EFFECT OF PLANTING DATES ON SEED AND OIL YIELD OF CANOLA (Brassica napus L.) CULTIVARS

Arezoo Armin, Ahmad Rezal Golparvar

1Department of Agronomy and Plant Breeding, Islamic Azad University, Khorasgan (Isfahan) Branch, Isfahan, Iran.

*Corresponding author (e-mail: dragolparvar@gmail.com)

ABSTRACT

This study was achieved to investigate the effect of sowing date on seed and oil yield as well as yield components in winter canola cultivars in Isfahan province during 2011-2012 farming season. A split plot design in randomized complete block design with three replications was used. Four planting dates 15 October, 22 October, 29 October and 5 November were considered as main factor levels in the main plot. Also, ten canola cultivars were used as sub factor levels and were arranged randomly in the sub plots. Results showed that the effect of sowing date was significant for all traits. On the other hand, the cultivar effect was significant for all traits. The interaction between planting date and cultivars was significant on traits stem elongation, flowering, end of flowering and maturity. In conclusion, cultivar KR4 in the first planting date (15 October) had the highest seed (4167 Kg/ha) and oil yield (1995 Kg/ha). Whereas, for late planting date (22 October) Karaj3 is the superior cultivar. Overall, KR4 is the best cultivar especially for normal planting date in Isfahan province.

Keywords: Planting date, Winter canola, Seed yield, Oil content, Yield components

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 oilseeds proteins. Rapeseed is also important oilseed crops of Iran. Winter oilseed rape (Brassica napus L.), the most important species of oilseeds, must compete economically with cereal crops and to meet this challenge, the yield of rapeseed crops must increase significantly. In this regard, it has been reported that at the early planting date, seed yield and straw yields were greater than late planting (Daly and Martin, 1988). 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 and Smith, 1992). A number of studies have shown yield decline in canola with delay in sowing (Hocking, 2001). 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 and Leitch, 1986). Degenhardt and Kondra (1981) also suggested that delayed seeding resulted in a significant decrease in seed yield, harvest index, racemes per plant and racemes per unit area. To date, management practices required for optimal yield of oilseed rape have been described for Iran.
This study was conducted to determine the effects of planting dates on seed and oil yield as well as yield components of canola (*Brassica napus* L.) cultivars in Isfahan province.

**Materials and Methods**

Experiment was conducted at the agricultural farm station of Kaboutar-Abad, Isfahan, Iran, during 2011-2012 farming season. The experimental field was a piece of well drained high land with moderately even topography. The soil is neutral in nature with pH 7.8. There were four dates of planting viz. 15 October, 22 October, 29 October and 5 November as main factor levels that arranged in the main plots. Ten canola cultivars (Opera, Karaj3, KR4,GA096 x Zarfam,Okapi x GA096 (2)(5),Orient x Modena (2)(4), Orient x Modena (5)(4) Okapi x GA096) GA096 x Zarfam (1) (2), Okapi x GA096 (2) (5), Orient x Modena (2) (4), Orient x Modena (5) (4) Okapi x GA096,GA096 xZarfam, GA096 x Zarfam (5) (1),Okapi x GA096,Okapi x GA096) were considered as the sub factor levels that randomly arranged in the sub plots.

The treatments were arranged in a split plot design in the layout randomized complete block design (RCBD) with three replications having plot size 4m x 1.2m. All other fertilizers and ½ amount of the urea were applied during final land preparation; and the rest ¼ of urea were applied at 15 days after seedling emergence. Weeding cum thinning, irrigation, and insect and disease control measures were done as per requirement. At maturity, 10 randomly selected plants were uprooted for data collection. Data were collected on phenological stages including days to stem elongation, days to flowering, days to end flowering and days to ripening as well as the other traits such as plant height, seed yield, oil percentage and oil yield.

Analysis of variance was used to assess the significant difference for planting dates, canola cultivars and interaction effects between dates and cultivars. Also, Duncan’s Multiple Range Test (DMRT) was performed to clarify the highest and lowest amount of the traits as well as significant difference among the planting dates, cultivars and interaction levels. SAS software was used for the statistical analyses.

**Results and Discussion**

Different dates of sowing have significant effects on all the measured traits. Plants of early sowing flowered normally due to prevalence of favorable environment especially low temperature during vegetative growth phase which enhanced flower initiation in the genotype. Saran and Giri (1987) and Soleymani et al. (2010) also reported that October 11 sowing date gave earlier flower. This variation might have occurred due to temperature and moisture stress. Above and below of this range, it reduced the growth rate by reducing plant height accumulation. The highest seed yield (4167 Kg/ha) and oil yield (1995 Kg/ha) were obtained from the plants of KR4 cultivar at 15 October planting and it was significantly different from all other dates of planting. Yield potential of a crop is a theoretical assessment of the maximum yield that can be generated when high yielding biological material is grown in an optimum physicochemical environment. 5 October planting date showed the highest amount of all traits especially seed and oil yield (Table 1).

**Table 1. Effect of planting dates on seed and oil yield and yield components**

| Date of planting | Days to stem elongation | Days to flowering | Days to end flowering | Days to ripening | Plant height(cm) | Seed yield(Kg/ha) | Oil yield percentage(%) | Oil yield(Kg/ha) |
|------------------|-------------------------|------------------|----------------------|------------------|-----------------|------------------|------------------------|----------------|}
| 15 October       | 166.3<sup>a</sup>       | 172.9<sup>a</sup>| 201.2<sup>a</sup>   | 229.5<sup>a</sup>  | 93.70<sup>a</sup> | 3170<sup>a</sup> | 43.83<sup>a</sup>   | 1415<sup>a</sup> |
| 22 October       | 157.9<sup>b</sup>       | 164.3<sup>b</sup>| 191.3<sup>b</sup>   | 217.1<sup>b</sup> | 88.70<sup>b</sup> | 2465<sup>b</sup> | 41.89<sup>a</sup>   | 1056<sup>b</sup> |
| 29 October       | 148.5<sup>c</sup>       | 152.9<sup>c</sup>| 178.6<sup>c</sup>   | 206.9<sup>c</sup> | 86.37<sup>c</sup> | 1882<sup>c</sup> | 43.56<sup>c</sup>   | 831.6<sup>b</sup> |
| 5 November       | 144.5<sup>d</sup>       | 150.5<sup>d</sup>| 176.5<sup>d</sup>   | 202.5<sup>d</sup> | 81.30<sup>d</sup> | 1410<sup>d</sup> | 41.72<sup>a</sup>   | 597.8<sup>c</sup> |

Means followed by the same letter(s) have no non significant difference.

*International Journal of Modern Agriculture, Volume 2, No.2, 2013*
The highest oil percent was produced in 15 October (43.83 %) while the lowest was observed in 5 November (41.72 %). Oil yield showed the highest amount (1415 Kg/ha) in 15 October. The lowest oil (597.8 Kg/ha) yield was produced in 5 November (Table 1). KR4 cultivar produced the highest amount of seed and oil yield as well as oil percentage. Karaj3 and Opera also showed higher amount of these traits than KR4 cultivar (Table 2).

Seed yield was reduced with the advancement of sowing date from 15 October to 5 November.

Table 2. Effect of canola cultivars on seed and oil yield and yield components

<table>
<thead>
<tr>
<th>Canola cultivars</th>
<th>Attribute</th>
<th>Days to stem elongation</th>
<th>Days to flowering</th>
<th>Days to end flowering</th>
<th>Days to ripening</th>
<th>Plant height(cm)</th>
<th>Seed yield(Kg/ha)</th>
<th>Oil percentage (%)</th>
<th>Oil yield(Kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opera</td>
<td></td>
<td>149.1^t</td>
<td>155.7^t</td>
<td>192.2^c</td>
<td>217.4^b</td>
<td>90.42^de</td>
<td>2742^g</td>
<td>45.67^a</td>
<td>1255^ab</td>
</tr>
<tr>
<td>Karaj3</td>
<td></td>
<td>166.4^b</td>
<td>168.4^b</td>
<td>200.9^d</td>
<td>229.8^c</td>
<td>90.08^e</td>
<td>3071^a</td>
<td>45.43^a</td>
<td>1403^a</td>
</tr>
<tr>
<td>KR4</td>
<td></td>
<td>155.7^d</td>
<td>160.5^d</td>
<td>187.5^f</td>
<td>215.1^c</td>
<td>92^d</td>
<td>3119^a</td>
<td>46.17^a</td>
<td>1450^a</td>
</tr>
<tr>
<td>GA096 x_Zarfam (1) (2)</td>
<td></td>
<td>151.7^e</td>
<td>158.7^e</td>
<td>188.2^ef</td>
<td>214^c</td>
<td>95.92^b</td>
<td>2391^c</td>
<td>44.39^a</td>
<td>1069^bc</td>
</tr>
<tr>
<td>Okapi x_GA096 (2) (5)</td>
<td></td>
<td>152.3^e</td>
<td>158.8^e</td>
<td>189.8^de</td>
<td>215.3^c</td>
<td>93.33^c</td>
<td>1827^d</td>
<td>43.52^a</td>
<td>801.1^cd</td>
</tr>
<tr>
<td>Orient x_Modena (2) (4)</td>
<td></td>
<td>159.6^c</td>
<td>165.7^c</td>
<td>190.6^cd</td>
<td>218.6^b</td>
<td>75.25^f</td>
<td>1487^g</td>
<td>34.90^a</td>
<td>515^d</td>
</tr>
<tr>
<td>Orient x_Modena (5) (4)</td>
<td></td>
<td>136.6^h</td>
<td>143.6^h</td>
<td>166.6^i</td>
<td>195.3^j</td>
<td>73.50^d</td>
<td>1723^ke</td>
<td>38.31^a</td>
<td>664^d</td>
</tr>
<tr>
<td>Okapi x_GA096 (5) (2)</td>
<td></td>
<td>144.7^g</td>
<td>151.7^g</td>
<td>174.7^h</td>
<td>206.3^h</td>
<td>69.67^h</td>
<td>1530^de</td>
<td>40.52^a</td>
<td>615.1^ef</td>
</tr>
<tr>
<td>GA096 x_Zarfam (5) (1)</td>
<td></td>
<td>155.2^d</td>
<td>161.8^d</td>
<td>184.3^d</td>
<td>210.3^d</td>
<td>93.67^d</td>
<td>1711^de</td>
<td>44.42^a</td>
<td>770^cd</td>
</tr>
<tr>
<td>Okapi x_GA096 (2) (2)</td>
<td></td>
<td>172^a</td>
<td>176.7^a</td>
<td>194.2^b</td>
<td>217.9^b</td>
<td>101.3^a</td>
<td>2717^b</td>
<td>44.16^a</td>
<td>1209^ab</td>
</tr>
</tbody>
</table>

Means followed by the same letter(s) have no significant difference.

In conclusion, determination of the response of different crop varieties to environmental variables from planting to harvest is one of the fundamental pillars of agriculture planning to achieve maximum yield and desirable quality. Delayed planting decreased seed and oil yield as well as oil percentage. Cultivar KR4 produced the highest seed yield in the first planting date, while Karaj3 in the second planting date (late planting) was the superior cultivar.

References


Chakraborty, P.K., A. Majumdar, and B.N. Chatterjee. 1991. Physiological process in Indian mustard (Brassica juncea L.) and yellow sarson (Brassica napus var glauca) and their agronomic appraisal in mild and short winter prevailing in Gangetic plains of eastern India. Indian Journal of Agricultural Sciences. 61(11): 851-858.


