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Determining a Suitable Seeding Time and Seed Rate for Harvesting a Rich Crop of Canola (*Brassica napus* L.)

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Abstract: Seeding times had a significant effect on different growth and yield parameters, where mid-October seeding produced maximum seed yield (1699.12 kg ha^{-1}). However, the seed oil content were highest (43.44%) in case of early seeding (seeding on September, 26) and gradually decreased with delay in sowing. The different seeding rates and the interactions between seeding times and seed rates were found to be non significant for almost all the parameters except that of numberof seeds pod^{-1} where, 5 kg seed ha^{-1} produced maximum number of seeds pod^{-1} (19.85).

Key words: *Brassica napus* L., seeding time, seed rate, yield, quality

Introduction

Edible oil production in Pakistan is very low as compared to its consumption. The annual growth rate in consumption of edible oil is 9%. For the current year the edible oil requirement for the country is estimated to be 1.7 million tones as compared to 1.69 million tones of the last year (Anonymous, 1999). Assuming the present growth rate in consumption of edible oil, it is imperative to enhance domestic production either by modifying traditional methods of cultivation or by including traditional oilseeds with greater yield potential and wider adaptability to our agro-climatic conditions.

Among traditional oilseeds, rapeseed and mustards hold good promise and have a great potential to bridge up the gap existing between local production and consumption of edible oil. Oil extracted from traditional rapeseed and mustards is of inferior quality. Keeping this in view, Canola, a rapeseed having high quality oil with low erucic acid and glucosinolate has been introduced in Pakistan. With the evolution of cultivars low in acids, it is possible to produce problem free oil in the country. Nonetheless, the production technology for a newly introduced crop needs to be determined in different environments. Besides many other factors, proper seeding time and seed rate are considered the most important pillars of a package production technology. Degenhardt and Kondra (1981) reported the highest yields and 1000-seed weight with early sowing. However, seeding rates had a non-significant effect on total yield, 1000-seed weight and seed oil content. Similarly, Hossain *et al*. (1984) observed that seed rates had no effect on 1000-seed weight or seed yield. While, the seed yield with sowing on mid of October was the highest and decreased with delay in sowing date and differences in yield between sowing dates were attributed to differences in number of pods $plant^{-1}$ and number of seeds pod^{-1}. Similarly, Christensen *et al*. (1985) also maintained that plant density, seed yield and seed quality were significantly influenced by seeding dates. Whereas, Uddin *et al*. (1986) concluded that later sowing (November sowing) generally reduced number of pods $plant^{-1}$ and number of seeds pod^{-1}.

Which in turn resulted in the lowest yield. Similarly, Ghosh (1994) found that delaying sowing reduced number of fruiting branches $plant^{-1}$ and seed yield. However, Pramanik *et al*. (1996) reported that seed and oil yields decreased with delay in sowing time. While, Tanveer *et al*. (1998) also found the highest yield with early sowing.

Materials and Methods

Present studies to evaluate the effect of different seeding times and seed rates on growth, seed yield and oil content of Canola (*Brassica napus* L. cv. Rainbow) were carried out on a sandy clay loam soil at the Agronomic Research Area, University of Agriculture Faisalabad, during 1998-99. The experiment was laid out using Randomized complete block design with split plot arrangement consisting of four replications, with a net plot size of 1.8 m × 5m. The treatments, seeding times (seeding on September, 26, October, 3, 13, 26 and November, 3) and seed rates (4, 5, 6 kg ha^{-1}) were randomized in the main and sub plots, respectively. The crop was sown on a well prepared fine seedbed in 30 cm spaced lines using a single row hand drill. A standard dose of 90-60 NP kg ha^{-1} was used. Whole of the phosphorus and 1/3 of nitrogen was applied as a basal dose, while 1/3 N was applied with first irrigation and remaining 1/3 N at flowering. The crop was kept free of weeds by giving one hoeing with kasola. All other agronomic practices were kept uniform and normal for all the treatments.

Crop was harvested on 17th of April, 1999 and observations were recorded on different plant parameters like number of plants per square meter, number of fruiting branches $plant^{-1}$, number of pods $plant^{-1}$, number of seeds pod^{-1}, 1000-seed weight, seed yield and seed oil content using standard procedures. Seed oil content were estimated by Nuclear Magnetic Resonance Test (Robertson and Morrison, 1979). The recorded data were analyzed by using Fisher's Analysis of variance Technique and LSD test was applied at 5 percent probability level to compare the differences among treatments means (Steel and Torrie, 1984).

Results and Discussion

Number of plants per square meter: Table 1 reveals that different seeding times had a significant effect on the parameter under question. Seeding on October, 13 produced significantly higher number of plants per square meter (52.58) than rest of all the treatments except seeding on October, 3. The higher number of plants per square meter in seeding on October, 13 treatment can be attributed towards relatively more favourable temperature prevailing affecting positively seed germination leading to a better crop stand. These results are in line with those of Christensen *et al*. (1985) who also reported the effect of seeding dates on plant density. However, the seeding rates did not affect significantly the parameter in question.

Number of fruiting branches $plant^{-1}$: Table 1 further shows that maximum number of fruiting branches $plant^{-1}$ (16.58) were produced with seeding on October, 13 which differed significantly from rest of all the treatments. The higher number of productive branches in case of mid October sowing could be because of favourable conditions existing during the early crop growth period

resulting in a vigorous growth. Similar results are also reported by Ghosh (1994).

However, the seeding rates were found to have non-significant effect on this parameter. These findings are quite in line with those of Gaffer and Mohammad (1988) who reported that yield and yield components were not significantly influenced by seeding rates.

Number of pods plant^{-1}: The number of pods plant^{-1} is also a vital factor which contributes materially towards final crop yield. Table 1 exhibits that seeding times had a highly significant effect on this parameter. The maximum number of pods plant^{-1} (476.75) were recorded in case of seeding on October, 13 treatment, which, however, remained statistically at par with seeding on October, 3 treatment which produced 434.75 pods plant^{-1}. Whereas, the minimum number of pods plant^{-1} i.e., 267.67 were noted in case of seeding on November, 3 treatment. Hossain *et al*. (1984) also reported the significant impact of seeding dates on number of seeds pod^{-1}.

Number of seed pods^{-1}: Data pertaining to the number of seeds pod^{-1} presented in Table 1 shows that seeding on October, 3, seeding on October, 13 and seeding on October, 26 being statistically at par produced higher number of seeds pod^{-1} than the crop either grown early (seeding on September, 26) or too late (seeding on November, 3). The maximum number of seeds pod^{-1} (19.50) were obtained in case of seeding on October, 13 treatment. Whereas, minimum number of seeds pod^{-1} (15.83) were obtained in case of sovying on 3rd of November. These results are supported by Uddin *et al*. (1986), who found reduced number of seeds pod^{-1} with later sowing which in turn resulted in lowest yield.

Similarly data packed in Table 1 further shows that seeding rates also had a highly significant effect on number of seeds pod^{-1}. The results revealed that 5 kg seed ha^{-1} produced maximum number of seeds pod^{-1} (19.85) and differed statistically from 4 kg seed ha^{-1} and 6 kg seed ha^{-1} treatments. The later treatments however, showed statistically the same results.

1000-seed weight (g): Data on 1000-seed weight presented in Table 1 shows that different sowing dates produced a significant effect on this parameter. The highest 1000-seed weight (3.27 g) was recorded in case of seeding on October, 13 treatment and differed significantly from rest of all the treatments. However, the treatments seeding on September 26, October 3 and October, 26 were found to be statistically alike producing 2.84, 2.96, 2.74 g of 1000-seed weight respectively. The treatment seeding on November, 3 however, produced minimum 1000-seed weight (2.659 g). The highest 1000-seed weight in case of seeding on October, 13 treatment could be because of more favourable conditions prevailing at seeding resulting in good germination and later growth leading to healthy plants. These results are in agreement with those of Jain *et al*. (1986) who reported the decreased seed yield and 1000-seed weight with delayed sowing. The rates of seeding resulted in non significant effect on 1000-seed weight (Table 1). This agrees with the previous work which found that 1000-seed weight was not significantly affected by seeding rates reported by Degenhardt and Kondra (1981).

Seed yield (kg ha^{-1}): Data regarding seed yield of canola as affected by different seeding dates and seed rates presented in Table 1 shows that different seeding times had pronounced effect on seed yield. The maximum seed yield of 1699.12 kg ha^{-1} was obtained in case of seeding on October, 13 which, however, remained statistically at par with that of seeding on October, 3 treatment producing the seed yield of 1611.11 kg ha^{-1}. Similarly, seeding on September, 26, October, 3, 26 and November, 3 treatments were found not differing statistically from each other. While minimum seed yield (1446.29 kg ha^{-1}) was obtained in case of seeding on November, 3 treatment. The highest seed yield can be attributed to the increase in main yield components like number of pod plant^{-1}, number of seeds pod^{-1} and 1000-seed weight for October, 13 seeding. These observations are in line with those of Hossain *et al*. (1984) and Tanveer *et al*. (1998) who reported the highest seed yield with sowing on first fortnight of October and decreased with delay in sowing time.

Seed oil content (%): The results given in Table 1 regarding seed oil content (%) exhibits that seed oil contents were gradually decreased with delay in sowing beyond 13th of October. The maximum seed oil content (43.44%) were obtained with seeding on September, 26 but remained statistically at par with that of seeding on October, 3 and October 13 treatments. The minimum seed oil content (39.87%) were found in case of seeding on November, 3 treatment. Reduction in duration of reproductive phase in delayed sowing adversely affected seed development and 1000-seed weight was reduced with the result that the oil content in the seed was Idss. These observations support the findings of Pramanik *et al*. (1996).

Table 1: Growth, seed yield and oil content of canola as influenced by different seeding times and seed rates

Treatments	No. of plants m^{-2}	No. of fruiting branches plant^{-1}	No. of pods plant^{-1}	No. of seeds pod^{-1}	1000-seed weight (g)	seed yield (kg ha^{-1})	Oil content (%)
Seeding times							
Seeding on Sept. 26	46.25b	13.92b	334.00cd	16.75bc	2.84bc	1472.22b	43.44a
Seeding on Oct. 3	48.42ab	13.33b	434.75ab	19.42a	2.96b	1611.11ab	42.68a
Seeding on Oct. 13	52.58a	16.58a	476.75a	19.50a	3.27a	1699.12a	42.85a
Seeding on Oct. 26	47.08b	13.25b	386.25bc	18.75ab	2.74bc	1446.92b	41.63b
Seeding on Nov. 3	43.87b	14.00b	267.67d	15.83c	2.65c	1446.29b	39.87c
LSD 5%	4.78	2.13	77.44	2.47	0.28	170.40	0.811
Seed rates (S) kg ha^{-1}							
a-4	48.75NS	14.55NS	388.05NS	17.70b	2.88NS	1521.42NS	42.35NS
b-5	47.10NS	14.15NS	371.70NS	19.85a	2.99NS	1542.31NS	42.07NS
c-6	48.25NS	13.95NS	380.25NS	16.60b	2.76NS	1541.66NS	41.88NS
LSD 5%	NS	NS	NS	1.382	NS	NS	NS
Interactions (TxS)	NS	NS	NS	NS	NS	NS	NS

leans in the same column having different letters differ significantly at ($p \leq 0.05$). NS = Non significant

However, the effect of seed rates on oil content of canola was found to be non-significant. Similar results were also reported earlier by Degenhardt and Kondra (1981).

Thus from the present study it can be concluded that seeding of canola at 4 kg seed ha^{-1} during the first fortnight of October is necessary for a achieving higher yields under irrigated conditions of Faisalabad.

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