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Evaluation of planting date on morphophysiological traits of canola Brassica napus L.)

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Abstract

The aim of this paper was to find out the optimum planting time for the newly selected genotype ORS 3150-3008. For this reason, an experiment was conducted at the Agriculture Research Station, Karaj, Iran during spring season of 2008-09 in five planting dates (April 15, April 25, May 5, May 15 and May 25). Significant variations due to different planting dates were observed in days to flowering, maturity, plant height, number of primary branches/plant, pod/plant, seeds/pod, 1000 seeds weight and seed yield/ha. Results showed that the highest seed yield (2.54 ton/ha) was obtained from the second planting (April 25) and it was significantly different from the yields of all other dates of planting. All other yield attributes were also found higher in the plants of second planting. The seed yield (2.57 ton/ha) of last planting (May 25) was also satisfactory because of the prolong winter season prevails in the northern part of the country.

Keywords: Planting time; genotype ORS 3150-3008; grain yield

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Introduction

Rapeseed (*Brassica napus* L. and *Brassica campestris* L.) are the important oilseed crops throughout the world which rank third among the oilseed crops after soybean and oil palm in production of vegetable oils, while fifth in the production of oilseed proteins. Rapeseed is also important oilseed crops of Iran. The national requirement of edible oil is going to increase even further in the coming years due to high population growth rate and increase in per capita consumption. This huge import can only be reduced by increasing the domestic oilseed production. The production of oil seed in Iran is not high; about 80% of Iran's necessary oil is imported from foreign countries (Crubbens et al., 2004).

Planting dates 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). 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 delayed flowering and reduced reflection of radiation during flowering which were 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. Taylor and Smith (1992) reported that yields of seed and oil declined when sowing was delayed beyond May (the optimum period of canola sowing in Australia) (Taylor, 1992). Robertson et al. (1999) observed that yield declined with delay in sowing date i.e., the linear regression slope coefficient between sowing date and grain yield

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was negative and the average relative yield loss per week was 5.1%. A number of studies have shown yield decline in canola with delay in sowing (Hocking et al., 2001). In addition, canola oil content has been found to decline with later sowing. Horton (2006) found that highest yield of canola was observed from earlier sowings. 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 April sowing compared to 29th April, 13 May and 28 May sowing. Seeding earlier than normal incorporates operational diversity into a cropping system that diversifies weed management systems. The detrimental effects of insects and diseases on canola yields, as well as the effect of delayed sowing on production cost have been reported (Yadav et al., 2011). The present study was conducted to evaluate the effect of planting date on morphological characteristics of canola.

Materials and Methods

The research work was conducted at the Agriculture Research Station, Karaj, Iran during April 2008 to February 2009. One newly selected genotype of *Brassica napus* L. (ORS 3150-3008) was selected for the experiment. There were five planting dates for the experiment as follows: D1 = April 15, D2 = April 25, D3 = May 5, D4 = May 15 and D5 = May 25. The experimental design was Randomized Complete Block Design (RCBD) with four replications having unit plot size 4.5m X 3.5m. The fertilizer dose used for the experiment was 135, 45, 100, 27, 5 and 0.9 (kg/ha) of N, P2O5, K2O, S, Zn and B in the form of urea, triple super phosphate, muriatic of potash, gypsum, zinc sulphate, and boric acid respectively. Half of the urea and whole amount of all other fertilizers were applied in the unit plots at the time of final land preparation prior to sowing. The remaining half of the urea was applied as topdressing in 25 days after emergence of seedlings. Weeding cum thinning, irrigation and insects and disease control measures were done as per requirement. At maturity, ten randomly selected sample plants were collected separately from each plot for data collection. Data were collected on the days to emergence, days to 1st flowering, days to flowering (50%), days to maturity, plant height (cm), number of primary branches/plant, number of pod/plant, number of seeds/pod, weight of seeds/plant, 1000- seed weight, seed yield/ha and biological yield. The Collected data were statistically analyzed using SPSS statistical software. The analysis of variance and level of significance along with the Least Significant Difference (LSD) Test were done following Gomez and Gomez, (1984).

Results and Discussion

Effects of date of planting on plant yield and yield component are presented in Table 1 and 2. Days to emergence of the genotype for different planting dates were more or less similar. The plants of first sowing needed the highest number of days (29 days) to first flowering. Plants of last planting (May 25) needed the lowest number of days (23) to give first flower. The first sowing needed the highest number of days to 50% flowering (55 days). Plants of second (April 25), third (May5) and fourth planting (May 15) needed 31 days and the last planting took 29 days to give 50% plants to flower. The longest period to mature (90 days) was required by the plants of first sowing and it was followed by the second and third plantings. The shortest period (80 days) to mature was required by the fourth and fifth plantings. Early plantings required longer period to mature and delayed sowing reduces time to mature. The present results are in well agreement with Islam et al. (1994), Mondal et al. (1999) and Robertson et al. (2004) who reported that the maturity period became gradually shorter with the delayed sowing. The highest plant height (115 cm) was recorded from the plants of third planting (5 May) and it was significantly different from the all other planting dates. Mondal and Islam (1993) supported the above result and showed that sowing in the early May gave the highest plant

Table 1: Plant characteristics of rapeseed genotype ORS 3150-3008 as influenced by different dates of planting during Spring season, 2008-2009

Treatment	Days to emergence	Days to first flowering	Days to flowering (50%)	Days to Maturity	Plant height (cm)	N. of Primary branches plant^{-1}
D_1=Oct.15	5	28	55	90	125	8.78
D_2=Oct.25	6	27	41	78	112	7.5
D_3=Nov.5	6	25	41	78	123	8.2
D_4=Nov.15	6	25	41	79	118	6.9
D_5=Nov.25	6	23	39	77	112	7.20
CV (%)	-	-	-	5.3	4.6	8.3
LSD 0.05	-	-	-	4.67	8.27	1.34

N. B. Days to emergence, Days to first flowering and Days to flowering (50%) were not statistically analyzed.

Table 2: Yield and yield attributes of rapeseed genotype ORS 3150-3008 as influenced by different dates of planting during Spring season, 2008- 2009

Treatment	Pod plant (m^{-1})	Seeds pod (m^{-1})	1000- seed weight (g)	Seed yield ha^{-1} (t)
D_1=Oct.15	84	21.25	3.68	1.33
D_2=Oct.25	115	24.00	3.80	2.54
D_3=Nov.5	102	22.75	3.68	1.98
D_4=Nov.15	98	21.75	3.28	2.10
D_5=Nov.25	85	18.75	3.24	1.47
CV (%)	13.7	8.5	9.4	0.56
LSD 0.05	17.6	4.68	0.09	0.24

height than in April and December. Shahidullah et al. (1997) also reported similar findings. Among the five planting dates, the highest number of primary branches/plant (8.78) was found from the plants of first planting (April 15) and it was statistically similar with the plants of second planting (April 25) and fourth planting (May 15). The lowest number of primary branches/plant was recorded from the plants of fifth planting, which was 7.20. Angrej et al. (2002) also reported that primary and secondary branches/plant was obtained higher when the crop was sown in between 5 to 25 April in India. The highest number of pod/plant (115) was obtained from the plants of second sowing (April 25), which was statistically similar to the first, third and fourth plantings. This finding was in conformity with the findings of Mondal et al. (1999) who stated that the plants of third planting (May 5) produced the highest number of pod/plant and reduced in the late sowings. The highest number of seeds/pod was produced in the plants of April 25 sowing, and it was statistically similar with those of April 15, May 5 and May 15 sowings. The lowest seed number/pod was found in the plants of May 25 sowing which was significantly different from all other sowing dates. These results are in agreement with the results of Mondal et al. (1999) and Shahidullah et al. (1997). Kalra et al. (1985) and Bukhtiar et al. (1992) also recorded that delaying in planting time reduced the seed yield/plant. The highest 1000 seed weight was recorded in April 25 sowing which was statistically similar to that of May 5 sowings. The May 25 sowing was recorded the lowest weight of 1000 seed indicating reduced test weight with each successive delay in sowing after April 25. Mondal et al. (1999) stated that 1000 seed weight reduced with the delayed planting time. A wide range of variation in stover yield was observed with different dates of sowing. The result was supported by the results of Islam et al. (1994), and Degenhardt and Kondra (1981). The higher seed yield (2.54 ton/ha) Produced by April 25 sowing might be attributed to higher number of pod in individual plants, number of seeds per pod and 1000 seed weight. Sowing on April 15 yielded the second highest yield (1.33 t/ha). The findings in the present study about seed yield were fully supported by Brar et al. (1998), Buttar and Aulakh, (1999), Mondal et al. (1999), Degenhardt and Kondra (1981). From the above findings, it may be concluded that mustard genotype ORS 3150-3008 may be sown from the end of April to May 2 in the northern parts of the country.

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