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Evaluation of yield and yield components in promising genotypes of bread wheat in Ardabil region

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Abstract

Cereal has historically used as feed by man and today, various products prepare from cereals. The experiment was conducted in order to evaluate 10 promising genotypes of bread wheat in a randomized complete block design with three replications and six samples at agricultural research station and natural resources of Ardabil in 2013 -2014. Six lines with a distance of 20 cm, and a length of 6 m was planted in each plot. Analysis of variance showed that significant differences were observed among genotypes in terms all traits except number of tillers and fertile tillers per plant. Mean comparison of data showed that among wheat genotypes studied, the highest plant length with average 98.39 cm was belonged to genotype 5 and were placed in class A with genotypes 2 and 9. Genotype 1 (with an average of 83.06 cm) had the lowest plant height. The results showed that the highest grain yield with an average of 11.09 tons per hectare was allocated to genotype 3. In contrast genotype 6 with an average of 6.06 ha had the lowest grain yield and it was placed in the final rank.

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Introduction

Cereal has historically used as feed by man and today, various products prepare from cereals. Wheat is one of the most important crop plants in most countries of the world and it has the largest area under cultivation between the cereals (Amini, 2003). The area under cultivation of wheat in the world was 225.43 million acres in 2009 and its global production was 681.915 million tons (FAO, 2009). Wheat is primarily for human nutrition and secondarily for feeding birds and animals and industrial uses. The importance of this crop is most related to the physical and chemical properties of materials such as starch and gluten that constitute its grains (Emam, 2005). The Middle Eastern countries and near eastern acquire about 70 percent of their needed calories from bread and other foods made with wheat and flour. More than 9 percent from people calories is supplied by the vegetarian food and 63 percent of the material by cereals (Binam, 2010). Among the cereals, given that rice is the staple food for most people, especially the inhabitants of Asia's world, but the wheat in terms of the importance, due to area under cultivation and its annual production is primarily important on a global scale, thus grain production has very value and important in the world. And among the grain, wheat has been more valuable in terms feeding the world's population and economy and is located at a higher stage. And annual more attention has applied to increase its production. And also more attempts will pay to increase the quality (Khodabandeh, 1996). Soghi *et al* (2009) performed an experimental in a randomized complete block design with three replications in four experimental stations to determine the stability of grain yield in 19 promising lines of bread wheat along with Tajan as control. In this experiment, the interaction of year × genotype × environment was significant at 0.01 but there was no significant difference between genotype × years. Naderi *et al* (2000) studied the genetic diversity of spring wheat genotypes in terms accumulation of dry matter and nitrogen in grain in favorable and drought stress conditions. The results showed that the effect of environment for harvest index and thousand seed weight were respectively significant at 5% and 1% levels. Variance between genotypes for grain yield, thousand seed weight, grain harvest index, and biological yield was significant at 1% level.

Materials and

The experiments was conducted with 10 promising varieties of wheat in a randomized complete block design with three replicates and 6 samples at Agriculture and Natural Resources Research Station in Ardabil in 2013- 2014. Pedigrees of genotypes tested are listed in Table 1. Agriculture and Natural Resources Research Station of Ardabil is located at 12 km Ardabil road to Khalkhal with an altitude of 1350 m above sea level and longitude 48 degrees 20 minutes and latitude 38 degrees and 15 minutes. The semi-arid and cold regional climate is with a rainfall average 310.9 mm in last 30 years and average annual minimum and maximum temperature of -1.98 and 15.18 ° C. Soil in the tested farm is the clay loam soil and in terms of poor organic matter (0.7 percent) is with the electrical conductivity of one mL mouse and pH 7.5, soil phosphorus 12 ppm and potassium 400 ppm with the good ventilation conditions (Anonymous, 2010). Tillage operations was included plowing by moldboard plowshare, Disk, Louler and furrows on fallow land.

Methods

In each plot, six lines with a spacing of 20 cm and the length of six meters and were planted with a seeds density of 450 seeds per square meter. A total area of each plot was 7.2 square meters and harvested area of six square meters with the elimination half meter of beginning and end of each plot to remove the marginal effect. Evaluated traits was included plant height, number of tillers, number of fertile tillers, the number of grains per spike, peduncle length, spike length, number of spikelet per spike, grain weight per spike, seed weight, seed weight and seed yield.

Software

To statistical analysis, software MSTAT-C was used.

Table 1. Pedigree and characteristics of 10 bread wheat genotypes evaluated.

No	Plot no. 91-92	Pedigree
1	C-91-1	Oroum
2	C-91-2	Zareh
3	C-91-3	Mihan
4	C-91-4	Zrn/Shiroodi/6/Zrn/5/Omid/4/Bb/Kal//Ald/3/Y50E/Kal*3//Emu
5	C-91-5	Jagger 'sib'/3/Lagos-7//Guimatli 2/17
6	C-91-6	Solh
7	C-91-7	Cupra-1/3/Croc1/Ae.squarrosa(224)//2*Opata/4/Pantheon
8	C-91-8	Fln/Acc//Ana/3/Pew"s"/4/F12.71/Coc//Cno79*2/5/Catbird
9	C-91-9	Cornelius
10	C-91-10	MV Laura

Results

The analysis of variance showed that there was significant difference between the genotypes in terms of plant length, peduncle length, spike length, number of grains per spike, grain weight per spike, thousand seed weight and grain yield at 1% level and there was significant difference at 5% level in terms of number of spikelet per spike and total plant weight. Also the analysis of data variance showed the same effect of treatments on the traits such as number of tiller and number of fertile tillers and there was no significant difference between wheat genotypes in terms of these characteristics (Table 2).

Table 2. Analysis of variance of evaluated traits in wheat genotypes.

Sources of change	df	MS					
		Plant length	Number of tillers	Number of fertile tillers	Peduncle length	Spike length	Number of spikelet per spike
Repeat	2	149.07	0.14	0.71	5.57	2.03	21.02
Genotype	9	370.67 **	0.33 ns	0.41 ns	141.24 **	27.97**	31.91**
Error	18	77.27	0.29	0.24	11.22	3.78	11.74
Sampling error	150	24.59	0.24	2.20	7.78	2.01	3.14
CV%		5.42	30.05	30.09	7.78	11.79	12.02

* and **: Significant at $p < 0.05$ and < 0.01, respectively

Continue Table 2. Analysis of variance of evaluated traits in wheat genotypes.

Sources of change	df	MS				
		Number of grains per spike	Grain weight per spike	Thousand seed weight	Total plant weight	Grain yield
Repeat	2	248.27	0.77	36.55	13.76	0.66
genotype	9	694.89 **	1.24 **	140.06 **	3.89 **	0.39 **
Error	18	103.10	0.27	13.37	1.23	0.69
Sampling error	150	59.29	0.14	13.08	1.34	-
CV%		22.99	24.42	7.93	27.16	9.47

* and **: Significant at $p < 0.05$ and < 0.01, respectively

The results of data mean comparison showed that among wheat genotypes studied the highest plant length with an average of 98.39 belonged to genotype 5 and were placed in class A along with genotypes 2 and 9. Genotype 1 (with an average of 83.06 cm) had the lowest plant height and genotype 2 had the highest peduncle length (with an average of 40.50 cm). The minimum value of this attribute belonged to genotype 4 with an average 31.81 cm. The results of means comparison showed that among wheat genotypes, the highest average of spike length belonged to genotype 3 with an average 13.56 cm and were placed in group A with genotypes 2, 4, 8 and 9. They had no significant difference in terms of this trait. And genotype 10 with an average 9.25 cm had the minimum spike length. The maximum number of

spikelet per spike was related to genotype 9 with an average 16.78 cm. Also genotype 3, 5, 10, 4 and 7 were placed following genotype 9. The minimum number of spikelet per spike was related to genotype 8 with average of 12.61 cm. The results showed that genotypes 3 and 10 had the highest number of grains per spikes (respectively with an average of 44.17 and 42.78) and genotype 6 had the lowest value of this trait (26.50). The results of data mean comparison showed that the highest grain weight per spike was assigned to genotype 3 with an average of 2.05 g. In contrast the lowest grain weight per spike was related to genotype 6 with an average of 1.14 g. Data mean comparison of total plant weight showed that genotype 3 with a mean of 5.21 g had the highest value and with genotypes 4 and 5 was located in class A in terms of this feature. In contrast, genotype 2 with an average of 3.74 g had the lowest total plant weight. The results showed that genotype 5 with an average 50.88 g, had the highest value in terms thousand seed weight and was in the top class. In contrast, genotype 10 with an average of 41.27 g had the lowest thousand seed weight. The results of the comparison showed that genotype 3 with an average of 11.09 tons per hectare had the highest amount yield. In contrast, genotype 6 with an average of 6.06 ha had the lowest values for this trait and was ranked last (Table 3).

Table 3. Mean comparison wheat genotypes studied in terms of trait were assessed.

genotype	Evaluated traits				
	Plant length (cm)	Peduncle length (cm)	Spike length (cm)	Number of spikelet per spike	Number of grain per spike
1	83.06 d	32.64 ef	11.31 d	13.22 cd	29.28 cd
2	96.06 ab	40.50 a	12.50 ad	14.06 bcd	32.00 cd
3	88.53 cd	35.58 cd	13.56 a	16.22 ab	44.17 a
4	91.17 bc	31.81 f	13.19 ab	15.11 ad	36.39 bc
5	98.39 a	39.19 ab	11.67 cd	15.72 abc	29.06 cd
6	91.39 bc	33.75 def	11.94 bcd	13.89 bcd	26.50 d
7	90.92 bc	34.03 def	11.39 d	14.39 ad	30.72 cd
8	88.25 cd	35.06 cde	12.25 ad	12.61 d	27.67 d
9	96.56 ab	34.42 de	13.14 abc	16.78 a	36.44 bc
10	90.86 bc	37.39 bc	9.25 e	15.33 abc	42.78 ab

Dissimilar letters in each column indicate significant differences at 5% level.

Continue Table 3. Mean comparison wheat genotypes studied in terms of trait were assessed.

genotype	Evaluated traits			
	Thousand seed weight(g)	Seed weight per Spikes (g)	Total plant weight (g)	Grain yield (t ha)
1	46.85 bc	1.37 bcd	3.86 c	7.99 de
2	45.46 bcd	1.46 bcd	3.74 c	9.79 abc
3	46.23 bc	2.05 a	5.21 a	11.02 a
4	46.70 bc	1.71 abc	4.41 abc	8.24 cde
5	50.88 a	1.48 bcd	4.89 ab	8.55 cde
6	42.79 de	1.14 d	4.12 bc	6.06 f
7	44.61 cd	1.37 bcd	4.19 bc	7.68 e
8	48.05 b	1.31 cd	3.89 c	10.54 ab
9	43.28 de	1.58 bc	4.23 bc	8.41 cde
10	41.27 e	1.77 ab	4.09 bc	9.37 bcd

Dissimilar letters in each column indicate significant differences at 5% level.

Discussion

Jaafar zadeh (2009) reported that there was significant difference between 25 genotypes studied at 1% level on the basis of analysis of variance with evaluation of different traits such as number of days to heading, plant height, maturity time, number of grains per spikes, number of fertile tillers, harvest index, thousand seed weight and seed yield.

Amini (2003) also reported that there was significant difference between examined genotype at 1% level after evaluate the results of variance analysis for traits such as number of days to heading, plant height, maturity time, number of grains per spikes, thousand seed weight and seed yield.

Khalil zadeh (2000) has reported significant difference between genotypes at 1% level with evaluate the results of variance analysis for 24 advanced genotypes of barely, traits such as number of days to heading, plant height, maturity time, thousand seed weight and grain yield.

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