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## Effect of sowing date on yield and yield components of cannabis

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### Abstract

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In order to investigate the effect of sowing date on yield and yield components of hemp, this study was conducted in the field condition during 2012 in a randomized complete block design with three replications and three sowing date consist of 30 April, 10 May and 20 May as treatments in research station of faculty of agriculture of Azarbaijan Shahid Madani University. Results showed that maximum plant height, biological yield of plant, seed number per plant, weight of seeds per plant, yield of seed per hectare was obtained from the second sowing date and maximum value of harvest index belonged to first date. Maximum 1000 seeds weight and seed oil yield per plant was observed in the first planting date but there was no significant difference with the second planting date. Finally, it seems that middle of May is the best time for hemp planting at western agronomic lands of Iran.

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## Introduction

Hemp (*Cannabis sativa* L.) is a quantitative short day plant. The flowering is induced by short days and genetically controlled (Kozłowski and Pallardy, 1997). Before flower initiation takes place, some vegetative growth must have occurred (Vince- Prue, 1975). Control of environmental factors that affect the growth and production of crops, is difficult. But Plants will be able to achieve their potential by adopt appropriate methods such as determination of suitable planting date. Therefore attention to issues such as the temperature of the soil for planting, a high percentage of seed-germination, seedling emergence, establishment of plants before weeds, non-synchronization of flowering, pollination and grain filling time with high temperature, non-synchronization of harvest with late season rainfall and so on, are important (Khajehpour, 2011). Auld *et al.* (1980) stated that the delay in sowing of pea reduces plant height, number of secondary branches, number of pods per branch and grain performance. Zehtab *et al.* (2004) reported the plant height, harvest index, number of seed and 1000 seed weight of anise decreased by delaying in planting. Cannabis is a plant with a long history of cultivation, but due to legal prohibition, has not found its original position, especially in Iran. Hence that did not considered as a food, pharmaceutical and industrial source. Therefore much research has not been done on the agronomic, physiological and biochemical characteristics of cannabis. The aim of this study was achieve to the most effective time of planting for reach to maximum performance.

## Material and methods

### *Site description and experimental design*

This experiment was conducted at the Agricultural Research Station of Azarbaijan Shahid Madani University (latitude 38°\_N, longitude 46°\_E, altitude 1350 m above sea level), as a randomized complete block design with three replications. The used seeds were obtained from the Esfahan Pakan company. Soil texture was sandy loam with pH= 7.96 and EC= 1/92 dSm<sup>-1</sup>.

### *Measurement of traits*

After removing marginal effects in each plot, variables of plant height, the number of seeds per plant, biological performance of plant, weight of seeds per plant, harvest index, 1000 seeds weight and oil performance per plant were measured. For measuring biological performance samples were placed in an oven with 70 °C for 48 hours and then dry weight were measured. Harvest index was calculated by ratio of economic performance to biological performance. Oil performance was determined according to Hosseini's method (2004), by using n- hexane solvent.

### *Statistical analysis*

Statistical analysis of the data was performed with MSTAT-C (1.42 version) software. LSD was applied to compare means of each trait at 5% probability.

## Results and discussion

Analysis of variance showed biological performance per plant, harvest index, the number of seeds per plant, seed weight per plant, seed yield per hectare, oil yield per plant were significant at %1 whereas, plant height and 1000 seeds weight were significant at %5 (Table 1). Plants had maximum height in the second planting date (185 cm) (Table 2). Connor and Sadras (1992) stated early planting increases length of the the growth period, hence the plants will have enough time for vegetative growth and increasing height. Rasam *et al.* (2008) expressed delay in planting leads to reduce of vegetative period of anise and reduce of plant height of it due to encounter with the heat.

Second planting date with 5373 grams per unit area showed the maximum amount of biological performance (Table 2). Silva (2005) reported that there is a direct relationship between dry matter yield per plant, period of plant growth and favorable environmental conditions. Kaiser and Hannan (1985) stated the delay in planting, weak seedling establishment and shorter length of time from emergence to maturity can lead to loss of biological performance of plants.

Highest harvest index was observed in the first planting date (Table 2). The reason for lower harvest index in the third planting date was related to reduce number and weight performance of grains. Sharp drop in harvest index in second planting date was due

to increased dry matter yield. Bange *et al.* (1998) reported delay in sowing leads to reduce of growth period, especially at post-pollinated and seed yield reduces more than biological yield.

**Table 1.** Analysis of variance of selected parameters of Cannabis by planting date treatments.

S.O.V	df	Height	Biological performance	Harvest index	Number of seeds per plant	Seed weight per plant	Seed yield per hectare	1000 seeds weight	Oil yield
Block	2	373.09	49352.71	1.53	43267.78	17398	1113.44	0.18	10.17
Treatment	2	493.63*	13517449.84**	479.57**	595755.10**	662.17**	42379.15**	8.80*	110.37**
Error	4	41.72	156996.47	9.25	12441.94	7.81	500186	0.52	2.14
CV%		3.79	13.54	11.57	6.96	3.96	3.96	2.92	6.69

Ns=Non significant; \* and \*\* = Significant at 5% and 1% probability level, respectively.

Maximum number of seeds per plant was observed in the second planting date but there was no significant difference with the first date (Table 2). Reduce the number of seeds in third date was due to increasing temperatures during flowering, pollination and

beginning of grain maturity. Ebrahimi *et al.* (2013) found the reason of reduction of grain number at the late planting was the effect of high temperature on seed abortion and decreasing length of the flowering period.

**Table 2.** Mean comparisons for different traits of Cannabis under different planting date treatments.

Variable \ Treatment	Height (cm)	Biological performance (gr)	Harvest index (%)	Number of seeds per plant	Seed weight per plant (gr)	Seed weight per hectare (Kg)	1000 seeds weight (gr)	Oil yield (gr)
First planting date	162.6 b	195.62 b	40.03 a	2955 a	78.31 a	6265 a	26.50 a	25.41 a
Second planting date	185 a	671.62 a	11.91 c	3180 a	80.04 a	6403 a	25.17 a	25.37 a
Third planting date	163.1 b	230.5 b	23.68 b	2321 b	53.49 b	4279 b	23.10 b	14.48 b

Similar letters in each column show non-significant differences according to LSD Range Test.

In the case of seed yield per plant and per hectare there was no significant difference between the first and second planting date (Table 2). Growth failure, loss of biological performance, decline in harvest index, loss grains number and reduction of duration of grain maturity can justify loss of grain weight in third planting date. Bastidas *et al.* (2008) reported delay in planting time causes linear decreasing performance of soybean.

and reduction dry matter lead to increasing the number of light, wizened and hollow grains and consequently reduction seed weight, which corresponded with the findings of Mohammadi-Nikpour and Kochaki (1991).

Maximum 1000 seeds weight was observed in the first planting date but there was no significant difference with the second date (Table 2). Since the seed weight is affected by the duration of seed filling, likely increasing temperature on the third planting date by reducing length of this period, increasing respiration

Third planting date showed the lowest seed oil (Table 2). By increasing duration of maturity more time will be provided for the synthesis of oil, consequently oil content will be increased (Silva, 2005). This researcher in a study conducted on oil flax with five different planting dates found the highest and lowest oil were obtained from first and fifth planting date respectively. As well reported increasing temperature and respiration and consumption of photosynthetic material leads to reduction of oil.

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