

## Survey Sowing Date and Density Different, on Seed and Oil Yield Two Cultivar Safflower (*Carthamus tinctorius* L.) in Region Ardabil

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**Abstract:** This experiment, the 2009-2010 crop year, in the research station of Islamic Azad University of Ardabil Located North West, Ardabil. The latitude and longitude 48 degrees 38 degrees and 15 minutes was performed. The experimental, factorial - split plot In a randomized complete block design with three replications. Main Factor, consisting Sowing date in four levels(20 March, 7 April, 23 April, 8 May) And density at three levels (10, 20, 30 cm) were as factorial. And cultivars used in this study Zarghan 279 and Sina, As sub Factor In the subplots, were randomized. The results of the ANOVA showed that, The number of heads and And 1000 seed weight Were affected by sowing date, but there was no significant difference in other traits. Plant density affect significantly The number of heads, number of seeds per head, seed yield and oil yield was. In general, the best sowing date of yield ;sowing date yield the fourth with 5144 kg/ ha And best density, density, distance 10 cm, with the yield 3190 kg/ ha. Two varieties were different in terms of yield and the highest seed and oil yield respectively in 2560 and 673 kg /ha to the Sina Cultivar was allocated.

**Key words:** Sowing Date • Density • Safflower • Seed Yield • Oil Yield

### INTRODUCTION

Sowing date, the first step in decisions, management of crop production, Especially in areas with environmental limitations such as, cold early Or late season and the summer heat is intense. Several studies in safflower, showed The germination [1-4], rosette stage [5, 6, 3], seed yield [7, 8, 9], number of seeds per head [8]. The number of heads [8] And 1000 seed weight, [8, 7] are all affected by Sowing date, take place. Lueble *et al.* [7]. The effect of sowing date on grain yield of spring safflower examined And reported every 4-6 weeks delay in sowing, seed yield From 160 to 366 kg /ha decreases.

Beech and Norman [10] Showed that the density and sowing date had a direct impact on yield. So, the delay in sowing reduces seed yield and the amount of oil, So that,

delay planting Resulting in decreased, amount of seed yeild and oil And also with increasing density, number of head increased, so that the amount of oil was increased from 5.7 to 39.7 %. Zimerman [11] also explained that the delay in planting safflower with increasing temperature, The seed oil is reduced. Lubes *et al.* [12] Concluded that the delay in planting, The safflower plant reproductive growth coincides with the very hot summer weather And stress, the yield is significantly reduced.

### MATERIALS AND METHODS

This experiment, the 2009-2010 crop year, in the research station of Islamic Azad University of Ardabil Located North West, Ardabil. The latitude and longitude 48 degrees 38 degrees and 15 minutes was performed.

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The experimental, factorial-split plot In a randomized complete block design with three replications. Main Factor, consisting Sowing date in four levels (20 March, 7 April, 23 April, 8 May) And density at three levels (10, 20, 30 cm) were as factorial. And cultivars used in this study Zarghan 279 and Sina, As sub Factor In the subplots, were randomized.

Row spacing in all densities 50 cm and the densities The change was made between the rows of plants. And planting seeds to a depth of 4 - 6 cm and done manually. So that each plot after removing the marginal effects, 1 m<sup>2</sup> was Harvest for yield.

In order to measure the traits, The number of heads, number of seeds per head and 1000 seed weight, From each plot, 10 plants were randomly selected. To measure, Oil yield from each plot 3 gr of seed oil was selected And method soxhlet, oil content was determined.

Data analysis and mean comparisons using Duncan at 5% level using the statistical software MSTAT-C, SPSS-19 and for drawing the diagrams, Excel software was used.

## RESULTS AND DISCUSSION

The results of variance analysis (Table 1), The effect of of sowing date for traits, The number of heads and 1000 seed weight in the 5% level And for other traits is not significant.

The effect of density on traits, The number of heads, seed yield and oil yield in the 1% level and For the trait number of seeds per head was significant at the 5% level. Between cultivars, the traits The number of heads, seed yield and oil yield was significant difference in the 1% level.

Interaction density × cultivar, Traits number of heads, seed yield and oil yield were significant for the 1% level. Three-way interaction sowing date × density × cultivar on seed yield and oil yield Was significant at the 5% level. Interaction, sowing date × density and sowing date × cultivar For the studied traits, non-significant.

According to the results of mean comparisons (Table 2), density for seed yield and oil yield (Figure 1),

Table 1: Analysis of Variance For traits studied

S.O.V	df	Number Of Head	Number Of Seed Per Head	Seed Yield (kg.ha)	1000 seed weight (gr)	Oil Yield (kg.ha)
Rep	2	0.766 <sup>ns</sup>	159.402*	103.501 <sup>ns</sup>	0.074 <sup>ns</sup>	59.228 <sup>ns</sup>
Sowing	3	4.052*	6.389 <sup>ns</sup>	158.402 <sup>ns</sup>	0.169*	59.003 <sup>ns</sup>
Density	2	13.481**	193.184*	1547.400**	0.079 <sup>ns</sup>	378.738**
Sowing×Density	6	0.222 <sup>ns</sup>	43.819 <sup>ns</sup>	12.544 <sup>ns</sup>	0.047 <sup>ns</sup>	5.178 <sup>ns</sup>
Error1	22	1.333	47.760	91.241	0.059	22.032
cultivar	1	0.172 <sup>ns</sup>	419.824**	338.853**	0.215 <sup>ns</sup>	189.257**
Sowing× cultivar	3	0.082 <sup>ns</sup>	24.850 <sup>ns</sup>	8.134 <sup>ns</sup>	0.099 <sup>ns</sup>	0.841 <sup>ns</sup>
Density× cultivar	2	7.542**	9.337 <sup>ns</sup>	13.785**	0.083 <sup>ns</sup>	10.473**
Sowing× Density× cultivar	6	0.111 <sup>ns</sup>	12.169 <sup>ns</sup>	10.428*	0.080 <sup>ns</sup>	5.149*
Error2	24	1.106	51.098	4.778	0.122	2.783
C.V%	-	18.650	22.030	4.600	5.520	7.010

\* and \*\* Significantly at p < 0.05 and < 0.01, respectively

Table 2: Comparisons of mean density for the studied traits

Treat	Number Of Head	Number Of Seed Per Head	Seed Yield (kg.ha)	Oil Yield (kg.ha)
Density1	23.33 <sup>b</sup>	29.31 <sup>b</sup>	3190 <sup>a</sup>	809.2 <sup>a</sup>
Density2	36.54 <sup>a</sup>	34.83 <sup>a</sup>	2236 <sup>b</sup>	556.3 <sup>b</sup>
Density3	40.21 <sup>a</sup>	33.23 <sup>ab</sup>	1611 <sup>c</sup>	412.3 <sup>b</sup>

Table 3: Comparisons of mean, cultivars for the studied traits

Treat	Number Of Seed Per Head	Seed Yield (kg.ha)	Oil Yield (kg.ha)
Zarghan279	30.03 <sup>b</sup>	2131 <sup>b</sup>	511.47 <sup>b</sup>
Sina	34.86 <sup>a</sup>	2560 <sup>a</sup>	673.71 <sup>a</sup>

Table 4: Comparisons of mean, interaction density×cultivar for the studied traits

Treat		Number Of Head	Seed Yield (kg.ha)	Oil Yield (kg.ha)
Density1	Zarghan279	20.66 <sup>d</sup>	2846 <sup>b</sup>	673.7 <sup>b</sup>
	Sina	26.00 <sup>cd</sup>	3533 <sup>a</sup>	944.7 <sup>a</sup>
Density2	Zarghan279	33.41 <sup>bc</sup>	2086 <sup>d</sup>	487.2 <sup>c</sup>
	Sina	39.66 <sup>ab</sup>	2385 <sup>c</sup>	625.4 <sup>b</sup>
Density3	Zarghan279	48.16 <sup>a</sup>	1460 <sup>f</sup>	373.5 <sup>d</sup>
	Sina	32.25 <sup>bc</sup>	1762 <sup>e</sup>	451.0 <sup>c</sup>

Table 5: Comparisons of mean, interaction sowing date × density × cultivar for the studied traits

Treat			Oil Yield (kg/ha)	Seed Yield (kg/ha)
Sowing1	Density1	Zarghan279	582.8 <sup>d,h</sup>	2667 <sup>ede</sup>
		Sina	765.8 <sup>bc</sup>	3009 <sup>bc</sup>
	Density2	Zarghan279	434.4 <sup>ghi</sup>	1775 <sup>h-i</sup>
		Sina	554.4 <sup>d,h</sup>	2149 <sup>gh</sup>
	Density3	Zarghan279	269.1 <sup>j</sup>	1127 <sup>m</sup>
		Sina	361.8 <sup>ij</sup>	1544 <sup>kl</sup>
Sowing2	Density1	Zarghan279	659.1 <sup>cde</sup>	2717 <sup>cde</sup>
		Sina	859.9 <sup>b</sup>	3224 <sup>b</sup>
	Density2	Zarghan279	417.7 <sup>hij</sup>	2031 <sup>ghi</sup>
		Sina	594.8 <sup>d,g</sup>	2231 <sup>fg</sup>
	Density3	Zarghan279	429.1 <sup>g,j</sup>	1630 <sup>l</sup>
		Sina	462.7 <sup>ghi</sup>	1736 <sup>h-l</sup>
Sowing3	Density1	Zarghan279	680.5 <sup>cd</sup>	2789 <sup>cd</sup>
		Sina	864.9 <sup>b</sup>	3296 <sup>b</sup>
	Density2	Zarghan279	451.3 <sup>ghi</sup>	1964 <sup>g-k</sup>
		Sina	634.6 <sup>c,f</sup>	2363 <sup>efg</sup>
	Density3	Zarghan279	358.2 <sup>ij</sup>	1493 <sup>lm</sup>
		Sina	471.9 <sup>f,i</sup>	1785 <sup>h-l</sup>
Sowing4	Density1	Zarghan279	772.4 <sup>bc</sup>	3212 <sup>b</sup>
		Sina	1288 <sup>a</sup>	4605 <sup>a</sup>
	Density2	Zarghan279	645.5 <sup>cde</sup>	2574 <sup>def</sup>
		Sina	717.7 <sup>bcd</sup>	2799 <sup>cd</sup>
	Density3	Zarghan279	473.6 <sup>ghi</sup>	1593 <sup>kl</sup>
		Sina	507.8 <sup>e,i</sup>	1981 <sup>ej</sup>

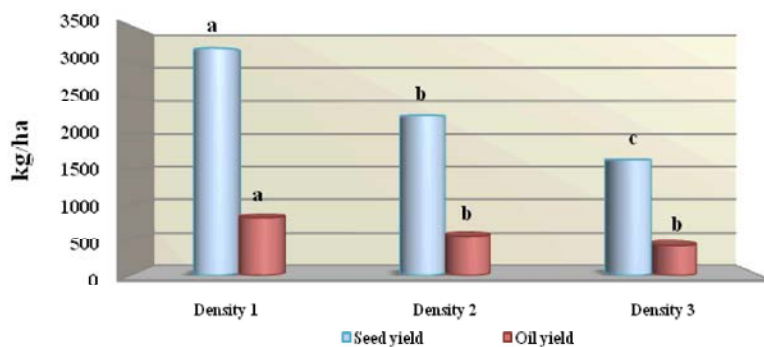


Fig. 1: Interaction density × cultivar for the seed and oil yield

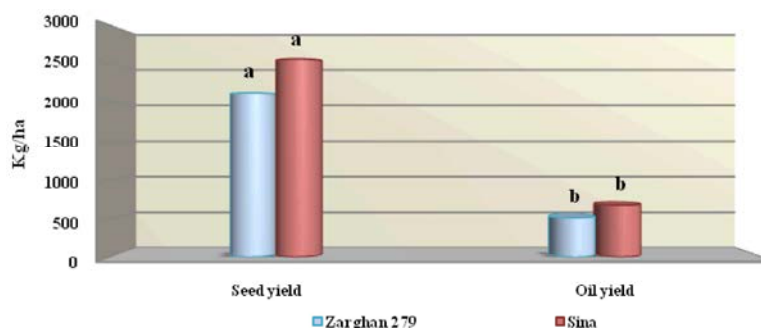


Fig. 2: Comparisons of mean, cultivar for the seed and oil yield

The highest oil yield and seed yield in the first density Respectively, with an average of 809.2 and 3190 kg/ ha And the lowest oil yield in the second and third density, respectively with an average of 412.3 and 556. 3 kg/ ha And the lowest seed yield in the third density with an average 1611 kg/ ha allocated.

The mean comparisons between cultivars (Table 3) the highest seed yield and oil yield, respectively, with averages 673.71 and 2560 kg/ ha Relevant to Sina cultivar And the lowest seed yield and oil yield Relevant Zarghan cultivar Respectively, with averages of 2131 kg per hectare is 511.47 In third density Respectively, with averages 373.5 and 1460 kg /ha to allocated (Figure 2).

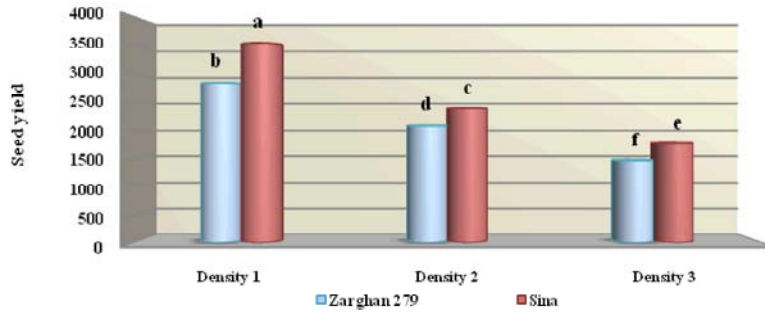


Fig. 3: Interaction density×cultivar for seed yield

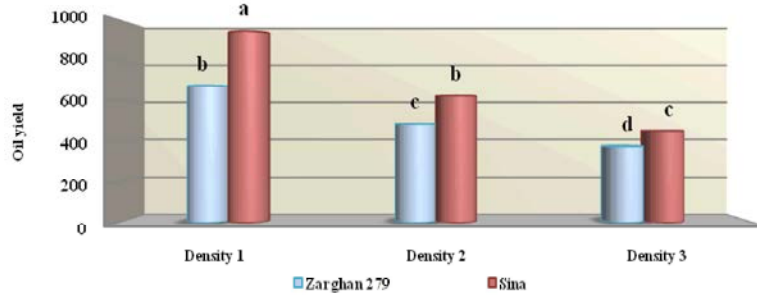


Fig. 4: Interaction density×cultivar for oil yield

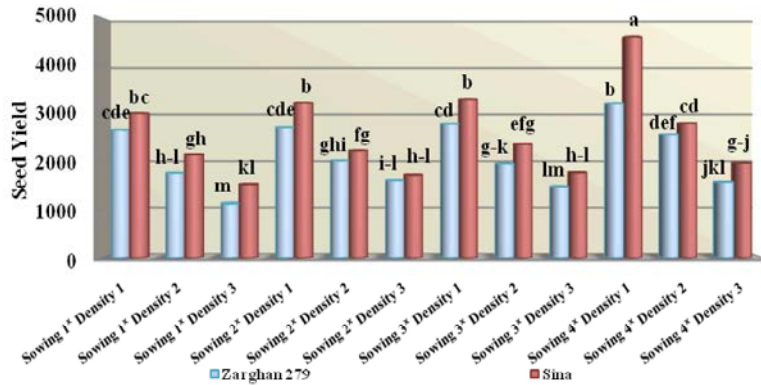


Fig. 5: Interaction sowing data×density×cultivar for seed yield

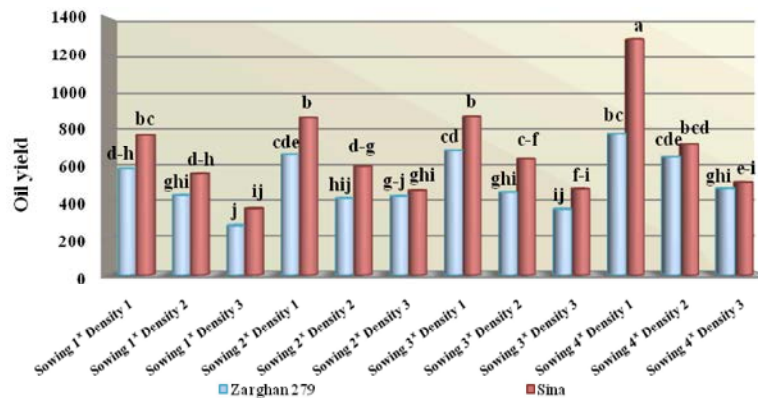


Fig. 6: Interaction sowing data×density×cultivar for oil yield

According to the results of mean comparisons (Table 4), Interaction density  $\times$  cultivar The highest seed and oil yield, respectively. With averages, 944.7 and 3533 kg/ha Relevant to cultivar, Sina in first density And the lowest seed and oil yield Relevant to cultivar, Zarghan In third density respectively with 373.5 and 1460 kg /ha (Figure 3, 4).

According to the results of mean comparisons (Table 5), three-way interaction sowing date  $\times$  density  $\times$  cultivar (Figure 5, 6). The highest seed yield and oil the sina cultivar The first density and fourth sowing date Respectively, with averages 1288 and 4605 kg/ ha and of the lowest seed yield and oil yield, the zarghan cultivar on the first sowing date and the third density respectively, with averages 269.1 and 1127 kg/ ha allocated.

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