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DETERMINATITION THE PROPER PLANTING DATE FOR COLD TOLERANT SPRING-TYPE CULTIVARS OF RAPESEED IN MILD COLD CLIMATIC CONDITIONS OF MASHHAD-IRAN

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Abstract

In order to determining the proper planting date for cold tolerant spring type cultivars of rapeseed, a two years experiment was done in Agriculture and Natural Resources Research Center of Khorasan-Razavi, Toroq Station in Mashhad , at North-east of Iran during 2006-2008 growing season. In this experiment seven planting dates with one month intervals from 23 Sept. to 23 March, were studied. Two cultivars namely, Hyola401 (Hybrid) and RGS003 (Standard Open Pollinated) were set as main plots and planting dates as sub plots in a split plot design, with four replications. Seed yield and yield components, i.e. number of branches per plant, number of pod per plant, was determined. Plant height at maturity stage also measured. Results showed, Hyola401 had greater yield especially in 23 Sept. and 23 Oct. planting dates. Planting of this cultivar on 23 Feb., as spring cultivation, produced a proper seed yield. This hybrid regardless of its shorter height, had very optimum branch number and also pods per plant and these tends it to achieve higher seed yield .For escaping from chilling stress in fields that is probable at the presence of reproductive stages at the end of fall, it is recommended , the farmers cultivate the Hyola401 on 23 October.

Key words*: B. napus, seed yield, delayed planting, Hyola401, RGS003.*

INTRODUCTION

Agricultural scientists know about the effect of interaction between genotype × environment for their breeding programs (Seyis et al., 2006). Amongst environmental factors, planting date has a key role for determining the time of plant phenological coincidence with external factors for yield increasing purpose. So some of spring rapeseed cultivars, because of their high tolerance to cold conditions, have possibility to sowing in autumn (Ghanizadeh, 2008).

Proper planting date can protect plant against freezing injuries (Rife and Zeinali, 2003), but in cold tolerant spring type rapeseed cultivars stem elongation is significantly related to planting date specially in moderate climatic conditions (Ghanizadeh, 2008).

Between vast range of spring cultivars of rapeseeds there is some cold tolerant ones can endure cold winters as well as winter types and obtain high potential photosynthetic capacity after wintering (Rapacz, 2002; Rapacz et al., 2001; Rife and Zeinali, 2003).

In this context, I have tried to show the effect of different planting date from Sept. to March on agronomic responses of two spring type of rapeseed cultivars that originally had cold tolerance capability and recently use by Iranian farmers in mild cold areas as a winter crop.

MATERIALS AND METHODS

In order to characterize the evolution of yield, yield components and plant height at maturity stage of two spring type of rapeseed to different planting dates a two years experiment was conducted. The site of experiment was Agriculture and Natural Resources Research Center of Khorasan-Razavi, Toroq Station in North-east of Iran. In this experiment seven planting dates with one month intervals from 23 Sept. to 23 March, were studied. Two cultivars namely, Hyola401 (Hybrid) and RGS003 (Standard OP) were set as main plots and planting dates as sub plots in a split plot design, with four replications.

The period analysed in this study was 2006-2008. In 2006-2007, the date 23 Jan. was omitted from analysis because we couldn't plant it for occurrence of heavy snow at that time.

The data, collected from the field was analysed statistically and mean comparisons was done based on Duncan's multiple range test.

RESULTS AND DISCUSSIONS

Seed yield

Results of interaction effects for means of cultivar × planting date in selected variables have shown in tables 1 and 2 for each year of experiment separately. The hybrid cultivar, Hyola401, had the more seed yield in all planting dates compared to RGS003 in two years. But the highest yield was obtained in the first and second planting dates i.e. 23 Sept. and 23 Oct. Apart from the nature of these cultivars, being spring, the highest seed yield was obtained in early fall planting dates. This confirms Rapacz (2002) suggestion about such cultivars.

As a spring crop, the best planting date in end of winter for rapeseed is around 23 Feb. Results for this date were different for two cultivars in two years. At first year the highest seed yield i.e. 1971 $kg.ha^{-1}$ was belonged to Hayola401, and in the second year 1856 $kg.ha^{-1}$ to RGS003, it shows that selecting a proper cultivar for sowing rapeseed in end of winter is slightly difficult and perhaps we need to select between cultivars with narrower differences and stable seed yields.

Different planting dates have distinct effects on seed yield, growth traits and morphology of rapeseed and yield is decreased in late plantings because of shortening the vegetative stage (Thurling, 1991; Kimber and McGregor, 1995).

Branch number/plant

The most branch numbers was established in 23 Nov. for two cultivars in both years. Because in this planting date we had much more chilling effect on plants, and this stimulated the re-growth of plant crown buds and more branching out. The second rank for this trait was belonged to 23 Sept., the first planting date. Mendham et al., (1981) showed in early plantings, rapeseed produce more branches. In both years the branching pattern for both cultivars was uniform but in Hyola401 was more stable. It seems hybrid cultivars have high potential for controlling their yield component in a steady state plateau for yield offset.

Pod number/plant

Pod setting pattern was different for cultivars in both years. The most pods per plant were produced by Hyola401 on 2006-2007 and by RGS003 on 2007-2008 growing season. The highest pod per plant was obtained in treatment 23 Nov. These advantages does not lead to higher seed yield, that in the previous section I explained My reasons for it.

As I mentioned previously the highest seed yields was achieved in planting dates 23 Sept. and 23 Oct., in which pod numbers per plant were 80-180. In connection with this trait, heritability has less controlling effect in comparison with environmental factors (Diepenbrock, 2000; Taylor and Smith, 1992).

More delay in planting date can reduce pod number per plant, because the pollination of rapeseed flowers coincides to the warmer parts of the season, then a lot of pollen abortion is occurred (Diepenbrock, 2000; McGregor, 1987).

Plant height

Totally the hybrid cultivar Hyola401, had the lowest height for sum of interaction effects in both years. Differences for this trait between cultivars can be due to the variation of days to maturity (Ozer, 2003).

The highest plant height was obtained in earliest planting dates i.e. 23 Sept. and 23 Oct. for Both cultivars, but the RGS003 was superior for this trait in both years. Delayed sowing reduced plant height up to 25 percent.

With delay in planting, availability of plant for growth resources such as light, water and nutrients is reduced, resulting in shortening its height (Sharief and Keshta, 2002). This is not necessarily an indication that shorter cultivars have lower seed yield (Rapacz, 2002).

Table 1.Mean comparison for cultivar × planting date effects in spring type rapeseed (Mashhad 2006-2007)

Source of Variation		Seed Yield (kg/ha)	Branch/plant	Pod/plant	Height (cm)
Hyola401	23Sept.	4444^{a}	3.5^{bc}	100^{c}	115^{abc}
	23 Oct.	3460^{b}	2.8^{c}	80.5^{c}	120^{a}
	23 Nov.	2604^{d}	5.3^{ab}	159^{b}	90^{e}
	23 Dec.	2100^{ef}	3.3^{bc}	78^{c}	98.7^{de}
	23 Feb.	1971^{ef}	3.3^{bc}	81.2^{c}	102^{cde}
	23March	977^{g}	4^{bc}	90^{c}	93.7^{de}
RGS003	23Sept.	3137^{bc}	3.5^{bc}	83.2^{c}	125^{a}
	23 Oct.	2694^{cd}	3.3^{bc}	82^{c}	128^{a}
	23 Nov.	1779^{f}	7^{a}	224^{c}	105^{bcd}
	23 Dec.	2408^{de}	3^{c}	65.8^{c}	117^{ab}
	23 Feb.	1609^{f}	3^{c}	57.5^{c}	103^{cde}
	23March	588^{g}	3.3^{bc}	61^{c}	92.5^{de}

Letters in each columns show significant differences based on Duncan's Test.

Table 2. Mean comparison for cultivar × planting date effects in spring type rapeseed (Mashhad 2007-2008)

Source of Variation		Seed Yield (kg/ha)	Branch/plant	Pod/plant	Height (cm)
Hyola401	23Sept.	4302^{a}	5.3^{c}	145.3^{cd}	118.8^{abc}
	23 Oct.	4523^{a}	5.3^{c}	105.5^{dc}	122.5^{ab}
	23 Nov.	1443^{fg}	13.7^{a}	289^{ab}	92.5^{ef}
	23 Dec.	2917^{b}	4.5^{c}	102.5^{de}	101.2^{def}
	23 Jan.	2580^{bcde}	4^{c}	104^{de}	110^{bcd}
	23 Feb.	1322^{fg}	6^{c}	109.8^{de}	105^{cdef}
	23March	602^{g}	4.2^{c}	39.7^{e}	91.2^{f}
RGS003	23Sept.	2841^{bc}	7.5^{bc}	215.5^{bc}	127.5^{a}
	23 Oct.	4303^{a}	4^{c}	90.7^{de}	130^{a}
	23 Nov.	1792^{def}	11.2^{ab}	339.5^{a}	106.3^{cde}
	23 Dec.	2773^{cd}	4.5^{c}	152^{cd}	118.8^{abc}
	23 Jan.	1765^{ef}	5^{c}	123^{de}	116.3^{abc}
	23 Feb.	1856^{cdef}	4.2^{c}	107^{de}	106.3^{abc}
	23March	996^{fg}	3^{c}	44.2^{e}	93.7^{ef}

Letters in each columns show significant differences based on Duncan's Test.

CONCLUSIONS

The hybrid cultivar, Hyola401, had distinct superiority in seed yield for both years. The best planting dates based on yield were 23 Sept. and 23Oct. In these sowing dates, Hyola401 showed high potential for compensation of environmental damages specially caused by cold conditions. It seems that despite 20 percent reduction in seed yield, the second planting date can be more safer and recommendable to mild cold regions. Planting on 23 Oct., prolongs the rosette stage of spring type rapeseed and the stem elongation of plant is coincide to early March. So, rapeseeds that have grown with these conditions, remain protected against damage of cold, because their reproductive growth do not start at the end of autumn, and their buds remain off until March due to cold temperatures.

The best planting date for those farmers who wants to sow rapeseed on end of winter, is 23 Feb., and the best cultivar for this purpose is Hyola401 too. This cultivar has a potential for producing 1900 $kg.ha^{-1}$ seed yield with complimentary irrigation.

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