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The effect of different planting densities on agronomy traits of canola varieties in Chaloos, Iran

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Abstract

A survey was conducted to study different planting densities of canola varieties at Research Farm, Chaloos City of Iran. The study was made on two varieties of canola (Hyola60 and Sarigol) at three planting densities (15cm, 25cm and 35cm). Results suggested that for maximum yield of canola the plant to plant distance should be maintained as 15 cm. Among varieties Hyola60 appeared to be high yielding variety under the existing climatic conditions. On average variety, Hyola60 with planting density (15 cm) produced higher grain yield of 2556.85 (Kg/ha) as compared to Sarigol variety and other planting densities (25, 35cm). The planting density of 35cm produced lowest yield of 1840.34 (Kg/ha). So, the farmers are suggested to plant canola through drill sowing methods by keeping plant to plant distance as 15 cm for obtaining maximum yield.

Keywords: canola, grain yield, planting densities, varieties

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Introduction

Canola is rapidly gaining acreage as a rotation alternative with small grains and other crops. Grown in several regions of the Iran, canola has strong demand as a healthy vegetable oil. Canola's main selling point characteristic is its low level of saturated fats, making it popular as cooking oil and for use in processed food. Canola (*Brassica napus L.*) has recently been introduced in Iran to overcome oil deficiency. Canola cultivars oil have higher notorious value in compare with other oil seeds due to its high unsaturated fatty acids one way to increasing seed yield/m^2 is using suitable cultivars compatible with climate conditions of any region in desired planting density in a manner with create minimum competition among plants. One of the main goals in agriculture is determining best plant density to get desired yield. Desired density obtain when canopy have maximum leaf area to up-taking sunlight at the beginning of reproductive stage (Larry et al., 2002). Goals such as improving absorbed sunlight by changing plant density and also changing row spacing pursued in agricultural planting (Maddonni et al., 2001). Increasing light penetrating into lower parts of canopy by changing it's structure is a management way with cause to improving yield (Reta-Sanches and Fowler, 2002). Little is known about agricultural practices to maximize canola oil production in Iran. 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. In oilseed rape, row spacing or plant density vary considerably worldwide, depending on the environment, production system and cultivar. Previous studies have shown that plant density is an important factor affecting rapeseed yield. Plant density in rapeseed governs the components of yield, and thus the yield of individual plants. A uniform distribution of plants per unit area is a prerequisite for yield stability (Diepenbrock, 2000). Early spring sowing of oil canola delayed flowering and reduced reflection of radiation

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during flowering which were important factors leading to the highest yields achieved by late sowing (Jenkins and Leitch, 1986). Al Barzinjy et al. (1999) investigated the effects of different plant densities ranging from 20 to 130 plants/m^2 in rapeseed. They concluded that pods per plant, seed weights and dry matter per plant decreased as plant density increased. Leach et al. (1999) also reported that plants grown at high density had fewer pod-bearing branches per plant but produced more branches and that with an increase in density 1000-seed weight increased. The same researchers also observed that there was no effect of density on seed oil content. Rapeseed is sometimes grown in rows with spacing wide enough to allow for mechanical cultivation. In most areas where herbicides are used, the crop is either broadcast seeded or planted in drill rows spaced 15–20 cm a part (Lewis and Knight 1987).

The aim of this study was to find the effect of different plant densities on the agronomy traits of different varieties of canola.

Materials and Methods

The study was carried out on two canola varieties (Sarigol and Hyola60) with three planting densities (15, 25 and 35cm) in Chaloos City, Iran during 2009-2010. The experiment was laid out according to Randomized Complete Block Design (RCBD) with split plot arrangement having three replications. The crop was planted in rows spaced 40 cm. The net plot size was 2.5×12 m^2. The nitrogen and phosphorus were applied at the level of 75 kg and 50 Kg/ha, respectively. All P_2O_5 and one third of N were applied at sowing and remaining doses of N were applied on 1^{st} and 2^{nd} irrigations. All other agronomic practices were kept normal and uniform for all treatments. Days to germination were recorded from the date of planting to the completion of 90% field emergence. Days to 50% flowering were calculated from the planting date to the time when the 50% flowers were completed. The number of primary, secondary branches, pods per plant, pod size and number of grains per pod were also counted at physiological maturity of the crop as an average from the same 20 randomly selected plants/plot. Data collected were statistically analyzed by analysis of variance technique at 5% level of probability (SPSS Software).

Results and Discussion

The results regarding the days to germination completion (DG) and days to 50% flowering completion do not differ vary greatly between varieties and among different planting densities (Table 1). Highly significant differences in the yield of canola varieties were noted. The canola variety Hyola60 gave higher yield of 2126.14 (Kg.ha-1) as compared to the variety Sarigol that produced 1850.45 Kg/ha (Table 1). The differences in the yield of two varieties were due to the best performance of variety Hyola60 in primary branches per plant, secondary branches per plant and number of pods per plant. There were highly significant differences among the results regarding planting densities. The maximum yield of 2310.34 Kg/ha was obtained from the plots in which planting density was kept as 15 cm and the minimum yield of 1840.34 (Kg/ha) was obtained from the plots in which the planting density was kept as 30cm (Table 1). Chavan et al. (1989), Patel et al. (1980) and Tanveer et al. (1998) support these results. Chen et al. (2008) observed an increase in yield at density of 32 plants per square meter increased. The results regarding to plant height, secondary branches per plant, pod size and grains per pod were non-significant in all types of planting densities. It is obvious from the results that different planting density has no effect on plant height, secondary branches per plant, pod size and grains per pod. The results in case of primary branches per plant and number of pods per plant differ significantly (Table 1). It indicates that different planting density affect the number of primary branches per plant and number of pods per plant that contributes towards high yield as reported by Luchsinger et al. (1988). The maximum number of primary branches per plant (12.2) was in case of the plots where plant to plant distance was maintained as 35 cm, but it did not significantly differ from the plots of 25cm planting density (Table 1). The lowest number of primary branches per plant (8.35) was produced in plots of 15 cm planting density (Table 1). The maximum number pods per plant (676.43) were obtained in case of plots in which the planting density was maintained as 35 cm (Table 1). These results are in convenient with the results obtained by Yadav et al. (1995) and Guljar et al. (1997). Overall maximum yield was obtained from the plots in which the plant to plant distance was kept as 15 cm. The reason of the highest yield in case of planting density (15 cm) was due to the greater number of plants per plot, which has a prominent effect on yield per hectare. The interaction between varieties and planting density (V×D) was found to be significant and the variety Hyola60 with planting density 15 cm (V2D1) produced maximum yield 2556.85 (Kg.ha-1). The lowest yield was obtained from variety Sarigol with planting density 30cm (V1D3) as reported by Moore and Guy (1997). It indicates that if the variety Hyola60 is sown with planting density 15cm, the yield of canola can be increased.

Table 1: Comparison of agronomy traits of canola varieties as influenced by different densities

Treatment	DG	DFC	Primary branches/Plant	Grain Yield (kg\ha)	Secondary Branches/Plant	Pods/Plant	Pod size	Grains/pod
Varieties								
V1	9	125	11.87	1850.45b	38.3	725.44	6.22	28.26
V2	8	122	11.67	2126.14a	37.1	657.5	6.55	28.30
LSD (0.05)			Ns	0.032	Ns	Ns	Ns	Ns
Planting Density								
D1	8	118	08.35b	2358.44a	35.4	602.6b	6.32	28.56
D2	9	119	11.3a	2020.2b	35.3	625.46ab	6.40	28.36
D3	9	121	12.2a	1840.34c	35.6	712.53a	6.46	28.22
LSD (0.05)			0.014	0.01	Ns	0.0023	Ns	Ns
Interaction								
V1D1	9	122	10.5	2296.32a	32.4	610.5	6.37	28.23
V1D2	8	121	11.2	2031.41b	34.2	620.1	6.30	28.25
V1D3	9	122	11.3	11612.3c	34.8	685.6	6.25	28.35
V2D1	8	118	10.33	2556.85a	36.0	592.4	6.27	27.93
V2D2	9	119	11.2	2001.54b	34.7	610.8	6.50	27.98
V2D3	8	119	11.1	1920.31b	34.8	633.3	6.27	26.9
LSD (0.05)			Ns	0.023	Ns	Ns	Ns	Ns

Ns, Non Significant; Days to 90% germination completion; DFC, Days to 50% flowering completion; D1=15 cm, D2=25 cm D3=35cm, V1=Sarigol, V2=Hyola60

Conclusion

Our results indicated that to obtain maximum yield of canola, the plant to plant distance should be maintained as 15cm. Among varieties Hyola60 was appeared to be high yielding variety under the existing climatic conditions. So, the farmers are suggested to plant canola through drill sowing methods by keeping plant to plant distance as 15cm for obtaining maximum yield. They should also prefer the variety Hyola60 because it performs excellently under climatic conditions of Chaloos of Iran, gave maximum yield to the farmers.

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