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Evaluation the effect of planting season and crop density on yield and yield density of lentil (ghachsaran variety) in the dry land condition

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ABSTRACT

To investigate the possibility of winter lentil grown under rain fed conditions and Comparison with conventional planting (spring) and determine the appropriate seeding density in each planting seasons this research in the city of Khorramabad 2008-2009 was administered. Experiment with two planting seasons (winter and spring) and seed density at five levels (200, 250, 300, 350 and 400 seeds per square meter), which were evaluated of factorial in a randomized complete block design with four replications. Trait measured were two seeds pod, single seedpods, total seed per unit area, seed yield, biological yield, harvest index(HI). Analysis of variance showed that the effect of planting date was significant on all traits. Seed yield, biological yield, harvest index, and number of seeds per unit area in autumn sowing were significantly higher than spring planting. The effect of planting density was significant on seed yield, seed number per unit area single seed pod. The maximum seed yield with 1600 kg/ha related to winter planting. Treatment of 350 seeds per square meter had the highest seed yield (1575 kg/ha).

Keywords: dry lentils, seed density, planting season, seed yield

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INTRODUCTION

Grain legumes such as lentils are the major source of protein in human's food and animal nutrition they plays an important role in soil fertility, reduce the spread of weeds, diseases and pests in alternation with crop [12].lentil need a little water so in most dry lands with chickpea instead of fallow being in cereals rotation. Also with the ability to fix, atmospheric nitrogen in soil fertility can be useful for growing crops next year [4]. Dry foliage of this plant is one of the values of livestock in dry years [20]. In general, reason of low lentil yield is poor crop management and low yield potential of local populations. One of the most important factors crop management is increasing effective rainfall for crop [2]. On the other hand, plant density is one of the important crop factors affecting the yield, which is influenced by cultivar and climate. To achieve high performance, optimum plant density is a prerequisite [5].Planting date has a significant impact on the lentil yield.

Because of changing, environmental conditions lead to encounter the plants in different stages of planting with different planting dates. As expected, the optimal planting date is different native in different location and sometimes varies from genotype to genotype [4]. Different studies indicate the superiority of the winter planting against spring planting [20].

Chengsy and Miller (2003) in investigation of the cultivation of winter and spring lentil showed. Culture was grown at 13 and 30 September toward April 11 increased seed yield respectively, 68 and 34 percent. Furthermore, the biological yield and follow the forage production is also higher.

Turk et al. (2003) reported that the number of pods per plant decreased with delay in planting. Muel(2002) showed that winter planting lentils can increase yield 20 to 30 percent. Winter planting of lentils causes the plant in feature growing season establishment faster, overcome the weeds and the chance of plant to use stored soil moisture increases. On the other hand, due to plant growth stages ahead, potential evapotranspiration is less. Furthermore, the earlier harvesting and non-encounter with high temperature in the end of growing season and its drought is causing high water use efficiency. Thus, the plant is well adapted to drought. Alternatively, it runs away and eventually yields per unit of water increases [20].

Mishra et al (1996) and Turk et al (2003) also reported that the number of pods per plant decreased with delay in planting. Considering the fundamental role of resource management in rain fed agriculture, particularly the planting date and plant density. This study is aimed. Some strategies to achieve higher yield through investigate the possibility of changing to spring planting in to the fall plantingand appropriate seed density for seed Gachsaran variety of lentil in the city of Khorramabad in both spring and autumn planting.

METERIALS AND METHODS

The experiment was conducted in the city of Khorramabad 2008-2009 Khorramabad, in latitude 33 degrees 30 minutes North and longitude 48 degrees and 18 minutes east of the Greenwich meridian is located. And its height from sea level is 1175 meters. Average annual rainfall is 520 mm, according to the 35 year old.
For measure, some parameters of the soil, soil samples were taken to laboratory measurements and parameters are described in the table1.

Table1: Soil characteristics of the experimental site

Depth	B(PPM)	Cu(PPM)	Zn(PPM)	Mn(PPM)	Fe(PPM)	C(PPM)	Ka(PPM)	P(PPM)	N%	Sand%
0-30	0.15	1.25	0.5	2.7	3.7	1.05	320	7.6	0.14	12
Silt%	Clay%	Soil Texture		T.N.V%			EC			PH
50	38	Si. CL. L		34			0.58			7.7

In this study the effect of tow factor, planting dates and plant densities in a factorial randomized complete block design in four replications were evaluated. The factors include

A - Planting season in tow levels, autumn and spring.
B - Seed density in five levels: 200 (d1), 250 (d2), 300 (d3), 350 (d4) and 400 (d5) seeds per square meter, respectively.

Each plot size was 4 × 1 mm and the distance between rows was 25cm. Moldboard plow done in the fall after the first effective rain and then leveling and double-disc done disrupt before disking , 50kg/ha net phosphorus 20 kg/ha nitrate were added to the soil. Samples were run in each box plot with 0.25×0.5 to evaluate yield components and Area 1.5m^2 for the seed yield harvested.

To determine the biological yield and grain yield of two middle rows of each plot by removing 0.5 m margin of each plot was harvested. Data analysis was performed using the statistical software MSTATC. In this study, mean comparison was done by Duncan at 5% level.

RESULTS AND DISCUSSION

The number two seed pods
Effect of planting dates on number at two seedpods per unit area was highly significant (Table 2). So that the number two seedpods in fall planting (1184.4 pods per square meter) were more and lower in the second planting date, (297.6 pod per square meter). It seems increase the number of pods in the first planting date due to prolonged growth period and increase plant biomass that lead to greater allocation of assimilates to pods and it has more consistency. Aggrawal et al (1984) were reported the number of two seedpods per plant is most variable trait among the yield components and stated number of seeds per pod depending on the situation of pod in plant.

The number single seed pods
Pods are one of the main components that are very effective on yield. Effect of planting dates on number one seedpods was significant at the 1% level probability (Table 2). The highest and lowest number single seedpod per square meter, obtained respectively, from fall planting (3257 pods per square meter) and spring planting (1451 pods per square meter) (Table 2). It seems that due to the long period of growth in autumn sowing, the number of stems per plant increased and with increasing reproductive period has increased the number of pods per stem. The results

with the results of other researchers Pezeshkpour and Mousavi (2007), Singh et al, 1997, Moussavi and Pezeshkpour (2006) are consistent. Effect of plant density on number of single seedpods per unit area was significant. The highest number of pods per unit area obtained from 350 seeds per square meter. Interaction of planting date, plant density on seedpods per unit area at 1% level probability was significant (Table 2).

Number of seeds per unit area

Effect of planting date on seeds per unit area was significant (Table 2). So that the first planting 5630 seeds per square meter and in the second planting, 2046.6 seeds per square meter obtained respectively. Delay in planting was reduced 63.7% the number of seeds per square meter. It seems that delayed planting due to encounter the reproductive growth with the higher temperature inoculation is less than the number of flowers and will lead to a reduction in the number of seeds per plant (Pezeshkpor and Mousavi, 2007).

Mishra et al (1996) and Turk et al (2003) also reported that the delay in planting reduced number of seeds per plant. There was no significant effect of density on the number of seeds per unit area. Interaction of planting date and plant density on seed number per unit area was significant. The highest number of grains per unit area obtained from the first planting date and plant density of 350 seeds per square meter.

Seed yield

Effect of planting date on seed yield was significant. Late planting and drought stress in grain filling stage reduced seed yield. Increase in temperature reduce seed filling period is reduced. This leads to a reduction in seed weight. Seed yield of lentil Gachsaran variety was very sensitive into different planting dates. The results with results of Pezeshkpor et al (2003) based on yield loss due to delay in planting date are consistent. Pezeshkpor et al (2003) reported that the cause of this increase are long growing period, water supply, increased leaf area index, leaf area duration and absorbed photo synthetically active radiation in the reproductive period and increased water use efficiency. There was significant difference between treatments amount of seed. The highest seed yield 1575 kg/ha, related to 300 seeds per square meter. There was no significant effect between interaction effects of planting date and amount of seed (Table 2).

Biological yield

Effect of planting date on biological yield at physiological maturity was significant (Table 2). In addition, dry matter accumulation was reduced with delay in planting date. Seems to high temperature stress at later stages of growth, with shorter period of LAD in the second planting date, the plant has produced a critical condition and with increasing temperature due to delay in planting, dry matter accumulation decreased to 43%. With increasing in density, the biological yield at first increased and then decreased.

Harvest index (HI)

Effect of planting date on harvest index was significant (Table 2).The highest HI obtained from the first planting date (36.3%) and in the second planting (32.5%) is the lowest. Research has shown that delayed planting date cause increased in harvest index and the reason is exposed to high temperatures and then decrease in vegetative and reproductive growth of the plant (goldani and Rezvanymoqadam, 2004). There was no significant difference between different densities. But with a higher density than optimal harvest index decreased. At densities higher than optimal, there is competition between plants. In such circumstances, due to the reduced contribution of assimilates to seed production (source) decreases followed by the low harvest index. Interaction between planting date and plant density on harvest index was not significant (Table 2).

Table 2 - Analysis of variance for traits measured

HI	Seed yield	Biological yield	Seeds per unit area	single seed pods	two seed pods	df	S.O.V
75.9 ^{ns}	108473.9 ^{ns}	2290509.8 ^{ns}	3257542.9 **	1574812.3 *	84285.8 ^{ns}	3	**Replication**
139.6 **	5023265.6 **	79261956 *	128450560 **	32630809.6 **	7799654 **	1	**Planting date(a)**
15.7 ^{ns}	572484.3 **	1516647.7 *	938051.4 *	693287.4 **	47172 ^{ns}	4	**Density(b)**
28.2 ^{ns}	68656.2 ^{ns}	182274.6 ^{ns}	1478963 *	1248016.6 ^{ns}	111498.4 ^{ns}	4	**a×b**
25.6	79967	530465	397113	278937	127591.5	27	**Error**
14.71	22.7	18.2	16.42	22.4	28.14	-	**CV**

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