Effects of planting date and density on the yield of a winter rapeseed cultivar in West Azarbaijan

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ABSTRACT

In order to study the effects of various planting date and plant density on seed yield of the winter oilseed rape cultivar Ceres, an experiment was conducted at Miandoab Agricultural Research Station in the North-West of Iran during the growing season of 1999 / 2000. Treatments including four planting date at intervals of 10 days starting on September 23rd, 1999 as main factor, and interrow and intrarow spacings at the levels of 30,45 and 60 cm and 5,10 and15 cm respectively, as subfactors were arranged in a split factorial design in three replications. Analysis of variance showed that the effect of date of planting on seed yield was significant at P = 0.01 level. There were no significant differences between the parameters row spacing and planting date, but the interaction between of planting date and row spacing showed a significant effect. As a result, highest yields were obtained from plots of the first planting date at each of tested interrow spacing levels and from plots of second planting date only at interrow spaces of 45 and 60 cm. The effects of multiple interactions, between 3 factors, were also significant at P = 0.01. It is concluded that the combination of the first planting date and plant spacing at 30cm x 10cm resulted in the highest amounts of seed yield and therefore, can be recommended to be applied under the climatic conditions of West Azarbaijan.

Key words: rapeseed, Cv.ceres, yield, Miandoab

INTRODUCTION

Rapeseed (*Brassica napus L.*) is one of the most important oil crops and therefore has a specific place in research and development programs. Yield and oil content of rapeseed depends on various factors including genetical and environmental factors. Also, correct handling of field practices including crop rotation, planting date and plant density could affect the yield and quality of rapeseed (Ahmadi, 1989-1999 and Shipway, 1981). In time planting of rapeseed increases the yield of the crop (Loof, 1960).

Delaying the planting time will decrease the yield of rapeseed as a result of coincidence of filling period of pods with adverse conditions such as high temperature and drought stress (Mendham et al. 1975 and Mendham et al.1981).

Another report showed that with suitable planting time, the overall size of plant flowering had been improved and late planting date result in the decrease in harvest index. Therefore, finding the proper planting date for every cultivar in a given location depends largely on the climatic and cultivar aspects (Scaribrick et al., 1981).

According to the Barszczak et al. (1991) late planting also leads to frost injuries at the crown of plant; so that affected plants will eventually die in late winter.

Application of the best planting density of winter rapeseed could result in proper seedling establishment, and increase yield. In most instances increasing plant density results in a decrease in lateral shoot per plant and, as a result in a sharp decrease in pod production (Barszczak et al., 1991; Helkinen et al., 1991; Loof, 1960; Mahler et al., 1991 and Sczygielski et al., 1987).

The results of Szcygleflski et al. (1987) showed that various planting densities lead to fundamental structural changes in plant and crop yield.

In order to evaluate the effect of planting date and plant density on the yield of of rapeseed, this experiment was conducted.

MATERIALS AND METHODS

This experiment was conducted at Miandoab Agricultural Research station located in the North-West of Iran. Before preparing the land for planting, various soil samples were taken and analyzed. The soil texture was clay with a PH= 7.

Treatments including 4 planting dates and interrow spacing of 30, 45, 60 cm and intrarow spacing of 5,10 and 15 cm were arranged in a factorial split combination in 3 replications, with the planting date as the main factor and the factorial combination of interrow and intrarow spaces as supplot factors.

The seed was planted in rows at the depth of 3 cm. and after planting irrigation was applied. Nitrogen in the form of urea was applied at the rate of 100 kg/ha at different stages of growth. The plots were thinned at the 6 – leaf stage to achieve the desired densities. Weeds were controlled by manual weeding, and chemical pesticides were applied against other pests including aphids and pollen - eating beetles. Early in spring all of plots were irrigated.

During the growth season data were collected from various traits including date of germination, number of days before germination, seedling vigor or penetrance from soil, time of rosset forming, percent cold injury, number of days before flowering, plant height, lateral branches per plant, number of seeds per pod, length of growing period and seed yield per plot at the 12 % moisture stage. All data were obtained from 2 central rows and the ends of the rows were left out for edge effect. Means were compared at levels of P < 1% and 5 % using Duncan,s test.

RESULTS AND DISCUSSION

The results of analysis of variance showed that the planting date of rapeseed significantly affects the yield at P < 1%. (Table, 1).

Table1: Analysis of variance of data obtained from the experiment with split factorial combination of treatments.

s.o.v	df	ss	ms	fr	prob
R	2	1435289.06	787644.53	1.3853	0.3490
A	2	26620169.932	73310084.96	25.6924	0.0052****
E1	4	2072222.567	518055.64	----------	ns
B	2	476952.173	238476.08	1.4716	0.2397
BA	4	5810067.179	1452516.79	8.9630	0.0000****
C	2	36745.784	18372.89	0.1134	ns
AC	4	619552.401	154888.10	0.9558	ns
BC	4	1283522.160	32088.54	1.9800	0.1126 ns
ABC	8	2390625.932	298828.24	1.8440	0.0918 ns
E2	48	7778754.704	162057.39		

**: Significant at (P<0. 01).
(A): date of planting, (B): row spacing (C): intrarow spacing

The levels of density did not differe significantly but mutual interaction between planting date x row distances was significant at P < 1%. Also the intrarow spacing factor significantly affected the yield, but interaction between date of planting, interrow and intrarow spaces were significant at P < 1%. Comparison means, using Duncan,s multiple range test indicated the first and second planting date resulted in the highest crop yield, but the third planting date was ranked in a different group (table, 2).

Table 2: Results comparison of means of yield at different planting times.

Date of sowing	Yield(kg/ha)	class
A1	2514	**a**
A2	2205	**a**
A3	1173	**b**

(A1): September 23rd·, (A2): October 2nd.and (A3): October 12th.

Comparison of means of interaction between planting date and interrow spacing showed that there is no difference between plots at 45 and 60 cm interrow spacing at the first and second planting date (table 3 and 4).
Differences between means of the multiple interactions of planting time and density were significant, and the combined effect of first planting time with interrow and intrarow spacing at 30× 10 cm resulted in the highest yield and therefore, can be recommended as the best combination under the climatic conditions of Minadoab.

Table 3: Results of means comparison between the interaction of the planting date and row spacing.

treatments	yield	class
A1B1	2715	**a**
A2B2	2655	**a**
A1B3	2429	**a**
A1B2	2399	**a**
A2B3	2376	**a**
A2B1	1584	**b**
A3B1	1287	**bc**
A3B3	1144	**c**
A3B2	1088	**c**

A (1,2&3): planting date
B (1,2&3): row spacing
Means in columns followed by different letters are significantly different at p<0.05(Duncan's test).

Table 4:Comparison of means of multiple interactions between planting date (A) and planting density (BC) on the yield of winter rapeseed CV. Ceres.

treatments	yield	class	treatments	yield	class	treatments	yield	class
A1B1C2	3204	**a**	A1B2C1	2444	**bcde**	A2B3C3	1331	**ghi**
A2B2C1	3012	**ab**	A2B2C2	2420	**bcde**	A3B1C1	1324	**hi**
A1B3C1	2694	**abc**	A1B1C3	2255	**cde**	A3B1C2	1278	**hi**
A1B1C1	2685	**abcd**	A1B2C2	2210	**cdef**	A2B1C1	1278	**hi**
A2B3C1	2579	**abcd**	A1B3C2	2083	**cdefg**	A3B1C3	1261	**hi**
A1B2C3	2542	**abcd**	A2B3C2	2060	**defgh**	A3B32C	1074	**hi**
A2B2C3	2532	**abcd**	A2B1C3	1800	**efgh**	A3B2C3	1049	**hi**
A1B3C3	2509	**abcd**	A2B1C2	1676	**fghi**	A3B3C1	1028	**hi**
A2B3C3	2491	**abcd**	A3B2C2	1407	**Ghi**	A3B2C1	808.5	**i**

Means in columns followed by different letters are significantly different at p<0.05(Duncan's test).

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