16.5 b-k	10.0 cd	17.4 ab	15.0 a-f	13.1 def	13.3 def	13.3 def	13.7 BC
Olas	7.6 n-p	7.8 n-p	6.3 p	7.7 n-p	16.8 b-j	22.7 a	20.8 a-e	19.7 a-f	7.4 d	20.0 a	12.2 f	15.3 a-f	13.6 c-f	13.7 c-f	13.7 BC
Remzibey-05	11.2 j-p	13.8 g-m	12.5 i-o	12.9 h-n	15.3 e-l	21.2 a-d	19.8 a-f	15.2 e-l	12.6 c	17.9 ab	13.2 def	17.5 ab	16.1 a-e	14.1 b-f	15.2 AB
	Year x Sowing Date								Year		Sowing Date				
Mean	11.5	11.3	10.2	10.6	18.4	19.9	17.9	17.8	10.9 B	18.5 A	14.9 AB	15.6 A	14.0 B	14.2 B	

*: There is no statistically significant difference between the means represented by the same letter in the same column, same row, or same group

and Linas cultivars displayed the lowest number of heads per plant, with 23.7 and 25.5 per plant, respectively. Based on the sowing dates, the first and second sowings exhibited the greatest values (32.0 and 32.8, respectively), while the fourth sowing demonstrated the lowest value (26.5 per plant). Based on the interaction between the sowing date and year (YxS.Dt.), the maximum value was observed during the first sowing of the second year, amounting to 37.5 per plant, whereas the minimum value was recorded during the fourth sowing of the first year, with a value of 22.3 per plant. Based on the interaction between the year and cultivar, it was observed that the Dinçer cultivar exhibited the highest value of 38.2 per plant in the second year, while the Asol and Olas cultivars displayed the lowest values of 18.5 and 19.8 per plant, respectively, in the first year. Based on the interaction between Cultivar and Sowing date, it was observed that the Dinçer cultivar had the highest value of 48.7 per plant during the first sowing, while the Asol cultivar had the lowest value of 22.9 per plant during the same sowing. Additionally, during the fourth sowing, both Asol and Olas cultivars had values of 22.0 and 22.9 per plant, respectively (Table 7).

Genetic control serves a dominant role in determining the number of heads, which is a crucial yield component (Pahlavani et al., 2012). A separate investigation revealed that varying water regimes resulted in a mean reduction of 37.8% in the number of capsules (also known as heads) produced by the plant (Omidi et al., 2012). Plants that are sown later tend to enter the generative phase earlier, as their vegetative development period is relatively brief. Consequently, due to inadequate flowering and pollination, there is a possibility of a reduced count of heads on the plant. A correlation between the number of branches present in a plant and the number of heads produced by plant can be posited (Özel et al., 2004; Yılman, 2017; Kıral, 2014; Tahernezhad et al., 2018). The observed variations in the spike count between cultivars can be attributed to genotypic distinctions.

3.5. Head diameter

The head diameter is a parameter that has an indirect effect on the seed yield. Apart from the factors of sowing date and YxS.Dt., significant ($p<0.01$) effects of other parameters were observed, as presented in Table 3. The Remzibey-05 cultivar had the largest head diameter (2.7 cm), while Olas had the smallest head diameter (2.3 cm), according to the cultivars. Based on the interaction between the year and cultivar (YxC), it was observed that the Remzibey-05 cultivar had the highest value (3.1 cm) in the second year, while the Olas cultivar had the lowest value (2.1 cm) in the first year. The results indicate that the Remzibey-05 cultivar exhibited the highest values (2.8, 2.8, and 2.8 cm) during the 2nd, 3rd, and 4th sowing times, based on the cultivar x sowing date interaction. The Balcı cultivar exhibited the lowest value during the 4th sowing date, while the Olas cultivar displayed the lowest value during the 3rd and 4th sowing dates. The results indicate that Remzibey-05 had the highest value (3.2 and 3.2 cm) in the second year, specifically during the second and third sowing dates, based on the YxS.Dt.xC interaction. The Olas cultivar exhibited a minimum value of 2.1 cm during the first sowing date of the first year (Table 8).

Based on the variation in head diameter, the statistical variances among sowing dates were insignificant, and the influence of air temperature on the plants during the flowering and pollination stages was not observed. Moreover, research indicates that the timing of sowing has a notable influence on the size of the head diameter (Özkaynak et al., 2001; Yılmazlar, 2008; Yurteri, 2016; Yılman, 2017). The dissimilarities in head diameter among cultivars could potentially be attributed to genetic variations (Golkar, 2014).

3.6. Thousand seed weight

Significant sources of variation were identified at 1%, except for the interactions YxC, YxS.Dt., and YxS.Dt.xC (Table 3). Based on the mean values of the various cultivars, it was observed that the Remzibey-05 cultivar exhibited the highest thousand seed weight (43.5 g), while the Asol cultivar had the lowest value (37.6 g). Based on the sowing date, the maximum value was observed on the second sowing date (41.6 g), while the minimum value was recorded on the fourth sowing date (37.2 g). According to the CxS.Dt. interaction, the highest value were in the Linas cultivar at the second sowing (44.4 g) and the Remzibey-05 cultivar at the fourth sowing (44.6 g), while the lowest value was in the Linas cultivar at the fourth sowing (34.9 g) (Table 9).

The observed differences in the thousand seed weight among various cultivars of the safflower can be attributed to their genotypic makeup, which is a common feature in other seed-bearing plants (Shahbazi and Saeidi, 2007; Tahernezhad et al., 2018). Plants that were sown on schedule exhibit a greater seed weight due to the sufficient duration of the seed-filling period, resulting in a fuller and heavier seed (Yılmazlar, 2008; Kıral, 2014). Another study has highlighted that the application of potassium fertilizer has a positive impact on seed weight, in conjunction with the timing of sowing (Kıllı and Küçükler, 2005). The potential causes of

Tablo 7. Average number of head values and statistical groupings of safflower cultivars sown at different dates (number plant^{-1})*

Cultivars	Year x Sowing Date x Cultivar														
	2018				2019				Year x Cultivar		Cultivar x Sowing Date				Mean
	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	2018	2019	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	(Cultivar)
Asol	17.4	22.2	17.4	16.9	28.4	31.4	29.1	27.1	18.5 f	29.0 de	22.9 h	26.8 fgh	23.2 gh	22.0 h	23.7 C
Balcı	29.3	25.7	26.0	22.3	45.4	38.8	30.1	33.7	25.8 e	37.0 ab	37.4 b-e	32.3 c-f	28.0 fgh	28.0 fgh	31.4 B
Dinçer	47.2	37.5	30.0	21.9	50.1	41.4	33.8	27.3	34.1 bc	38.2 a	48.7 a	39.4 bc	31.9 c-f	24.6 fgh	36.2 A
Linas	19.1	29.5	27.9	29.6	32.3	32.7	34.0	34.8	26.5 e	33.5 bc	25.7 fgh	31.1 d-g	30.9 d-g	32.2 c-f	30.0 B
Olas	17.8	24.8	19.5	17.2	34.4	34.3	27.1	28.6	19.8 f	31.1 cd	26.1 fgh	29.5 e-h	23.3 gh	22.9 h	25.5 C
Remzibey-05	28.3	40.5	42.4	25.8	34.1	34.9	39.0	33.0	34.3 bc	35.2 ab	31.2 d-g	37.7 bcd	40.7 ab	29.4 e-h	34.8 A
	Year x Sowing Date								Year		Sowing Date				
Mean	26.5 E	30.0 CDE	27.2 DE	22.3 F	37.5 A	35.6 AB	32.2 BC	30.8 CD	26.5 B	34.0 A	32.0 A	32.8 A	29.7 B	26.5 C	

*: There is no statistically significant difference between the means represented by the same letter in the same column, same row, or same group

Tablo 8. Average head diameter values and statistical groupings of safflower cultivars sown at different dates (cm)*

Cultivars	Year x Sowing Date x Cultivar														
	2018				2019				Year x Cultivar		Cultivar x Sowing Date				Mean
	S.Dt.-1	S.Dt.-2	S.Dt-3	S.Dt.-4	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	2018	2019	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	(Cultivar)
Asol	2.5 b-h	2.4 b-h	2.4 b-h	2.3 d-h	2.2 gh	2.4 b-h	2.5 b-h	2.6 a-h	2.4 bc	2.4 bc	2.3 bcd	2.4 a-d	2.4 a-d	2.4 a-d	2.4 BC
Balcı	2.4 b-h	3.0 ab	2.8 a-g	2.2 e-h	2.5 b-h	2.5 b-h	2.7 a-h	2.3 c-h	2.6 b	2.5 b	2.4 a-d	2.8 ab	2.7 abc	2.3 d	2.5 B
Dinçer	2.4 b-h	2.4 b-h	2.4 b-h	2.3 c-h	2.5 b-h	2.4 b-h	2.4 b-h	2.9 a-d	2.4 bc	2.6 b	2.5 a-d	2.4 a-d	2.4 a-d	2.6 a-d	2.5 BC
Linas	2.4 b-h	2.5 b-h	2.5 b-h	2.2 fgh	2.9 a-f	2.6 a-h	2.6 a-h	2.4 b-h	2.4 bc	2.6 b	2.6 a-d	2.5 a-d	2.5 a-d	2.3 cd	2.5 B
Olas	2.1 h	2.2 d-h	2.1 gh	2.1 gh	2.5 b-h	2.6 a-h	2.4 b-h	2.3 d-h	2.1 c	2.4 b	2.3 cd	2.4 a-d	2.2 d	2.2 d	2.3 C
Remzibey-05	2.3 d-h	2.3 c-h	2.4 b-h	2.7 a-h	3.0 abc	3.2 a	3.2 a	2.9 a-e	2.4 bc	3.1 a	2.6 a-d	2.8 a	2.8 a	2.8 a	2.7 A
	Year x Sowing Date								Year		Sowing Date				
Mean	2.3	2.5	2.4	2.3	2.6	2.6	2.6	2.6	2.4 B	2.6 A	2.5	2.5	2.5	2.4	

*: There is no statistically significant difference between the means represented by the same letter in the same column, same row, or same group

Tablo 9. Average thousand seed weight values and statistical groupings of safflower cultivars sown at different dates (g)*

Cultivars	Year x Sowing Date x Cultivar														
	2018				2019				Year x Cultivar		Cultivar x Sowing Date				Mean
	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	2018	2019	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	(Cultivar)
Asol	36.7	39.1	36.1	34.8	38.0	42.1	37.8	36.5	36.7	38.6	37.3 e-i	40.6 a-g	37.0 f-i	35.6 g-i	37.6 D
Balcı	38.9	38.9	36.6	33.1	39.4	38.7	39.3	39.7	36.9	39.3	39.1 b-i	38.8 b-i	38.0 d-i	36.4 g-i	38.1 CD
Dinçer	42.3	38.1	34.5	33.3	44.4	42.2	39.5	36.8	37.0	40.7	43.4 abc	40.2 a-h	37.0 f-i	35.0 hi	38.9 BCD
Linas	39.7	42.4	42.5	31.9	41.1	46.4	43.7	37.9	39.1	42.3	40.4 a-g	44.4 a	43.1 a-d	34.9 i	40.7 B
Olas	41.6	39.6	38.4	36.6	42.9	44.6	38.9	40.2	39.1	41.7	42.3 a-e	42.1 a-f	38.6 b-i	38.4 c-i	40.4 BC
Remzibey-05	41.4	41.2	42.7	43.1	43.7	46.2	46.4	43.0	42.1	44.8	42.6 a-e	43.7 ab	44.6 a	43.0 a-d	43.5 A
	Year x Sowing Date								Year		Sowing Date				
Mean	40.1	39.9	38.5	35.5	41.6	43.4	40.9	39.0	38.5 B	41.2 A	40.8 AB	41.6 A	39.7 B	37.2 C	

*: There is no statistically significant difference between the means represented by the same letter in the same column, same row, or same group

variations in thousand-seed weights have been suggested to be different agricultural techniques and genetic variations among safflower cultivars (Carvalho et al., 2006).

3.7. Seed yield

The analysis of variance values for seed yield at the 1% level indicates that significant results were obtained for the following variables: year, cultivar, sowing date, and YxC. However, no significant results were obtained for the interactions involving CxS.Dt., YxS.Dt., and YxS.Dt.xC (Table 3). The cultivar exhibiting the highest mean value was Remzibey-05, with a yield of 3350 kg ha^{-1}. Several other cultivars belonged to the same statistical group. Based on the sowing date, the first sowing exhibited the greatest yield (3311 kg ha^{-1}), while the fourth sowing demonstrated the lowest yield (2147 kg). Based on the interaction between the year and cultivar, it was observed that the Remzibey-05 cultivar had the highest yield of 3478 kg in the first year, while the Olas cultivar had the lowest yield of 2040 kg in the second year (Table 10).

One of the most desirable characteristics of safflower is its high seed yield. In comparison to plants that are sown earlier, those that are sown later initiate the generative phase prior to completing the vegetative phase. This situation may impact the yield of seeds. It can be posited that the differences observed among various safflower cultivars are indicative of a genotypic characteristic (El-Lattief, 2012; Golkar et al., 2012a; Çamaş et al., 2007). However, it is noteworthy that discrepancies within the identical safflower species can also be ascribed to environmental conditions (Kıllı and Küçükler, 2005; Hatipoğlu et al., 2012; Tahernezhad et al., 2018) and diverse agricultural practices (Carvalho et al., 2006; Omidi et al., 2012).

3.8. Protein ratio

The variance analyse results revealed that the protein ratios of the safflower plant were subject to significant sources of variation, including cultivar at a 5% level and CxS.Dt. and YxCxS.Dt. at a 1% level, as shown in Table 3. Based on the cultivar averages, it can be inferred that the Asol cultivar exhibited the highest protein ratio, which amounted to 16.4%. The variety with the lowest value was observed in Dinçer (16.0%). The results of the study indicate that the CxS.Dt. interaction had a significant effect on protein ratios. Specifically, the Asol cultivar exhibited the highest protein ratios on the 3rd sowing date, while the Linas cultivar showed the highest ratios on the 4th sowing date. The Olas cultivar, on the other hand, displayed the highest protein ratios on the 2nd sowing date. The minimum value was observed during the fourth sowing date of the Dinçer cultivar. Based on the interaction between YxS.Dt.xC, the maximum values were observed in specific instances. For instance, in the first year, the fourth sowing of the Asol cultivar exhibited the highest value (16.7%). Similarly, in the second year, the Linas cultivar demonstrated the highest values in the first and fourth sowings (16.8% and 16.8%, respectively). Additionally, the Olas cultivar displayed the highest value (16.8%) in the second sowing of the second year. The Olas cultivar exhibited the minimum percentage (15.3%) on the first sowing date of the second year (Table 11).

The high protein content of safflower seeds is indicative of their superior nutritional value (Golkar, 2014). Furthermore, the protein ratio is influenced by genetic factors (Golkar et al., 2012b; Pahlavani et al., 2012). Protein rates are also influenced by varying sowing dates (Öztürk et al., 1999; Yılmazlar, 2008; Kıral, 2014) and agricultural practices (Carvalho et al., 2006). The study demonstrates that the protein ratios in safflower seeds are influenced by the types of safflower varieties and the different sowing dates.

3.9. Oil ratio

Sources of variation for cultivar, CxS.Dt., YxS.Dt., and YxCxS.Dt. were found to be significant at 1% for oil contents (Table 3). Based on the cultivar averages, the Asol cultivar exhibited the highest oil content (32.0%). The cultivar with the lowest value was observed in Dinçer (28.0%). The results indicate that the YxS.Dt. interaction had a significant effect on the oil yield. Specifically, the highest percentage of oil was observed on the third sowing date of the second year, with a value of 31.8%. The minimum percentage was observed during the second and third sowing dates of the first year, with values of 30.2, and 30.0, and the first sowing date of the second year, with 29.8%. The results indicate that the Asol cultivar exhibited the highest oil content (33.2%) on the third sowing date, in accordance with the CxS.Dt. interaction. The Dinçer cultivar exhibited the lowest percentage (26.1%) on the fourth sowing date. Based on the interaction Y x S.Dt. x C, the most notable results were recorded in the Asol cultivar during the third sowing (33.7%) of the second year, and in the Linas cultivar during the fourth sowing (33.7%) of the second year. The Dinçer cultivar exhibited the lowest percentage (25.1%) during the fourth sowing date of the second year (Table 12).

Variations in the oil content of seeds among different cultivars have been observed, indicating the prevalence of genetic characteristics. The impact of sowing dates on oil content is not statistically significant, and environmental factors

Tablo 10. Average seed yield values and statistical groupings of safflower cultivars sown at different dates (kg ha^{-1})*

Cultivars	Year x Sowing Date x Cultivar								Year x Cultivar		Cultivar x Sowing Date				Mean
	2018				2019										
	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	2018	2019	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	(Cultivar)
Asol	3396	3213	2635	2327	3199	2460	1795	1587	2893 bc	2260 efg	3298	2837	2215	1957	2577 B
Balcı	2786	2084	1859	1679	3640	3511	3030	2455	2102 fg	3159 ab	3213	2797	2444	2067	2630 B
Dinçer	3155	2938	2189	1742	3286	3265	2858	2072	2506 cde	2870 bc	3221	3101	2523	1907	2688 B
Linas	3206	2258	2758	2653	2931	2658	2328	1961	2719 cd	2470 def	3069	2458	2543	2307	2594 B
Olas	3523	3367	3117	2658	2644	2364	1743	1410	3166 ab	2040 g	3084	2865	2430	2034	2603 B
Remzibey-05	4118	3911	3325	2556	3844	3380	3002	2663	3478 a	3222 ab	3981	3646	3163	2610	3350 A
	Year x Sowing Date								Year		Sowing Date				
Mean	3364	2962	2647	2269	3257	2940	2459	2025	2811 A	2670 B	3311 A	2951 B	2553 C	2147 D	

*: There is no statistically significant difference between the means represented by the same letter in the same column, same row, or same group

Tablo 11. Average protein ratio values and statistical groupings of safflower cultivars sown at different dates (%)*

Cultivars	Year x Sowing Date x Cultivar								Year x Cultivar		Cultivar x Sowing Date				Mean
	2018				2019										
	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	2018	2019	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	(Cultivar)
Asol	16.3 abc	15.8 abc	16.7 ab	16.7 a	16.5 abc	16.0 abc	16.7 ab	16.5 abc	16.4	16.4	16.4 ab	15.9 abc	16.7 a	16.6 ab	16.4 A
Balcı	16.1 abc	16.2 abc	16.1 abc	16.0 abc	15.4 bc	15.9 abc	16.6 abc	16.4 abc	16.1	16.1	15.7 bc	16.0 abc	16.4 ab	16.2 abc	16.1 AB
Dinçer	15.9 abc	16.1 abc	16.6 abc	15.6 abc	16.1 abc	16.4 abc	16.1 abc	15.4 bc	16.0	16.0	16.0 abc	16.3 abc	16.3 abc	15.5 c	16.0 B
Linas	16.0 abc	16.0 abc	15.6 abc	16.6 abc	16.8 a	16.5 abc	16.1 abc	16.8 a	16.0	16.5	16.4 ab	16.2 abc	15.8 abc	16.7 a	16.3 AB
Olas	16.5 abc	16.5 abc	15.7 abc	16.0 abc	15.3 c	16.8 a	16.5 abc	16.1 abc	16.2	16.2	15.9 abc	16.7 a	16.1 abc	16.1 abc	16.2 AB
Remzibey-05	15.9 abc	16.1 abc	15.8 abc	16.1 abc	16.2 abc	16.1 abc	16.1 abc	16.4 abc	15.9	16.2	16.0 abc	16.1 abc	16.0 abc	16.2 abc	16.1 AB
	Year x Sowing Date								Year		Sowing Date				
Mean	16.1	16.1	16.1	16.2	16.0	16.3	16.3	16.3	16.2	16.1	16.1	16.2	16.2	16.2	

*: There is no statistically significant difference between the means represented by the same letter in the same column, same row, or same group

Tablo 12. Average oil ratio values and statistical groupings of safflower cultivars sown at different dates (%)*

Cultivars	Year x Sowing Date x Cultivar								Year x Cultivar		Cultivar x Sowing Date				Mean
	2018				2019										
	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	2018	2019	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	(Cultivar)
Asol	31.9 a-f	30.2 a-h	32.6 a-d	32.1 a-f	31.7 a-f	30.8 a-f	33.7 a	32.7 a-d	31.7	32.2	31.8 a-e	30.5 a-f	33.2 a	32.4 abc	32.0 A
Balcı	30.2 a-h	31.1 a-f	29.9 a-h	30.9 a-f	29.4 a-h	29.4 a-h	32.2 a-f	30.2 a-g	30.5	30.3	29.8 b-f	30.3 a-f	31.0 a-f	30.5 a-f	30.4 BC
Dinçer	28.7 a-h	27.1 fgh	30.1 a-h	27.2 fgh	28.9 a-h	28.6 b-h	28.3 c-h	25.1 h	28.3	27.7	28.8 efg	27.8 fg	29.2 c-g	26.1 g	28.0 D
Linas	30.4 a-g	30.9 a-f	29.2 a-h	31.8 a-f	33.3 abc	31.9 a-f	30.8 a-f	33.7 a	30.6	32.4	31.9 a-e	31.4 a-e	30.0 a-f	32.7 ab	31.5 AB
Olas	32.5 a-d	31.2 a-f	29.9 a-h	31.2 a-f	25.7 gh	33.6 ab	33.4 abc	31.6 a-f	31.2	31.0	29.1 d-g	32.4 a-d	31.6 a-e	31.4 a-e	31.1 AB
Remzibey-05	28.1 d-h	30.6 a-g	28.2 d-h	31.0 a-f	29.9 a-h	27.4 e-h	32.3 a-e	28.9 a-h	29.5	29.6	29.0 efg	29.0 efg	30.2 a-f	29.9 a-f	29.5 C
	Year x Sowing Date								Year		Sowing Date				
Mean	30.3 AB	30.2 B	30.0 B	30.7 AB	29.8 B	30.3 AB	31.8 A	30.4 AB	30.3	30.6	30.1	30.2	30.9	30.5	

*: There is no statistically significant difference between the means represented by the same letter in the same column, same row, or same group

do not exert any discernible influence on this particular attribute. The quantitative trait of oil content is influenced by various factors such as genetics, environment, and genotype-environment interactions (Öztürk et al., 1999; Hamdan et al., 2008; Yılmazlar, 2008; Aamir et al., 2016; Yılman, 2017).

3.10. Oil yield

Cultivar, sowing date, and YxC were found to be significant (1%) with regard to the oil yield in the safflower plant, while other parameters were insignificant (Table 3). Remzibey-05, a safflower cultivar, yielded the most oil (987 kg ha^{-1}). The other cultivars were all grouped together. The results indicate that the first sowing period yielded the highest oil production (996 kg ha^{-1}), as influenced by the sowing date variable. The minimum yield was observed during the fourth sowing date, which amounted to 655 kg ha^{-1}. Based on the interaction between the YxC, it were observed that the Remzibey-05 and Olas cultivars exhibited the highest oil yield (1021 and 989 kg ha^{-1}, respectively) in the first year, whereas the Balcı cultivar demonstrated the lowest oil yield (641 kg ha^{-1}) in the first year and the Olas cultivar (625 kg ha^{-1}) in the second year (Table 13).

The proportionate increase in seed yield and/or oil content of the safflower plant leads to a concurrent increase in oil yield. The oil yield in oilseeds can be determined by computing the product of the seed yield and oil content. The cultivability of safflower plants in a particular region or country is contingent upon their capacity to yield oil and seeds (Bassil and Kaffka, 2002; Abd Alrahmani, 2004). The oil yield of safflower is subject to variation based on factors such as cultivar type (El-Lattief, 2012), sowing dates (Öztürk et al., 1999; Yılmazlar, 2008; Omidi et al., 2012; Kıral, 2014), and genotypic traits (de Oliveira et al., 2018).

4. Conclusions

Six different safflower cultivars were sown on various dates, and numerous parameters such as soil and air temperature, rainfall amount, and timing had varying effects on the growth phases and yield components. The safflower plant produced the best yield on February 16, the second sowing date out of four. In order to help reduce the edible vegetable oil gap, it is believed that safflower planting would be advantageous in the Mesopotamian Plain and other areas that are similar to it and have wide expanses suitable for agriculture. An additional important consideration to contemplate pertains to the prospective suggestion for the propagation of this specific flora in the present locality and other suitable localities exhibiting analogous climatic and environmental circumstances.

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Declaration of Conflicts of Interest

No conflict of interest has been declared by the author.

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Tablo 13. Average oil yield values and statistical groupings of safflower cultivars sown at different dates (kg ha^{-1})*

Cultivars	Year x Sowing Date x Cultivar								Year x Cultivar		Cultivar x Sowing Date				Mean (Cultivar)
	2018				2019										
	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	2018	2019	S.Dt.-1	S.Dt.-2	S.Dt.-3	S.Dt.-4	
Asol	1084	968	861	745	1016	759	602	519	915 abc	724 de	1050	863	732	632	819 B
Balcı	839	649	555	520	1074	1035	976	741	641 e	956 ab	956	842	766	630	799 B
Dinçer	905	796	651	474	949	933	808	519	707 de	802 cd	927	864	730	497	754 B
Linas	975	693	807	843	975	848	717	666	829 bcd	801 cd	975	770	762	754	815 B
Olas	1146	1049	932	830	679	793	583	445	989 a	625 e	913	921	758	638	807 B
Remzibey-05	1158	1197	937	792	1145	927	971	770	1021 a	953 ab	1152	1062	954	781	987 A
	Year x Sowing Date								Year		Sowing Date				
Mean	1018	892	791	701	973	882	776	610	850	810	996 A	887 B	783 C	655 D	

*: There is no statistically significant difference between the means represented by the same letter in the same column, same row, or same group

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