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THE IMPACT OF DIFFERENT SEEDING DATES ON SEED YIELD OF SOYBEAN

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ABSTRACT

This study was conducted to determine the effect of six different seeding dates (15th April, 1st May, 15th May, 1st June, 15th June and 30th June) on the yield and yield components of the soybean. The experimental design was a randomized complete block with split plot having four replicates. The studies were conducted at GAP International Agricultural Research and Training Center in 2004, 2005 and 2006 years. The results indicated that the cultivars were significantly influenced by the different seeding dates for the traits of plant height (PH), first pod height (FPH), pod number (PN), weight for 100 seeds (SW), seed yield (SY), oil yield (OY) and protein yield (PY), It was observed that cv. NE3399 had the highest seed yield while the lowest seed yield was given by UMUT2002.

Key words: Soybean, Seeding Date, Seed, Oil and Protein Yield.

INTRODUCTION

In parallel with the increasing world population, need for vegetable oil continues. More than 50% of world vegetable oil production has been met by only soybean. Soybean (*Glycine max.* L), contains valuable nutrients for the human and animals, has an important place with respect to nutrition. Soybean cultivation, production and yield values of Turkey in 2010 were 27.000 ha and 85.000 tons and 3148 kg ha^{-1} respectively (Anonymous, 2010a). These values are 83.695 ha, 189.233 tons and 2260 kg ha^{-1} approximately in the world (Anonymous, 2010b). By its role of cultivation and production pattern, soybean cultivation has also a great importance to contribute covering oil deficit. Cultivar, seeding date and cultivar x seeding date interaction have great importance in soybean farming, influencing the yield per unit area, fat and protein in the seeds. Maximum efficiency may be achieved by selecting the proper maturation cultivars. Different maturation soybean cultivars may be affected from changing environmental conditions (Beyyavaş *et al*. 2007). Soil fertility by adding both major and essential nutrients as well as soil organic matter which improve moisture and nutrient retention (Farhad *et al*., 2009).

If very early maturating soybean cultivars cultivated as the main crop, vegetation time increased and yield decreased significantly. According to the researches, the highest number of pods and branches, seed yield and the longest plant cultivation can be obtained on seedingdate of 16th May, the highest number of fruit, 100 grain weight and number of branches can be ensured on seeding date of 6th April (Ahmad *et al*. 2010 a, Ahmad *et al*. 2010 b,; Gizlenci *et al*. 2005). The yield declines at significant quantities in cultivation after 21 June (Arıoğlu 2000). According to the studies with soybean cultivars, 40.0-63.11 cm plant height, the height of the first pods 5.40 to 10.10 cm, number of pods between 29.47-68.93 pods $plant^{-1}$, weight of 100 seeds 12.94-19.19 g, seed yield 14.1-37.6 kg ha^{-1}, rate of oil 18.10-20.60% and rate of protein 32.63-38.83%, was reported in ecological conditions in Diyarbakır (Karaaslan *et al*. 1998). The narrow row spacing especially with uniform distribution improved soil and leaf water status, and was able to resist drought stress, leading to increased yield of soybean (Zhou *et al*. 2011).The purpose of this study was to identify the soybean cultivar ensuring the highest seed yield and to determine the appropriate maturation and the optimal planting time for soybean in Southeastern Anatolia.

MATERIALS AND METHODS

The studies were conducted at GAP International Agricultural Research and Training Center in 2004, 2005 and 2006 in Diyarbakır province. The soil structure in experimental area was fine-textured alluvial material or lime with the main substance, the red brown soil containing low phosphorus and organic materials, in flat and deep levels near or medium-deep slopes, ABC-profile zonal soil (Anonymous, 1997). Diyarbakir province is located in South East Anatolian Region of Turkey. Soils are classified as clay. The region has a warm climate in summer, and the mean annual rainfall is around 450 mm, most of which fall in a major cropping season which extends from November to June. Thus, soybean can be grown during summer season with irrigation in cereal or food legume based cropping systems in the region. Maximum and minimum air

temperature and monthly precipitation, for 2004, 2005, 2006 and long years are presented in Figures 1 and 2, respectively (Anonymous, 2006). To ensure the normal development of plants during the vegetation period, the amount of water varies according to the years and water need covered by irrigation. The cultivated area sown was the ploughed in the autumn; before planting soil was plowed by cultivator after processing twice and two times after it is processed and ready for planting by pulling. All three years, the front of crop was the wheat. Soybean seeding was done with a four-line trial seeder in all three years. All plots were furrow irrigated regularly to avoid drought stress. A total of 5-6 irrigations each year were applied. Plants were harvested in all three years a week after reaching at the stage of physiological maturation with HEGE plot harvesters, This was done following dates: plants sawn on 15th April, 1st May, 15th May, 1st June, 15th June and 30th June were harvested respectively on 15th September, 17th September, 25th September, 2nd October, 9th October and 14th October.

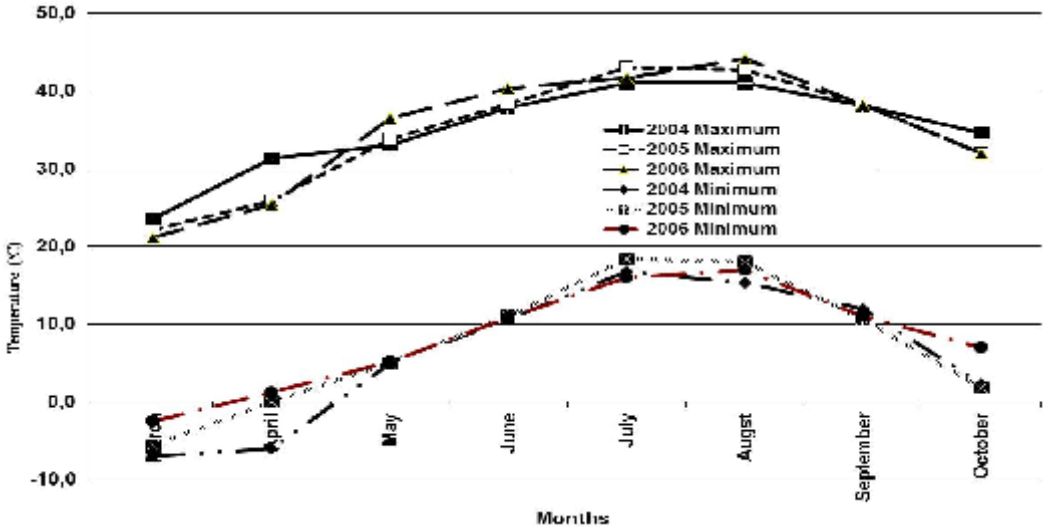

Figure 1. Monthly minimum and maximum temperature (^{0}C) in 2004, 2005 and 2006 in Diyarbakır

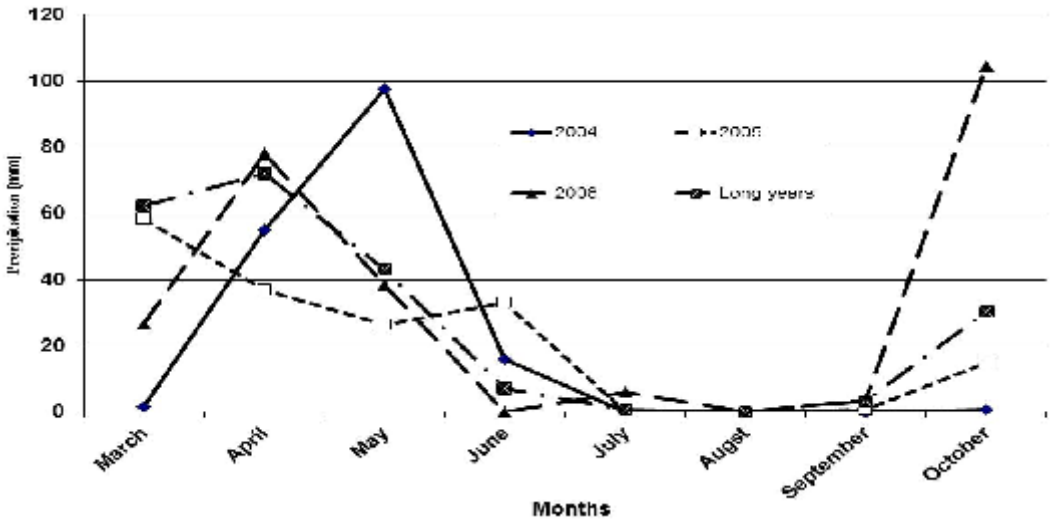

Figure 2. Monthly precipitation (mm) in 2004, 2005, 2006 and long years in Diyarbakır

As a randomized complete block, split plot design with four replications in the main plot sowing date (SD) (15th April, 1st May, 15th May, 1st June, 15th June and 30th June), kind of sub-plots (mid-early UMUT2002, and medium latish NE3399) the investigation was conducted as (Cv) order. Plots were 6 m long, and row spacing was 70 cm, and 4 rows were established. In the study, plant height (PH), first pod height (FPH), pod number (PN), weight for 100 seeds (SW), seed yield (SY), oil yield (OY) and protein yield (PY), were

investigated. Ten plants were selected randomly for recording number of pods per plant before harvest. After threshing, seed yield and hundred seed weight were determined directly after correction for the seed moisture content (average 7%). In three years, the seeds from each plot were taken after harvest for determining oil and protein content of seeds. In order to determine the protein and oil contents, a 25 g sample of dry seeds from each plot were finely grounded. The each sample was analyzed for crude protein content with a model LECO FP528 analyzer (LECO Corp., Joseph, MI), three reading for protein was taken from three subsamples and their average value was recorded. The crude protein content in seeds was estimated by applying the factor N x 6.25 to the seed N content. Soybean flour was extracted into petroleum ether using soxhlet apparatus for 4h as per process of the instrument (AOAC, 1960). Oil contents were determined by weight differences. All values are mean of observations in three independent samples. Seed protein and oil contents were expressed in % on a dry matter basis. Oil and protein yields were calculated as a function of oil and protein contents and seed yield. Using JMP (SAS Institute Inc. Copyright © 1989-2002.) statistical software package, the values were analyzed for each obtained feature in the study. All the data pooled and then the results were examined in accordance with the F test and the average values were grouped according to LSD test.

RESULTS AND DISCUSSION

Analyzed three-year data and the results of analysis of variance for the investigated properties have been given in Table 1. Seeding date in terms of plant height, 1%; cultivar, and CvxSD interaction 5%; seeding date, cultivar and CvxSD interaction in terms of the first pod height, 1%, seeding date in terms of the number of pods, 5%, cultivar 1%, and CvxSD interaction 1%; seeding date in terms of hundred seeds weight property, 1%; cultivar, 5%, seeding date in terms of seed yield and CvxSD interaction 1% and cultivar, 5%; seeding date in terms of oil yield 1%; seeding date in terms of protein yield 1%. Average values of cultivar, seeding date and plant height characteristics of CvxSD interactions and consisting groups according to the LSD test have been given in Table 2.

Statistically significant differences for plant height were depicted by cultivars, seeding dates and their interaction (Table 2). The maximum (101.2 cm) plant height was given by NE3399, while minimum (87.0 cm) plant height by UMUT2002. Seeding dates affected plant height significantly. Plant height progressively increased from first seeding and reached to peak at third seeding (15th May) and decreased thereafter till the end assuring the highest values of plant height, the seeding dates of 15th May (103.7 cm) and 1st June (100.6 cm) and ensuring the lowest plant height values 15th April (88.0 cm) and 30th June (84.3 cm) form (SD) groups; the UMUT2002 cultivar 1st May (107.0 cm), 15th May (111.5 cm) and 1st June (106.8 cm) ensure the highest values of plant height of CvxSD interactions, the NE3399 cultivar of 15th April (80.6 cm), 1st May (81.1 cm) and 30th June (79.2 cm) ensure lowest plant height values of CvxSD interaction groups.

Different average values of plant height cultivar, seeding date and CvxSD interactions could be caused by the high summer temperatures in the region and cultivars of different maturity groups. Nevertheless, the most suitable seeding date for plant height may be said between 15th May and 1st June. The findings seem to support the findings of Sarmah *et al*. (1984), William *et al*. (2005) and Beyyavaş *et al*. (2007).

According to the first pod height (cm), average values of cultivar, seeding date and CvxSD interactions have been given in Table 3.

As shown in Table 3, ensuring the highest value of the first pod height (20.9 cm) in UMUT2002 cultivar and giving the lowest value of the first pod height (18.0 cm) the NE3399 cultivar form the (Cv) groups; assuring the highest value of the first pod height, the seeding date of 15th May (23.3 cm) and ensuring the lowest value of first pod height 30th June (14.1 cm) form (SD) groups; the UMUT2002 1st May cultivar (24.2 cm) and 15th May (24.6 cm) ensure the highest value of first pod height of CvxSD interactions, the NE3399 cultivar of 30th June (14.2 cm) and the UMUT 2002 30th June (13.9 cm) ensure the lowest value of the first pod height of CvxSD interaction groups.

The first pod height values could be influenced by the extreme temperatures during the research in the region and the different interactions of cultivars of different seeding dates and maturation groups. However, it may be said that the most suitable seeding date was 15th May with respect to the first pod height, and delay of seeding date might cause decreases in the value of the first pod height.

Average values of cultivar, seeding date and CvxSD interactions according to the number of pods plant^{-1} have been given in Table 4. As shown in Table 4, ensuring the value of the highest number of pods the UMUT2002 cultivar (44.7 pods plant^{-1}), assuring the lowest number of pods NE3399 cultivar (40.3 pods plant^{-1}) form the (Cv) groups; ensuring the highest values of pod numbers, 15th April (45.1 pods plant^{-1}), 1st May (43.4 per plant) and 30th June (43.3 pods plant^{-1}), and assuring the lowest values of pod numbers 15th May (40.2 pods plant^{-1}), 1st June (42.5 pods plant^{-1}) and 15th June (40.4 pods plant^{-1}) form the (SD) groups; ensuring the highest number of pods UMUT2002 30th June cultivars (52.4 pods plant^{-1}) and assuring the lowest number of pods the NE 3399 30th June (34.2 pods plant^{-1}) form the CvxSD interaction groups. It may be said that, the values of pod

numbers might be influenced by extreme temperatures and different cultivars of different maturation groups in the research area.

Table 1. Analysis of variance for three years data with respect to investigated properties

Source of Variance	D. F.	PH (cm)	FPH (cm)	PN (per/plant)	100 SW (g)	SY (kg ha^{-1})	OY (kg ha$^{-1)}$	PY (kg ha$^{-1)}$
Cultivars	1	162.0**	47.4**	21.7**	15.4*	137.9**	2.1^{ns}	2.2^{ns}
Seeding Dates	5	17.3**	101.3**	3.5*	58.2**	3.2*	6.9**	9.0**
Year	2	8.3*	29.8**	94.6**	1221.7**	202.3**	91.2**	120.4**
VxSD	5	3.6*	26.3**	19.8**	1.1^{ns}	9.4**	1.9^{ns}	4.1^{ns}
VxYear	2	5.1*	33.9**	62.2**	6.8*	5.3*	2.5^{ns}	4.6*
SDxYear	10	7.4**	17.5**	15.8**	73.9**	22.4**	24.9**	10.3**
VxYearxSD	10	1.4^{ns}	9.6**	7.4**	2.1*	6.8**	6.9**	4.7**

Table 2. Plant height of two soybean cultivars in response to seeding date.

Cultivars	Year	Seeding Date						Mean
		15th April	1st May	15th May	1st June	15th June	30th June	
NE3399	2004	83.3	86.6	94.2	81.7	91.5	94.8	88.7c
UMUT2002		96.3	107.3	115.7	102.4	101.7	107.9	105.2a
Mean		89.8eg	96.9ce	104.9ac	92.0eg	96.6ce	101.4bd	96.9a
NE3399	2005	75.3	79.7	92.1	94.1	90.1	65.7	82.8d
UMUT2002		93.5	110.4	98.9	112.5	103.8	80.1	99.9b
Mean		84.4gh	95.0df	95.5df	103.3ad	97.0ce	72.9ı	91.3b
NE3399	2006	83.3	77.1	101.5	107.8	89.7	77.2	89.4c
UMUT2002		96.3	104.5	120.0	105.5	85.2	80.2	98.6b
Mean		89.8eg	90.8eg	110.8a	106.6ab	87.5fg	78.7hı	94.0ab
NE3399	Mean of 3 years	80.6d	81.1d	95.9bc	94.5bc	90.4bc	79.2d	87.0b
UMUT2002		95.4bc	107.4a	111.5a	106.8a	96.9b	89.4c	101.2a
Mean		88.0c	94.2b	103.7a	100.6a	93.7b	84.3c	-
C.V. (%)		9.15						
L.S.D. (%5)		C:2.51, SD:4.93, Y:3.10, CxSD:6.97, CxY:4.36, SDxY:8.53,						

Table 3. First pod height of two soybean cultivars in response to seeding date.

Cultivars	Year	Seeding Date						Mean
		15th April	1st May	15th May	1st June	15th June	30th June	
NE3399	2004	15.6oq	17.6lo	20.2fj	18.1jn	16.6nq	18.2jn	17.7bc
UMUT2002		22.5ce	30.0b	33.6a	24.2c	22.9cd	20.8dg	25.6a
Mean		19.0gı	23.8b	26.9a	21.1df	19.7fg	19.5g	21.7a
NE3399	2005	15.4pq	18.9gl	23.7c	22.8cd	18.4ım	12.9rs	18.7bc
UMUT2002		20.7eh	24.0c	22.3ce	19.3gl	19.9gk	9.2t	19.2b
Mean		18.0hı	21.4de	23.0bc	21.1df	19.1gh	11.1k	18.9b
NE3399	2006	15.6pq	14.2qr	22.1cf	22.9cd	18.9gl	11.5s	17.5c
UMUT2002		22.5ce	18.7hm	17.9kn	20.4eı	16.2oq	11.8s	17.9bc
Mean		19.0gı	16.5j	20.0eg	21.6cd	17.5ıj	11.6k	17.7c
NE3399	Mean of 3 years	15.5e	16.9d	22.0b	21.2b	18.0d	14.2f	18.0b
UMUT2002		21.9b	24.2a	24.6a	21.3b	19.6c	13.9f	20.9a
Mean		18.7c	20.6b	23.3a	21.3b	18.8c	14.1d	-
C.V. (%)		7.80						
L.S.D. (%5)		C:0.95, SD:0.85, Y:1.18, CxSD:1.23, CxY:1.67, SDxY:1.50, VxYxSD:2.12						

Table 4. Pod number of two soybean cultivars in response to seeding date.

Cultivars	Year	Seeding Date						Mean
		15th April	1st May	15th May	1st June	15th June	30th June	
NE3399	2004	53.9bd	56.2bc	36.1jl	36.3jl	30.7ln	24.4n	39.6cd
UMUT2002		43.3gj	30.3ln	28.1mn	24.4n	25.4mn	28.1mn	29.6e
Mean		47.6cd	43.2de	32.1g	30.4gh	28.0gh	26.3h	34.6c
NE3399	2005	36.7jl	35.9jl	41.0hj	40.4hj	36.7jl	38.4ık	38.2d
UMUT2002		45.0fı	40.4hj	45.9eh	48.1dg	43.8fı	56.1bc	46.5b
Mean		40.9ef	38.1f	43.4de	44.2ce	40.2ef	47.3cd	42.4b
NE3399	2006	52.2be	45.5eh	32.1km	38.5ık	50.5cf	39.7hj	43.1bc
UMUT2002		41.3gj	52.4be	57.9b	67.6a	55.5bc	73.1a	58.0a
Mean		46.7cd	48.9bc	45.0ce	53.0ab	53.0ab	56.4a	50.5a
NE3399	Mean of 3 years	47.6b	45.9bc	36.4gh	38.4fg	39.3eg	34.2h	40.3b
UMUT2002		42.5ce	41.0df	44.0bd	46.7b	41.6df	52.4a	44.7a
Mean		45.1a	43.4a	40.2b	42.5ab	40.4b	43.3a	-
C.V. (%)	11.47							
L.S.D. (%5)		C:2.12, SD:2.79, Y:2.60, CxSD:3.94, CxY:3.68, SDxY:4.83, VxYxSD:6.83						

Table 5. Hundred seed weight of two soybean cultivars in response to seeding date.

Cultivars	Year	Seeding Date						Mean
		15th April	1st May	15th May	1st June	15th June	30th June	
NE3399	2004	11.56ho	12.18em	12.84bı	11.32ıo	11.88fn	13.37bf	12.19b
UMUT2002		12.42el	14.12ac	15.18a	13.21bg	13.70ae	14.00ad	13.77a
Mean		11.99eı	13.15ad	14.01a	12.26dh	12.79bf	13.68ab	12.9a
NE3399	2005	10.73mp	11.64hn	11.26jo	9.62p	10.50np	11.33ıo	10.84c
UMUT2002		11.64hn	10.52np	10.08op	11.11kp	11.08lp	11.70gn	11.02c
Mean		11.18hl	11.08ıl	10.67kl	10.36l	10.79jl	11.52gk	10.9b
NE3399	2006	11.06lp	12.33el	12.94bh	12.65bk	13.41bf	12.75bj	12.52b
UMUT2002		12.67bj	12.86bı	12.97bh	12.53dl	12.59cl	14.17ab	12.96ab
Mean		11.86fj	12.59cg	12.96ae	12.59cg	13.00ae	13.46ac	12.7a
NE3399	Mean of 3 years	11.11d	12.04bc	12.34b	11.19cd	11.92bd	12.48ab	11.85b
UMUT2002		12.23b	12.50ab	12.74ab	12.28b	12.45ab	13.29a	12.58a
Mean		11.67c	12.27ac	12.54ab	11.73c	12.19c	12.88a	-
C.V. (%)		9.00						
L.S.D. (%5)		C:0.45, SD:0.61, Y:0.57, CxSD:0.87, CxY:0.79, SDxY:1.09, VxYxSD:1.52						

Table 6. Seed yield of two soybean cultivars in response to seeding date.

Cultivars	Year	Seeding Date						Mean
		15th April	1st May	15th May	1st June	15th June	30th June	
NE3399	2004	2339.5bd	2163.5cf	2629.5a	1847.5gj	2353.5bd	2631.0a	2327.4a
UMUT2002		2169.0cf	2213.7ce	2306.0bd	1944.2fh	1933.2fı	2374.2bc	2156.7b
Mean		2254.2b	2188.6bc	2467.7a	1895.8eg	2143.3bd	2502.6a	2242.0a
NE3399	2005	2128.2cf	2135.2cf	1844.2gj	2017.5eg	2280.7bd	1835.2gj	2040.2c
UMUT2002		1351.2mn	1690.7ıl	1856.7gj	2006.5eg	2117.5df	1413.7mn	1739.4e
Mean		1739.7gh	1913.0eg	1850.5fg	2012.0df	2199.1bc	1624.5hı	1889.8b
NE3399	2006	2289.5bd	1532.2ln	1325.2mn	2156.7cf	1728.5hl	2498.0ab	1921.7d
UMUT2002		2219.0ce	1787.2gk	1683.7jl	1975.0eh	1303.5n	1555.5km	1754.0e
Mean		2254.2b	1659.7hı	1504.5ı	2065.8ce	1516.0ı	2026.7ce	1837.8c
NE3399	Mean of 3 years	2252.4ab	1943.6d	1933.0d	2007.2bc	2120.9bc	2321.4a	2096a
UMUT2002		1913.0de	1897.2de	1948.8d	1975.2d	1784.7e	1781.1e	1883.3b
Mean		2082.7a	1920.4c	1940.9c	1991.2ac	1952.8bc	2051.2ab	-
C.V. (%)		8.91						
L.S.D. (%5)		C:38.15, SD:101.40, Y:46.74, CxSD:143.39, CxY:66.11, SDxY:175.61, VxYxSD:248.37						

However, it might be said that the most suitable seeding date was 15th April and 1st May in terms of number of pods and the delay of seeding date may cause decrease in number of pods. The findings seem to support the findings of Sarmah *et al*. (1984), Tuncer (1990), Kara (2003), Gizlenci *et al*. (2005), Arıoğlu (2000) and Beyyavaş *et al*. (2007).

Average values of cultivar, seeding date and CvxSD interactions according to hundred seeds weight (g) have been given in Table 5.

As shown in Table 5, ensuring the highest value of the weight of hundred seeds the UMUT2002 cultivar (12.58 g), and assuring the lowest value of the weight of hundred seeds the NE3399 cultivar (11.85 g), form the (Cv) groups; ensuring the highest value of the weight of a hundred seeds seeding date of 15th April (11.67 g) and assuring the lowest value of hundred seed weight the seeding date of 1st June (11.73 g) and 15th June (12.19 g) form the (SD) groups; ensuring the highest weight of hundred seeds, the UMUT2002 cultivar and seeding date of 15th April (12.23 g) the CvxSD interactions and assuring the lowest weight of hundred seeds the NE3399 and the seeding dates of 1st June (11.19 g) and 15th June (11.92 g) also form the CvxSD interaction groups.

It may be said that the most suitable seeding date for a hundred seed weight could be 15th May; delay of seeding date may cause declines in values of hundred seeds and due to appropriate growing time early cultivars may have high values of hundred seeds. The findings seem to support the findings of Sarmah *et al*. (1984), Gizlenci *et al*. (2005), William *et al*. (2005) and Beyyavaş *et al*. (2007).

Average values of cultivar, seeding date and CvxSD interactions according for grain yield (kg ha^{-1}) have been given in Table 6.

As shown in Table 6, ensuring the value of the highest seed yield, the NE3399 cultivar (2096 kg ha^{-1}), and assuring the lowest seed yield the UMUT2002 cultivar (1883 kg ha^{-1}) form the (Cv) groups; ensuring the highest values of seed yield seeding dates of 15th April (2082.7 kg ha^{-1}), 1st June (1991.2 kg ha^{-1}) and 30th June (2051.2 kg ha^{-1}) assuring the lowest seed yield seeding dates of 1st May (1920.4 kg ha^{-1}), 15th May (1940.9 kg ha^{-1}), 1st June (1991.2 kg ha^{-1}) and 15th June (1952.8 kg ha^{-1}) form the (SD) groups; ensuring the highest values of seed yield, the NE3399 and seeding dates of 15th April (2252.4 kg ha^{-1}) and 30th June (2321.4 kg ha^{-1}) form the CvxSD interactions; assuring the lowest seed yield the UMUT2002 and 15th June (1784.7 kg ha^{-1}) and 30th June (1781.1 kg ha^{-1}) form the CvxSD interaction groups. No matter what average values of seed yield do not show differences according to cultivar, seeding date and CvxSD interactions, it is noteworthy that higher yield values during early seeding.

The differences could be caused by high day and night temperature differences in the region, different impacts of very high summer temperatures on growth periods of plants and may be due to the fact that the cultivars of different maturity groups. The findings seem to support the findings of Sarmah *et al*. (1984), Tuncer (1990), Gizlenci *et al*. (2005), Arıoğlu (2000) and Beyyavaş *et al*. (2007).

Average values of cultivar, seeding date and CvxSD interactions according to oil yield (kg ha^{-1}) have been given in Table 7. As shown in Table 7, the differences between the cultivars and CvxSD interactions is significant statistically, and ensuring the highest oil yield values the seeding date of 15th April (445.09 kg ha^{-1}) with NE3399 cultivar and obtained the lowest oil yield values seeding dates of 30th June (333.99 kg ha^{-1}) with UMUT2002 cultivar. According to the seeding dates the highest oil yield was obtained from 1st April (415.59 kg ha^{-1}), the lowest was obtained from 15th May (372.51 kg ha^{-1}). Cultivar NE3399 was higher oil

Table 7. Oil yield (OY) of two soybean cultivars in response to seeding date.

Cultivars	Year	Seeding Date						Mean
		15th April	1st May	15th May	1st June	15th June	30th June	
NE3399	2004	461.9bd	469.5ac	512.5a	380.0gı	495.9ab	516.6a	472.7
UMUT2002		437.8cf	449.6bf	446.7cf	352.9ıl	359.2hk	442.7cf	414.8
Mean		449.8ab	459.6ab	479.6a	366.4e	427.5bc	479.6a	443.8a
NE3399	2005	421.2dg	424.6cg	362.3hj	402.6fh	449.9be	366.3hj	404.4
UMUT2002		274.0np	330.5jm	365.7hj	402.5eh	431.3cf	287.3mo	348.6
Mean		347.6ef	377.5de	364.0e	402.4cd	440.6b	326.8fg	376.5b
NE3399		452.1bd	297.3mn	233.5p	370.0hj	307.1ln	443.9cf	350.7
UMUT2002	2006	446.4cf	328.3jm	314.0kn	348.8ıl	240.9op	271.8np	325.0
Mean		449.2ab	312.8g	273.7h	359.4ef	274.0h	357.8ef	337.8c
NE3399	Mean of 3 years	445.0a	397.1bc	369.5de	384.1cd	417.6ab	442.3a	409.3a
UMUT2002		386.1cd	369.5de	375.5cd	368.1de	343.8ef	333.9f	362.8b
Mean		415.5a	383.3b	372.5b	376.1b	380.7b	388.1b	-
C.V. (%)		8.78						
L.S.D. (%5)		C:14.64, SD:19.38, Y:17.92, CxSD:27.42, CxY:25.36, SDxY:33.58, VxYxSD:47.50						

Table 8. Protein yield (PY) of two soybean cultivars in response to seeding date.

Cultivars	Year	Seeding Date						Mean
		15th April	1st May	15th May	1st June	15th June	30th June	
NE3399	2004	725.8bf	693.4cj	843.8a	539.0mo	676.1ck	818.8ab	716.2a
UMUT2002		661.3dl	698.9cı	762.4ad	595.2hn	586.4ın	754.4ae	676.5b
Mean		693.6b	696.2b	803.1a	567.1eg	631.3be	786.6a	696.3a
NE3399	2005	641.8em	787.4ac	533.9mo	587.1ın	643.9em	526.9mo	620.2c
UMUT2002		406.6p	570.2kn	597.0hn	577.8jn	606.5gn	439.1op	532.9d
Mean		524.2g	678.8bc	565.4eh	582.5dg	625.2be	483.0h	576.5b
NE3399	2006	716.4bg	505.1np	435.4op	704.9bh	624.5fm	777.0ad	627.2c
UMUT2002		678.9ck	546.4lo	609.9fn	604.4gn	389.8p	440.9op	545.1d
Mean		697.6b	525.8fh	522.6gh	654.7bd	507.2gh	608.9cf	586.1b
NE3399	Mean of 3 years	694.7a	662.0ab	604.3be	610.3be	648.2ad	707.6a	654.5a
UMUT2002		582.2df	605.2be	656.4ac	592.5cf	527.6f	544.8ef	584.8b
Mean		638.5	533.6	530.4	601.4	587.9	626.2	-
C.V. (%)	13.52							
L.S.D. (%5)		C:15.82, Y:19.37, CxSD:67.74, CxY:27.39, SDxY:82.96, VxYxSD:117.33						

yield than the cultivar UMUT2002. To obtain the highest oil yield in seeds the most suitable seeding dates may be April 15, delays of seeding date may decrease the oil yield. The findings are different from the findings of Willow *et al*. (2005) and Beyyavaş *et al*. (2007) may originate from different materials, environmental features and various laboratory conditions. Average values of cultivar, seeding dates and CvxSD interactions according to the protein yield (kg ha^{-1}) were given in Table 8.

As shown Table 8, the differences between the cultivars and CvxSD interactions is significant statistically, ensuring the highest protein yield the seeding dates of 1st April (694.72 kg ha^{-1}) and 30th June (707.60 kg ha^{-1}) with NE3399 cultivar, and assuring the lowest protein yield the seeding dates of 15th June (527.64 kg ha^{-1}) with UMUT2002 cultivar. According to the seeding dates; 15th April (638.51 kg ha^{-1}) was given the highest protein yield and the lowest was obtained from 15th June (587.93 kg ha^{-1}). Cultivar NE3399 was higher protein yield than the cultivar UMUT2002. To obtain the highest protein yield in seeds the most suitable seeding dates may be 15th April, delays of seeding date may decrease the protein yield.

Conclusion: As a result, it has been observed that extreme temperatures during the growing period affected the development of soybean plants negatively, according to the analyzed features with respect to seed yield, hundred seed weight, pod number, plant height and first pod height the most seeding dates might be 15th April for the main crop cultivation and the 15th June for the second crop cultivation but there might be changes according to group features of cultivars; this situation was due to very high temperatures during the pollination of seeds and seed formation periods; higher yields were obtained when pollinations of seeds and seed formation periods coincide with more suitable temperature conditions according to the seeding date of crop; and delay in seeding date might influence these features negatively, and consequently the NE3399 cultivar was the highly efficient.

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