

## THE EFFECT OF VARIOUS NITROGEN LEVELS AND PLANTING DATES ON SOME PHYSIOLOGICAL TREATS OF TWO CULTIVARS OF COASTER BEANS

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### Abstract

BORHAN, N., H. AFSHARI and J. M. SINKI, 2013. The effect of various nitrogen levels and planting dates on some physiological treats of two cultivars of coaster beans. *Bulg. J. Agric. Sci.*, 19: 439-443

In order to study the effect of various amount of nitrogen on coaster beans cultivar in different planting dates in Damghan climate an experiment was conducted in a split plot design based on completely randomized blocks with three replications during 2010-2011. In this experiment main factors consisted of two cultivars (Aoura and local), sub factor was nitrogen fertilizer in three levels (100, 150 and 200 kg/ha) and secondary sub factor was planting date in three dates (30 April, 15 May and 31 May). Treats like oil percent, Protein percent, fiber percent and ash were measured in the experiment. The results showed that effects of cultivar and planting dates on Protein and oil percent and fiber and ash percent was significant ( $P < 0.01$ ). Means comparison of cultivar and planting date interaction on Protein percent and fiber was significant ( $P < 0.05$ ). The results showed that planting of Aoura cultivar in early Ordibehesht (late April) and applying 150 Kg/Ha is suitable in Damghan.

*Key words:* coaster beans, planting date, Cultivar, Nitrogen, Seed oil percent

### Introduction

Coaster beans is an oil plant from Ephorbiaceae family which is commonly distributed in tropical zones and its native has been North Africa and with more probability from Ethiopia (Naseri, 1997). The main ingredients of coaster beans seed are its oil which is 35-55 percent in commercial cultivars (Omidbeigi 1998). Nowadays chemical fertilizes are used to achieve ideal yield. If nitrogen is more or less than desirable level, it will cause disorders in growth and development; even it will stop reproductive growth (Naseri, 1997). Wagh et al. (1991) in their studies on sunflower found out that increasing in oil percent and Protein percent was followed by nitrogen fertilizer application and this fertilizer was known as effective environmental factor in growth and seed yield. Jackson studied various levels of nitrogen, 0, 30, and 60, 90 kg /ha on coaster beans and concluded that seed yield and Protein percent were increased along with increasing in fertilizer appli-

cation (Jackson, 2000). Planting date is also one of the effective factors to achieve desired yield in crop plants especially in coaster beans and will increase photosynthesis efficiency and suitable storing of photosynthesis products in seed (Bang et al 1998). Silva (2005) in an experiment showed that seed yield and oil percent of flax is declined significantly with delay in planting date. As there is little information available on the reaction of coaster beans plant to planting date and fertilizer application, this experiment was conducted to study the effects of different amount of nitrogen on coaster beans cultivar in different planting dates.

### Materials and Method

In order to study effects of different amounts of nitrogen fertilizer on coaster beans cultivars, an experiment was conducted in different planting dates in 2011, 5 km away from Damghan town. The place is located in 53 15' 20" longitudes and be-

tween 34 45' 36" and 36 58' latitude and 1170 meters altitude. The experiment was designed in split plot based on completely randomized block with three replications. The treatments were three different planting dates that are 30<sup>th</sup> April, and 15<sup>th</sup> of May and 31<sup>th</sup> of May and nitrogen fertilizers at three levels 100, 150 and 200 kg/ha using Urea and two cultivars Aoura and Local. Tillage was done in previous fall and two perpendicular disks and land leveling was conducted in April. Seed planting was done in rows with 75 cm between the rows and 45 cm on rows. The length and wide of plots were considered 4 and 3 m respectively and in each plot four lines were considered. The depth of seed planting was 5-3 cm and plots space was considered 2 m. In each planting date, the place of planting was determined by omitting previous probabilities. The end of each plot was blocked to prevent penetrating of fertilizers of different plots into each other, furrows were created between the blocks to irrigate, and irrigation was done every 8 to 9 days by pond irrigation. Urea fertilizer was split into two so that half was applied in strip, 4-5 cm below the seeds, according to the treatments, and the remaining was used before flowering. Soxhlet extractor, Protein by kjeldhal and fire by Skimosovak et al method and ash by Baraza et al. data analysis was conducted by SAS software did oil extracting. Mean comparisons was done by Duncan's new multiple range test at 5 percent probability. Graph drawing was done by Excel software.

## Results and Discussion

The results of analysis of variance showed that the effects of cultivars and planting dates on Protein and the interaction

of cultivar\*planting date and cultivar\*nitrogen\*planting date were significant at one and five percent respectively ( $P<0.01$  and  $P<0.05$ ) (Table 1). Rao et al. (1991) reported that Protein percent is controlled by genetic factors. The graph of means comparison for fertilizer treatments showed that 150 kg/ha nitrogen was the highest with 30.74 % Protein and increasing in fertilizer consumption from 150 to 200 kg/ha resulted in intangible drop in Protein percent (Figure 1). According to means comparison the highest Protein percent was achieved in first planting date with 27.53 % and the least was achieved in the third planting date with average 27.53% (Figure 1). Means comparison of interaction of cultivar\*planting date, Aoura in first planting date with 35.17 % had the highest Protein percent. Delay in planting date declined Protein percent especially in local cultivar (26.7%) (Figure 3). The interaction of cultivar, nitrogen fertilizer and planting date graph showed that Aoura cultivar had the highest Protein percent in first planting date with 150 kg/ha (Figure 5). Delay in first planting date along with increasing in nitrogen decreased Protein percent in both cultivars.

The results of variance analysis showed that cultivar and planting date on oil percent was significant ( $P<0.01$ ) (Table 1). According to means comparison the difference between cultivar was significant statistically and Aoura cultivar with 41 percent oil had the highest oil percent (Figure 1). Rao et al. (1991) reported that oil percent is influenced by genetic factors, if there is not any stress at the end of season; oil percent will remain stable in each cultivar.

The highest oil percent was achieved less than 100 kg/ha nitrogen with 39.71 percent and increasing of fertilizer caused

**Table 1**  
**Qualitative Analysis of variance of the effect of cultivar, planting date and nitrogen in castor plant**

Mean square (M.S)					
Percent of the total fiber	Ash percent	Oil percent	Protein percent	Degrees of freedom	Sources of variation
0.92ns	0.19ns	0.77ns	4.38ns	2	Block
64.03**	10.14**	172.09**	244.48**	1	Cultivar
0.38ns	0.67ns	1.62ns	19.26*	2	The first error
0.15ns	0.20ns	1.31ns	6.84ns	2	Nitrogen
0.13ns	0.41ns	2.85ns	1.97ns	2	Nitrogen × Cultivar
0.34ns	0.12ns	9.57ns	2.27ns	8	The second error
2.69**	5.17**	31.52**	98.53**	2	planting date
0.21ns	0.21ns	2.3ns	23.53*	2	Cultivar × planting date
0.2ns	0.12ns	5.69ns	2.31ns	4	Nitrogen × planting date
0.54*	0.007ns	2.82ns	7.57*	4	Nitrogen × planting date × Cultivar
0.43ns	0.39ns	2.93ns	5.4ns	24	The third error
7.24	9.23	4.33	7.74		Coefficient of variation

( ns, \*, \*\*) Were meaningless, statistically significant at the five and one percent is

a decline in oil percent (Figure 1). According to Jackson (2000) delay in plant maturation and lengthening of growth period caused by nitrogen consumption, was introduced as one important reason for oil percent in rapeseed, in response to nitrogen consumption. In contrast, Holmz (1980) reported that providing more nitrogen for plants, will increase Protein containing procures and directs competition on primary material for construction of Protein or fatty acids towards protean. In addition (Rathke et al, 2005) suggest that a reduction in carbohydrates providing to produce fatty acids as the most important reason for reduction in oil percent when nitrogen is provided. According to means comparison the highest oil percent was achieved in first planting date with 40.72 % and third planting date with 38.08 percent had the least (Figure 1). Ferreira and Abreu (2001) showed that early planting would increase oil percent. Research on sunflower showed that the highest seed yield was achieved from early planting date and seed yield and seed oil content decline with delay in planting (Khiavi, 2002).

Considering the results, it is obvious that temperature has the most effect on oil percent, among other climatic factors. In the last planting dates, oil percent was declined due to coincidence with high temperature, meanwhile the highest oil percent was produced under moderate temperature and proper relative humidity. Hocking and Stapper (2001) Rabertson et al. (1999) and Walton et al. (1999) reported similar results respective to oil percent reduction 1.7 percent per degree increase in temperature in flowering and seed filling. Rabertson et al. (1999) in their studies on reaction of rape seed and mustered to planting date in stressful condition, reported that with delay in planting date oil percent of seed decreased from 42.6 % in first planting date to 38.6, 37.0 and 35.6 percent in later planting dates, that is compatible with our results. These researchers announced high temperature in seed filling period as responsible for oil percent reduction in later planting dates.

Interaction of three treatments of cultivars, nitrogen and planting dates showed that Aoura cultivar in 150 kg/ha ni-

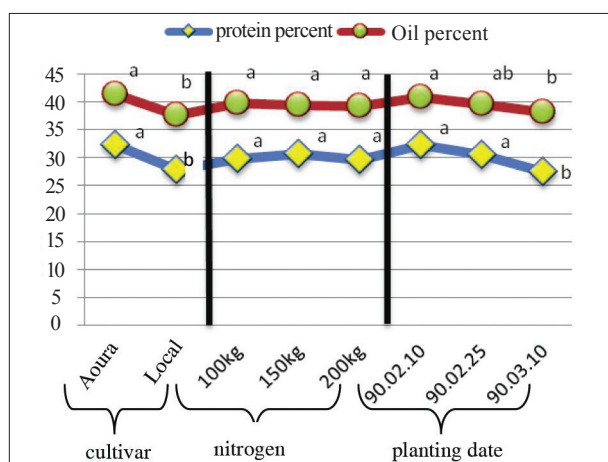


Fig. 1. Means comparison of Protein percent and oil percent as affected by cultivar, nitrogen and planting date

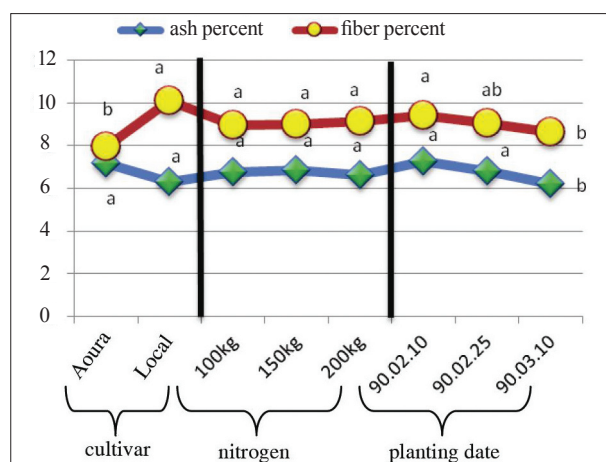


Fig. 2. Means comparison of ash and fiber percent as affected by cultivar, nitrogen and planting date

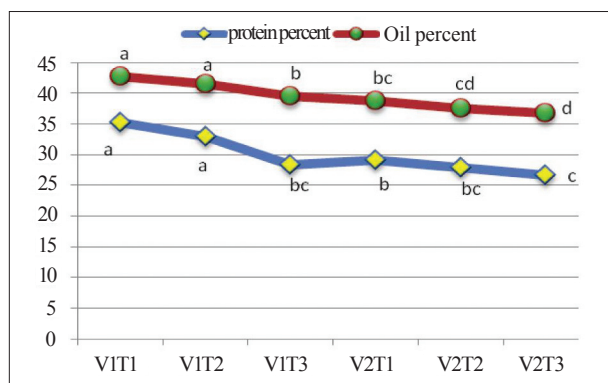


Fig. 3. Means comparison of the interaction effects of cultivar\*planting date for Protein and oil percent

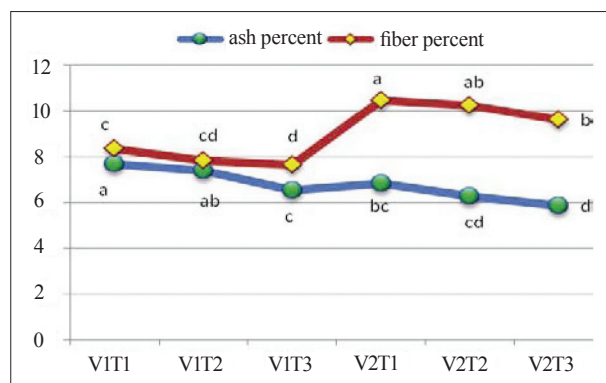


Fig. 4. Means comparison of the interaction effects of cultivar\* planting date for ash and fiber percent

trogen and first planting date had the highest oil percent (Figure 5).

Analysis of variance of fiber showed that the effect of planting date and cultivar on this treat was significant ( $P < 0.01$ ) (Table 1).

Means comparison of cultivars showed that local and Aoura cultivar were the first and last with 10.11 and 7.94 percent respectively (Figure 2). The results of means comparison showed that increasing of fertilizer increased per-

cent of fiber in plant (Figure 2). In addition, means comparison showed that first planting date with 9.40 percent had the highest and third planting date with 8.63 had the least fiber percent (Figure 2). Raw fiber ratio has direct relation with dry matter. Delay in planting along with an increase in temperature will shorten vegetative growth period and will cause plant to enter in reproductive cycle and a reduction in biomass; which causes in reduction of dry matter and fiber content.

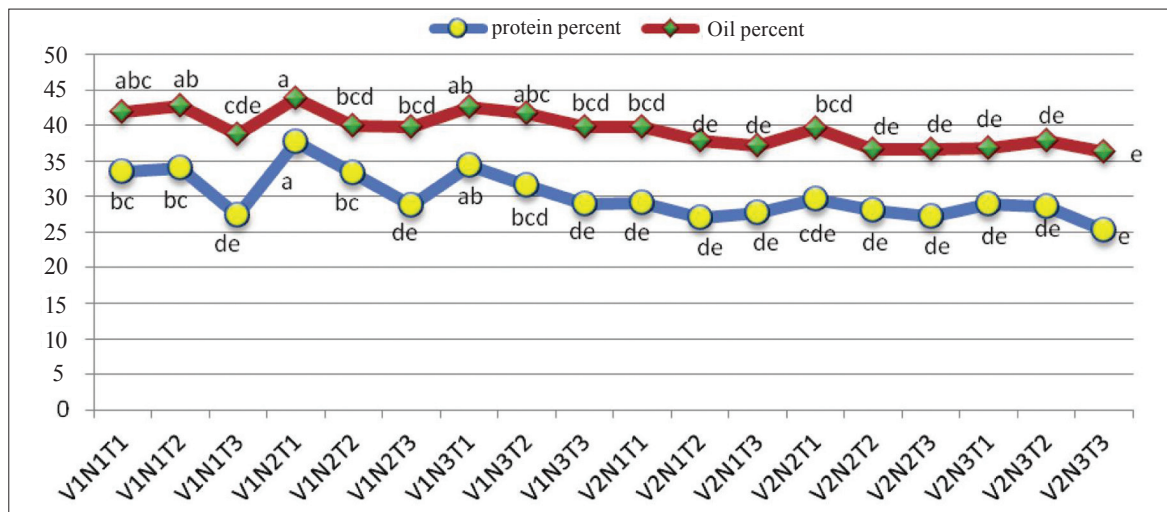


Fig. 5. Means comparison of the interaction effects of cultivar\*nitrogen\*planting date on Protein percent and oil

Abbreviation table		
T1: planting date 30/04/2011	N1: Nitrogen 100 Kg/Ha	V1: Aoura cultivar V2: Local cultivar
T2: planting date 15/05/2011	N2: Nitrogen 150 Kg/Ha	
T3: planting date 31/05/2011	N3: Nitrogen 200 Kg/Ha	

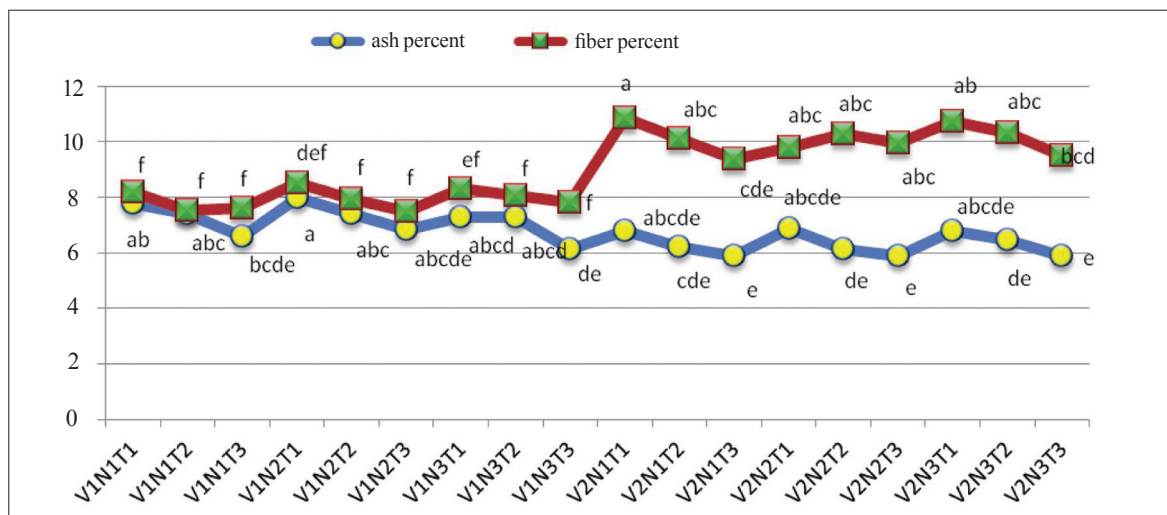


Fig. 6. Means comparison of the interaction effects of cultivar\*nitrogen\*planting date on ash percent and fiber



In interaction of cultivar\*planting date, it was distinguished that delay in planting date in both cultivars reduced fiber percent; this reduction was higher in Aoura than that of local cultivar (Figure 4).

According to Table 1 the interaction of cultivar\*nitrogen\*planting date on fiber percent was significant ( $P<0.05$ ). The fact indicates that the trend of changes in fiber percent of cultivar in various planting dates and fertilizer amount were similar. In most studied planting dates and nitrogen fertilizer levels, local cultivar had the highest fiber percent (Figure 6).

## Conclusion

The results of simple analysis of variance on ash percent indicated that the effect of planting date and cultivar on this trait was significant ( $P<0.01$ ) (Table 1). Means comparison of cultivars indicated that Aoura and local cultivars were the first and last with 7.19 and 6.32 percent respectively (Figure 2). Means comparison of fertilizer indicated that increasing at nitrogen level increased in ash content slightly and then decreased ash percent (Figure 2). Along with increasing at nitrogen level, the growth of vegetative parts improved and also root grows better and the more expansion in root, the mineral absorption and in addition to production of more organic, plants can retain more minerals. In addition, means comparison showed that first planting date with 7.26 percent had the most and the third planting date with 6.19 percent had the least percent of ash (Figure 2). Noticing the results, application of 150 kg/ha nitrogen in first planting date and Aoura cultivar indicated superiority comparing to other treatments.

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Received August, 8, 2012; accepted for printing February, 2, 2013.