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MEASURING OF YIELD AND YIELD COMPONENTS OF WINTER RAPESEED VARIETIES ON DIFFERENT PLANTING DATES

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Abstract

Planting date is an important factor affecting crop yield, yield components and quality, especially in cold regions. In order to elucidate the effect of sowing dates on the yield and yield components of six winter oilseed rape (Brassica napus L.) varieties, an experiment was conducted in Mashhad. A split plot layout within randomized complete block design with four replications was used in the experimentation. Four sowing dates consider as main plots, consist September 6th, September 21st, October 6th and October 21st and six winter rapeseed varieties (Fornax, Okapi, Colvert, Talayeh, SLM046 and Orient) were in the subplots. Variables including plant height, seed yield, LAI, CGR, NAR, TDM and HI were measured. Results showed sowing time significantly affected on TDM, LAI, CGR, plant height, seed yield and HI and they improved by early sowing dates. The most suitable varieties were Fornax and Colvert respectively.

Key words*: Brassica napus, sowing dates, oilseed.*

INTRODUCTION

Rapeseed (*Brassica napus* L.) is one of the leading edible oil crops that is now one of the most important oil crops in the Iran. Sowing time is very important for rapeseed production because sowing at proper time allows sufficient growth and development of a crop to obtain a satisfactory yield. Rapeseed has high value of oil (40-45%) and protein (39%) (Eskandari and Kazemi, 2012).

Rapeseed oil contains a desirable profile of saturated fatty acids (7%) and high level of unsaturated fatty oleic acids (about 61%) and medium level of unsaturated fatty linoleic acids (21%) and linoleic acid (11%) (Molazem et al., 2013).

The seed yield and maturity of rape seed plants are greatly influenced by environmental conditions regardless of genotypes. Therefore, whenever a new genotype/variety is developed or introduced in a region, an appropriate package of production practices must be developed.

Since rapeseed planting has been very common in Khorasan Razavi province, therefore, whenever a new variety is developed or introduced in this region, an appropriate package of production practices include sowing time must be developed. According to the importance of the growth period in this plant , it is necessary to evaluate the distinct planting dates. Hence some experiments have been conducted in this field by (Ghasemi et al., 1996 and Mandal et al., 1994) in which they insisted on early planting. Furthermore other scientists such as Jenkins and Leich (1996), Walton and Bowden (1999), emphasized on the importance of the planting dates .Although numerous studies have been handled on the sowing dates, any location requires it special planting dates because of having distinct climatic features.

MATERIALS AND METHODS

The experiment was conducted on 2010 growing season at Agriculture and Natural Resources Research Station of Toroq, Mashhad in East - North of Iran (36°, 13', 12" and 54°, 43', 14" E) with annual rainfall of 286 mm. Soil texture was silty loam with the moderate amount of organic matter and nutrient elements. Each experimental plot included 4 planting rows with 5 meter length. Distance of planting on rows was 30 cm and planting density was 70 plants per m^2. The study was carried out using rapeseed cultivars (Colvert, Fornax, Okapi, SLM046, Orient, Talayeh) as

main plot factor and sowing dates (Sep. 6th, Sep. 21st and Oct. 6th, Oct. 21st) as subplot factor in a split plot experiment based on randomized complete block design (RCBD) with 4 replications. Leaves, stems and pods were separately taken from three plants of each plot and plant growth parameters such as plant height, number of leaves, fresh and dry weight were recorded. All data from the experiment were subjected to analysis of variance (ANOVA) using SAS 9.1 package, the means compared with Duncan's test and all graphs were drown using Excel.

RESULTS AND DISCUSSIONS

The results showed that the planting date significantly affected yield and yield components of rapeseed (Table 1). Based on results obtained, plant height was significantly affected by the different sowing dates. The maximum plant height was recorded on Sep. 21st, whereas the minimum plant height was gained on Oct. 21st (Table 1). Results about the effect of different varieties on plant heights also showed Fornax was the longest variety and Okapi was oroduced the shortest plants (Table 2). The interaction effects of planting date and varieties showed Fornax and Colvert varieties were significantly sensitive to the early planting.

Results indicated that planting date significantly affected number of pod per plant, number of seed per pod and 1000 seed weight. Late planting significantly reduced number of pods per plant, number of seeds per pod and 1000 seed weight (Table 2). The differences among the varieties were noticeable (Table 1). Interactions between variety and planting dates indicated that, Colvert had the most sensitivity to late sowing date and Orient and Talayeh had the least sensitivity to planting date respectively.

The results of effect of planting time on seed yield showed that the late planting time significantly reduced the seed yield. Based on results planting date at Oct. 21s caused reduced the yield nearly 50% (Table 2). Results showed the Fornax variety produced the highest seed yield and significantly produced more seed yield to compare with the other varieties. However, early planting of Colvert could increase the yield of this variety.

The capacity of transforming of photosynthetic materials from sink to source can display with Harvest Index. The result of analysis variance demonstrated that late planting reduced the H.I. significantly (Table 1). Considering this parameter in the varieties showed huge difference among them. Results showed Fornax had the highest H.I. amoug the varieties. The correspondent effect of variety and planting date was significant on this parameter. Late planting time reduced the H.I. in SLM046 and Okapi, while other varieties were not very sensitive.

Based on collected data delay on the postponement in planting time significantly reduced Total Dry Mater almost in all six verities. The highest amount of TDM was obtained by Colvert (1006 gr/m^2) in first planting time and SLM046 on last planting date produced the lowest TDM (255 gr/m^2).

Results indicated that the planting date did not significant affected on LAI of six verities. The effect of sowing dates was not noticeable before the rosette stage. After the rosette stage by changing the environmental conditions and increasing the temperature and light the LAI growth is almost obvious. This condition continuous until flowering stage and two weeks later. The LAI was different among distinct varieties and based on data analysis Fornax and Colvert had highest LAI.

According to different stages of growth, the CGR was very slow at early stages of growth like rosette and before this stage. It is slow because neither the plant canopy was completed, nor environmental conditions were good for plat growth. Also after the rosette stage by increasing the temperature and increasing light by sunny days the plant growth increased, significantly. Hence, the growth parameters such as leaf area, dry matter, increased meaning fully, CGR increased to this condition maintained until the flowering stage. At the flowering stage the CGR was maximum. Delay in planting time reduced the CGR. The amount of CGR on Sep.6th was 3.2 and on Oct.21st was 1.4 gr $m^{-2}day^{-1}$ The CGR was different among distinct varieties, so it was 3.8 on Okapi, since Fornax for the first planting date had the lowest CGR among the varieties.

Table 1. Effect of planting date on rapeseed characteristics, Mashhad -Toroq

Planting Date	Plant Height (cm)	No. of Secondary Branches	No. of Sheaths / Plant	No. of Seed / Sheath	Sheath Length (cm)	1000 Seed Weight (gr)	Seed Yield (kg / ha)	Harvest Index **(%)**
Sep.6th	101.7[b]	1.25[a]	31[a]	19.7[a]	7.2[ad]	3.5[a]	2850[a]	37[a]
Sep.21st	107.4[a]	1.17[a]	28[b]	19.1[a]	7.4[a]	3.2[b]	2498[b]	34[b]
Oct.6th	97.9[c]	0.33[b]	22 [c]	18.9[a]	6.9[bc]	2.9[C]	1346[d]	33[c]
Oct.21st	97,7[c]	0.38[b]	21[c]	18.5[s]	6.6[C]	2.9[C]	1467[c]	32[d]

Table 2. The mean of Agronomical features of six varieties of rapeseed Mashhad -Toroq

Variety	Plant Height (cm)	No. of Secondary Branches	No, of Sheaths /Plant	No, of Seed / Sheath	Sheath Length (cm)	1000 Seed Weight (gr)	Seed Yield (kg / ha)	Harvest Index **(%)**
Colvert	102.4[abc]	1.44[a]	32[a]	13.3[b]	5.9[e]	3.5[a]	2305[b]	33[c]
Fornax	104.4[a]	1.00[b]	29[b]	19.2[a]	7.3[bc]	3.1[d]	2471[a]	37[a]
Okapi	95.1[d]	0.7 5[bc]	21[cd]	19.7[a]	6.7[d]	3.0[c]	1526[f]	30[d]
Orient	103.2[ab]	0.38[d]	22[cd]	20.3[a]	7.9[a]	3.1[d]	1953[d]	36[b]
Slm046	100.2[C]	0.44[cd]	20[d]	20.7[a]	7.0[C]	3.2[b]	1902[e]	36[b]
Talayeh	101.8[bc]	0.64[bcd]	24[c]	21.4[a]	7.4[d]	3.1[b]	2035[c]	36[b]

*Values followed by similar upper case letters in a column are not significantly different at p <0.05

CONCLUSIONS

The planting date is considered as significant parameter which approximately stimulates all of the growth influenced by early planting. The early planting generally increases the quantity and quality of yield simultaneously. The following parameters were also influenced by plant date: the plant height, number of secondary branches. The yield components like number of sheath per plant, number of seed per sheath and seeds weight were also affected by early planting any were increased on dates like September 6th, 21st October planting dates. Finally, the studies demonstrated that the two varieties (Fornax *s* Colvert) were suitable for planting in Mashhad region.

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