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Effect of Different Planting Densities on the Grain Yield of Canola (Sarson) Varieties

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Abstract: A field study was conducted on canola during 1999-2000 at Arid Zone Research Institute, Bahawalpur. The treatments included the two varieties of canola (Dunkled and Rainbow) and three planting densities (10, 20 and 30cm). The objective of this study was to determine the response of canola to different planting densities for days to 90% germination (DG), days to 50% flowering completion (DFC), seed yield Kg ha⁻¹, plant height, number of primary branches per plant, number of secondary branches per plant, number of pods per plant, pod size and number of grains/pod. On average variety dunkled with planting density (10cm) produced higher grain yield of 2222.27 Kg ha⁻¹ as compared to variety Rainbow and other planting densities (20, 30cm). The planting density 30cm produced lowest yield of 1704.33 Kg ha⁻¹. In case of number of primary branches per plant, number of pods per plant and seed yield the results were significantly effected by different planting densities.

Key words: *Brassica napus*, genotypes, planting density, seed yield, performance

Introduction

Pakistan is facing chronic shortage of edible oil because of its domestic production is hardly enough to meet the demand of the people. Almost 70% of its requirements are being met through import. Pakistan's spend a huge amount of 40 billion rupees on the import of edible oil each year. The total area under rapeseed and mustard in Pakistan is 326.7 thousand hectares with the average yield of 855 Kg ha⁻¹ which is far below than other countries of the world (Anonymous, 1999). The planting density is an important factor to contribute to final yield and by adapting proper planting density the seed yield of canola can be increased. The previous study showed that planting density has greatly influenced the yield of sarson as reported by McGregor (1980) and Degenhardt and Kondra (1981). Through the replacement of traditional varieties with that of "Canola" and by adopting the improved production technology the production of edible oil can be increased.

In this study two varieties of canola with three planting densities were compared to find out the high yielding variety and appropriate planting density for increasing yield.

Materials and Methods

The study was carried out on two canola varieties (Rainbow and Dunkled) with three planting densities (10, 20 and 30cm) at Arid Zone Research Institute, Bahawalpur during 1999-2000. 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 45 cm. The net plot size was 2.25 x 13 m². The Nitrogen and Phosphorus were applied @ 75 and 50 Kg ha⁻¹, respectively. All P₂O₅ and one third of N were applied at sowing and remaining doses of N were applied 1st and 2nd 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 completed. Plant height was measured at physiological maturity of crop by taking an average of 10 randomly selected plants per plot from ground level to the top of the plant. The number of primary branches, 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 10 randomly selected plants/plot. Data collected were statistically analyzed by analysis of variance technique at 5% level of probability (Steel and Torrie, 1980).

Results and Discussion

The results regarding the days to germination completion (DG) and days to 50% flowering completion do not differ very greatly between varieties and among different planting densities (Table 1). Highly significant differences in the yield of canola varieties were noted. The canola variety dunkled give higher yield of 2006.13 Kg ha⁻¹ as compared to the variety rainbow that produced yield of 1908.35 Kg ha⁻¹ (Table 1). The differences in the yield of two varieties were due to the best performance of variety Dunkled 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 2207.33 Kg ha⁻¹ was obtained from the plots in which planting density was kept as 10 cm and the minimum yield of 1704.33 Kg ha⁻¹ 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. 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 effect the number of primary branches per plant and number of pods per plant that contributes towards high yield as reported by Luchsinger and Harald-Heinrich (1988).

The maximum number of primary branches per plant (10.18) was in case of the plots where plant to plant distance was maintained as 30cm, but it did not significantly differ from the plots of 20cm planting density (Table 1). The lowest number of primary branches per plant (9.45) was produced in plots of 10 cm planting density (Table 1). The maximum number pods per plant (624.99) were obtained in case of plots in which the planting density was maintained as 30 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 10 cm. The reason of the highest yield in case of planting density (10 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 x D) was found to be significant and the variety Dunkled with planting density 10 cm (V₁D₁) produced maximum yield 2222.27 Kg ha⁻¹. The lowest yield was obtained from variety Rainbow with planting density 30cm (V₁D₃) as reported by Moore

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Table 1: Comparison of means of grain yield and yield components of canola varieties as affected by different planting densities

Treatment	DG	DFC	Plant height (cm)	Primary branches/ plant	Secondary branches/plant	Pods/ plant	Pod size	Grains/ pod	Yield (Kg ha ⁻¹)
Varieties									
V ₁	8	120	1.71	09.99	33.14	609.11	5.41	24.26	1908.35b
V ₂	7	118	1.74	09.82	34.14	586.51	5.44	24.30	2006.13a
LSD (0.05)			NS	NS	NS	NS	NS	NS	0.022
Planting Density									
D ₁	7	119	1.74	09.45b	33.45	571.38b	5.42	24.21	2207.33a
D ₂	8	117	1.75	10.08a	33.62	597.06ab	5.50	24.38	1960.07b
D ₃	8	118	1.69	10.18a	33.86	624.99a	5.36	24.25	1704.33c
LSD (0.05)			NS	00.013	NS	000.047	NS	NS	0.000
Interaction									
V ₁ D ₁	8	120	1.73	09.57	31.89	581.15	5.47	24.19	2192.40a
V ₁ D ₂	7	118	1.69	10.17	33.67	599.42	5.40	24.35	1994.27b
V ₁ D ₃	8	118	1.71	10.25	33.87	646.71	5.35	24.25	1538.40c
V ₂ D ₁	7	117	1.74	09.33	35.00	561.60	5.37	24.24	2222.27a
V ₂ D ₂	8	119	1.81	10.01	33.57	594.70	5.60	24.40	1925.87b
V ₂ D ₃	7	118	1.68	10.11	33.85	603.22	5.37	24.25	1870.27b
LSD (0.05)			NS	NS	NS	NS	NS	NS	0.012

NS, Non significant DG, Days to 90% germination completion DFC, Days to 50% flowering completion
 D₁ = 10 cm, D₂ = 20 cm, D₃ = 30cm V₁ = Rainbow, V₂ = Dunkled

and Guy (1997). It indicates that if the variety dunkled is sown with planting density 10 cm, the yield of canola can be increased. It is proved through this study that to obtained maximum yield of canola the plant to plant distance should be maintained as 10cm. Among varieties dunkled 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 10 cm for obtaining maximum yield. They should also prefer the variety dunkled because it performs excellently under climatic conditions of Bahawalpur and Cholistan and gave maximum yield to the farmers.

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