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Effect of different planting date on agronomical traits of canola varieties (*Brassica napus* L.)

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Abstract

An experiment was carried to study the effect of planting date on agronomical traits of different varieties of canola. Two varieties of canola i.e., RGS 006 and Hybrid Hyola-42 were chosen as one factor and four dates of planting (1 November; 15 November; 30 November and 15 December) as another factor in a factorial experiment. The experiment was randomized complete block design with three replication. Results showed that the interaction effect between planting date and variety produced highest yield in Hyola-42 variety and the best planting date found to be 15 November.

Keywords: Canola; planting date; yield and yield component

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Introduction

The increase in the planted area of oil seed crops is an indication of the success of plant breeders and agronomists in developing suitable cultivars and production methods in semi arid regions (Rao et al., 1991). This plant grows annually in the favourable weather conditions. The meal and oil are two products extracted from this plant. The canola seed contains 40-50 percent oil. The average yield of oil crops in Iran is 245000 ton (Area harvested 521000 ha), whereas the world average yield of oil crops is 261,099,000 ton (Area harvested 157,382,000 ha) as stated by FAO (2010). Sowing time is an important factor that determines the length of growing season and hence yields. If planted in spring, they can be grown as summer crop but the seed yield would be decreased due to short growing season and lack of enough water at the end of growing season, thus, winter cropping is preferred. Early spring sowing of oil canola delays flowers and reduce reflection of radiation which are important factors leading to the highest yields achieved by late sowing (Jenkins et al., 1986). Planting time is one of the most important factors for maximizing canola yield especially in those areas where temperature, day length, rainfall and humidity vary throughout the year. Johnson et al. (1995), Karam (1998) and Tanveer et al. (1998) noted the significant effects of sowing date on the yield of canola Sarson (Johnson et al., 1995; Karam et al., 1998; Pritchard et al., 2000). Planting dates obviously affect canola yield and yield components. In this regard, it has been reported that at the early planting date, seed yield and straw yields were greater than late planting (Daly et al., 1988). A number of studies have shown that yield decline in canola with delay in sowing (Mendham et al., 1990). In addition, canola oil content has been found to decline with later sowing. Yadav (2011) found that highest yield of canola was observed from earlier sowings (Yadav, 2011). Growth and yield are functions of a large number of metabolic processes, which are affected by environmental and genetic factors. Number of pod per plant recorded higher in 14 October sowing compared to 29th October, 13 November and 28 November sowing (Singh et al., 2002). Seeding earlier than normal incorporates operational diversity into a cropping system that diversifies weed management systems (Harker et al., 2003). The detrimental effects of insects and diseases on canola yields, as well as the effect of delayed sowing on production cost have been reported.

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Materials and Methods

Before the beginning of experiment, soil samples were taken in order to determine the physical and chemical properties. A composite soil sample was collected from depth of 0-30 and 30-60 cm. It was air dried, crushed and tested for physical and chemical properties. The research field had a clay loam soil. The first top dressing distribution at 4-6 true leaf stage (125urea kg.ha^{-1}) and the second was conducted at the time of reproductive organs appearance. Hand weeding was done at 4-6 true leaf stage as well as mid-stem elongation stage. To conduct the experiment, two canola cultivars (Hyola-42, RGS 006) were used with 4 planting dates (1 November; 15 November; 30 November and 15 December). The experiment was done as factorial and in completely randomized blocks with three replications. The width of the plots was 2 meters and their length was 5 meters. To avoid marginal affects the harvest was done just in the four middle lines. To do it, 0.5 meter from the top and bottom of the middle line was excluded and the harvest was done only in the 4 meters in the middle. The distance between the rows was 25 cm and the distance between the bushes in the rows was 4 cm. To determine agronomical characteristics, the related notes were taken. At physiological maturity stage, for determining the seed yield, the crop was harvested from a 4.8 m^2 area per each plot and was left in the field for drying until constant weight (up to 12% moisture). In order to separate seeds form pod, a trashing combine harvester was used. The harvested seeds from each experimental unit individually weighed with a precision scale and thereafter seed yield was expressed as kg/ha. In order to measure the seed oil percentage of each experimental plot, about 3 grams of seed was prepared and using an NMR apparatus, the oil percentage was measured. This apparatus works on the basis of magnetic induction of hydrogen nucleus which is a spectrometry method. Data was analysed using SAS statistical software. Means comparison of the data was done by Duncan's multi-range test (DMRT) considering $P<0.05$.

Results and Discussion

Grain yield

In this factor, the simple and interactive effect of the cultivar and the planting date indicate a significant effect (Table 4). Results indicated that 15 November is better than all the treatments (Table 1).

Cultivar HYOLA-42 also has a better yield than the other cultivars, as shown in table 2. In table 3, the cultivar HYOLA-42 has a better effect than the other cultivars in all planting dates. Jasinska et al. (1989) reported that seed yield decreased with delay in sowing date. Also Taylor and Smith (1992) concluded that grain yield declined when sowing date is delayed (Hoseinie Bay et al., 2003). In general, crop responses and evaluation them for optimal yield under various environmental conditions is dependent on different environmental conditions.

Table1: The effect of the planting date on agronomical traits in Canola

Agronomical traits	A1	A2	A3	A4
Number of flowers	518.94±3.1^a	452.52±2.8^b	306.5±2.04^c	300.24±1.9^c
Plant Height (cm)	161.24±1.05^a	158.2±1.09^a	136.62±1.4^b	125.28±0.9^b
Number of pods in plant	267.84±2.2^a	333.72±1.8^a	317.52±1.7^a	333.72±1.09^a
Grian yield (Ton/ha)	3.40±0.03^b	4.1±0.02^a	3.1±0.03^b	2.2±0.01^c

A_1: time to planting (1 November); A_2: time to planting (15 November); A_3: time to planting (30 November); A_4: time to planting (15 December)

Table2: The effect of the variety on agronomical traits in Canola

Agronomical traits	B1	B2
Number of flowers	426.8±2.03^a	401.2±1.09^a
Stem length (cm)	157.2±0.5^a	133.5±0.6^b
Number of pods in plant	282.7±2.03^a	343.9±2.5^a
Grian yield (Ton/ha)	3.3±0.02^a	2.3±0.03^b

B1: Variety Hyola-42; Variety RGS 006

Plant height

The simple effect of the cultivar and the planting date and also the interaction between the cultivar and the planting date were significant in plant height (Table 4). Results indicated that early planting date (1 November), (15 November), have better effects on this parameter (Table 1). Among the studied cultivars the cultivar Hyola-42 had more effect on the stem length (Table 2). Hoseinie et al. (2003) reported that the sowing dates noticeably affect the different canola traits such as the plant height. Potts et al. (1980) proved that a delay in sowing does not significantly affect the plant height. Taylor et al. (1992) have reported that the delayed sowing causes a decrease in canola height.

Number of the flowers

The effect of the cultivars on the number of the flowers was not significant and according to Duncan test, the average does not have significant differences. But, the effect of the planting date and the interaction between the cultivar and the planting date was significant (Table 4). Results indicated that among studied dates the first date had the greatest effect on the number of the flowers (Table 1). Results indicated that the effect of the cultivar on the number of flowers is not significant (Allen et al., 1975).

Table 3: Interaction between cultivar and different planting dates on agronomical traits in Canola

Agronomical traits	A_1B_1	A_1B_2	A_2B_1	A_2B_2	A_3B_1	A_3B_2	A4B12	A_4B_2
Number of flowers	499.716±1.6^{ab}	538.164±1.3^{a}	442.8±1.05^{c}	462.24±0.9^{bc}	308.88±0.81^{d}	303.48±0.7^{d}	299.9±0.8^{d}	300.5±1.02^{d}
Stem length (cm)	175.284±1.08^{a}	147.204±1.02^{bc}	154.11±1.4^{bc}	162.324±0.9^{ab}	161.244±1.06^{ab}	111.9±0.6^{d}	138.24±1.3^{c}	112.3±1.09^{d}
Number of pods in plant	348.51±2.2^{abc}	186.5±2.01^{d}	367.2±1.9^{ab}	301.32±2.5^{bcd}	222.48±2.09^{cd}	412.8±1.8^{ab}	192.9±2.1^{d}	474.8±2.9^{a}
Grian yield (Ton/ha)	3.78±0.09^{c}	3.02±0.03^{d}	5.508±0.01^{a}	2.7±0.03^{d}	4.644±0.04^{b}	1.62±0.03^{e}	2.592±0.012^{d}	1.9±0.01^{e}

A_1B_1: Planting time (1 November),variety Hyola-42; A_1B_2: Planting time (1 November),variety RGS 006; A_2B_1: Planting time (15 November),variety Hyola-42; A_2B_2: Planting time (15 November),variety RGS 006; A_3B_1: Planting time (30 November), variety Hyola-42; A_3B_2: Planting time (30 November),variety RGS 006; A_4B_1: Planting time (15 December),variety Hyola-42; A_4B_2: Planting time (15 December),variety RGS 006

Table 4: Variance analysis of the Study of planting date effect on agronomical traits of varieties canola (*Brassica napus* L.)

(S.O.V)	Df	Number of flowers	Plant height (cm)	Number of the pod in the plant	Grain yield (Ton/ha)
Replication	2	ns	ns	ns	ns
Planting time	3	**	*	ns	*
Variety	1	ns	*	ns	*
Variety × Planting time	3	*	*	*	*
Error	14	95.762	594.994	481.720	0.095

Levels of significant:* P< %5, ** P<%1, NS = not significant

Number of the pod in plants

The simple effect of the cultivar and the planting date had no significant effect on the number of the pod in plants. Interaction between the cultivars and the planting date has a significant effect on this factor (Table 4). According to results in Table 1, the different planting dates have had a significant effect on the number of pods in plants. Cultivars have no significant effect on the number of the pods in plants. The last planting time has a positive effect on the number of sheaths and the remaining treatments also are different (Table 3). Mendham et al. (1995) reported that the pod number of fertile genotypes of canola, is more subordinate to weather conditions, sowing date and plant density than other such determinants. Furthermore, Degenhart and Kondra (1987) reported that the "pod number per plant" decreases by delay in sowing. Thus they observed that, as a result of the decrease in the number of pods pre plant, the number of pods per stem decreases (Karam et al., 1998).

Conclusion

Due to the different varieties and planting dates, the highest yield among the different effects of variety and planting date, has varieties Hyola-42 (15 November) and this variety and planting date , to be developed in the study area .

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