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Responses of Wheat Genotypes as Affected by Different Sowing Dates

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Abstract: A field experiment was conducted Seed and Plant Improvement Institute, Karaj (Iran) for two seasons, 2007-08 and 2008-09, on farmer's fields to investigate the effect of two sowing dates; optimum sowing date (1st November) and late sowing date (20th November) on yield and yield components of eight wheat genotypes. The results showed that the optimum sowing produced higher grain and biomass yields, 1000- grain weight, Spike per square meter compared to late sowing. Between grain yield and traits of biological yield, 1000- grain weight and grain per square meter were correlated positively.

Key words: Grain yield, sowing dates, wheat, yield components

INTRODUCTION

Wheat is an important food crop grown during the winter season. Variation in weather conditions among and within season is one of the most important constraints affecting yield potential (Murungu and Madanzi, 2010). Therefore, one of the requirements for obtaining high yield is the choice of the suitable sowing date and there are enough possibilities to increase wheat yields through developing new high yielding varieties and by adopting proper sowing date. The sowing date varies in the different locations and depends on rainfall pattern (frequency, duration and amount) as well as the maturity period of the specific wheat variety (Tanner *et al*., 1991). Thorne (1962) reported that early sowing increases dry matter production, leaf area, number of shoots and amount of nitrogen taken up by the crop. Furthermore, early sowing prolongs the duration of tillering, whereas late sowing decreases the yield (Ishag, 1994). On the other hand, Ibrahim (1996) showed that delayed sowing in Northern Sudan is often associated with substantial losses in grain yield estimated up to 86% for short maturing varieties of 90 to 100 days.

Researchers concluded that, early sowing, among factors affecting growth, is develop crop and final grain yield. Iqbal *et al.* (2001) also found yield reduction in grain wheat yield grown under Pakistan condition were 27 and 52% when crop was sown on December sowing. Arian *et al.* (1999) and Sial *et al.* (2005) suggested that sowing dates in terms of changed temperatures are critical for determining appropriate crop yields. Ortiz Monasterio *et al*. (1994) reporter that the three cultivars used in field experiment were differing in their response to sowing date. Fisher and Maurer (1978) reported highly significant difference in yield contributing characters among cultivars.

This study was conducted to study wheat performance in Karaj area to determine the most suitable variety and sowing date for that area.

MATERIALS AND METHODS

This study was carried out at the Seed and Plant Improvement Institute, Karaj (Iran) in 2007/08 and 2008/09 growing seasons. eight genotypes of wheat was evaluated to study yield and yield components under optimum sowing date (1st November) and Late sowing date (20th November) condition. Experimental design was split plot, based on RCBD design with three replications. The main plots were allocated to sowing dates, while the sub-plots were assigned for wheat cultivars (DM-81-6, DM-82-1, Bahar, DN-11, DN-7, Pishtaz, WS-82-9 and C-85-6). Each experimental unit consisted of three rows with distances of 20 cm and lengths of 6 m. All plants of 6 m^2 area of each plot were harvested at maturity and for each treatment at each replicate, grains per unit area, spikes per unit area, 1000-grains weight, biological yield and grain yield per unit area were determined.

Data were analyzed using SPSS17 for analysis of variance. The means were compared by Duncan's multiple range method at 0.05 probability level, using SPSS software program. Correlation between grain yield and yield components was estimated by CORR proc. of SAS.

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Table 1: Result of analysis of variance for studied traits

Source of variance	df	Means of square				
		Grain yield	Yield biological	1000 grains weight	Spike per m^2	Grain per m^2
Year	1	1.4	0.73	5.04	7668.3	191568901.5
Year* replication	4	16.5	126.47	108.27	198079.7	162784743.7
Sowing date	1	102.34*	629.65**	1643.41*	107870.0**	706237.0^{ns}
Year* sowing date	1	15.04	82.84	15.36	69660.3	20003830.0
Replication* sowing date (year)	4	12.73	27.90	118.81	3985.9	67670186.1
Cultivar	7	2.63**	57.74*	148.97**	131284.9**	129890294.5*
Year*cultivar	7	0.47	51.09	19.53	62857.8	51986753.9
Cultivar* sowing date	7	0.99	36.18	26.37	38369.6	33895862.5
Year* cultivar* sowing date	7	0.44	39.04	13.82	16042.8	10712794.2
Coefficient of variation		11.71	15.00	8.98	16.4	23.83

*: significant in 1%; **: significant in 5%; ^{ns}: non significant

Table 2: Grain yield and yield components of different wheat cultivars and sowing dates

Cultivar	Grain yield	1000 Grains weight	Spike per m^2	Grain per m^2	Biological yield
DM-81-6	5.93 c	35.43b	1024.3c	24866 b	26.67c
DM-82-1	6.51 bc	33.56b	1033.4c	23282b	27.73bc
Bahar	5.72 c	28.2d	1145.2bc	24788b	27.87bc
DN-11	7.26 a	34.05b	1214.0ab	32808a	33.04a
DN-7	6.86ab	35.13b	1157.3bc	26804b	29.47abc
Pishtaz	6.69a b	30.80c	1326.5a	27905ab	30.90ab
WS-82-9	6.76 ab	39.58a	1060.67bc	25102b	31.66ab
C-85-6	6.28 bc	30.7c	1061.9bc	25198b	28.64ab
Sowing dates	7.56 a	37.57a	1187.2a	28416a	32.6a
optimum sowing date late sowing date	5.49 b	29.29b	1094.42b	28244a	26.94b

Different letters in each column indicates significant difference at 5% level of probability according to value of Duncan's multiple range

Table 3: Correlation coefficients of grain yield with yield components in wheat

	Grain yield	Biological yield	1000 Grains weight	Spike per m^2
Biological yield	0.47**	1.00		
1000 grains weight	0.71**	0.43**	1.00	
Spike per m^2	0.15^{ns}	0.59**	0.20*	1.00
Grain per m^2	0.25*	0.61**	0.03^{ns}	0.55**

*: significant in 1%; **: significant in 5%; ^{ns}: non significant

RESULTS

In this experiment, grain yield, biological yield, 1000- grain weight, Spike per square meter and grain per square meter were studied. The effect of sowing date and cultivar on all of traits except effect of sowing date on grain per square meter were significant, but interaction effect between of them non significant. It is indicates a substantially additive behaviour for these two sources of variability (Table 1).

The comparison of sowing dates showed that all of traits at November first were high level (Table 2). The reason for this variability in grain yield is increasing air temperature with flowering at sowing dates November twentieth, that decreased amount all of other traits. Thus, the late sown crops in this study passed through cooler temperatures, and were associated with late flowering. Differences between sowing dates were highly significant in biomass yield, which declined with delayed sowing. This was also reflected in the work of Kirby (1969) who confirmed that the potential for biomass yield in winter and spring wheat was reduced as sowing was delayed. Delayed sowing decreased the number of spike per square and 1000 seed weight. Similar results were obtained by Ishag (1994).

Concerning genotype variation among the eight genotype, worthy demonstrated that DN-11 had a higher grain yield, the number of grain per square and biological yield. Between grain yield and traits of biological yield, 1000-grain weight, and grain per square meter were correlated positively (Table 3).

CONCLUSION

Results showed that the optimum sowing date had higher number of spike per square, 1000-seed weight, biological yield and final grain yield. Grain yield of November first sowing dates is significantly higher than that of November twentieth sowing dates. Low grain yield resulted from stress is caused by higher temperatures that prevailed during grain filling. These results agree with those of (Ishag, 1994).

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