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A Study on the Important Agronomic Traits in Various Wheat Cultivars during Two Years in Ardabil Region

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Abstract: In order to evaluation some of main agronomic traits in Various Cultivars of Wheat in Ardabil region, an experiment was carried out in a randomized complete block design with three replications in Ardabil Islamic Azad University Agricultural Research Station in two agricultural years of 2014-2015 and 2015-2016. The studied cultivars included Pishgam, Gaskogen, Gaspard, Siosson and MV17. Results from ANOVA for the trait of days from plating to flowering showed that there was a significant difference between cultivars and years at one percent and there is a significant difference between them in the traits of number of grains per spike, spike length and grain weight. However, there was no significant difference between the cultivars based on the trait of bush height among the studied factors. Analysis of variance results suggested that there was a significant difference between the studied cultivars on seed yield at one percent. Also, results showed that there was no significant difference found between the years and the interaction of the year on cultivar. Data mean comparison indicated that among the studied wheat cultivars, the cultivar of Pishgam with a mean of 225.33 days had the highest number of days from planting to flowering and the cultivar of Gascogne with a mean of 221.17 days, had the lowest number of days from planting to flowering. Based on the trait of number of grains per spike, the cultivar of Pishgam had the highest number of grains per spike (with a mean of 67.65) and the other cultivars were in one statistical level and there was no difference between them based on this trait. Based on the trait of spike height, this trait with a mean of 10.18 cm belonged to the cultivar of MC17 and it was in the same level with the cultivar of Pishgam in Group A and they didn't have a significant difference based on this trait, while the cultivars of Gaspard and Sayson were in the same statistical level and were the lowest in this trait. Based on the trait of grain weight, cultivars of Gascogen and MV17 were in the best group and they didn't have any difference based on this trait. On the contrary, cultivars of Gaspard and Sayson were in the same statistical level and had the lowest grain weight. Data mean comparison results indicated that Siosson with the mean of 6,627.7 kg per hectare had the highest seed yield and MV17 with the mean of 5,498.5 kg per hectare had the lowest seed yield

Keywords: Agronomic Traits, Wheat, Ardabil

INTRODUCTION

Recent studies show that the velocity of crop yield increase has decreased in the past decade and the yield in other parts of the world might not increase (Pingali, 2006), and it is needed to double the crop production by 2050 (Ray et al., 2013). 58% of the harvest area in the world is dedicated to grains (Nelson et al., 2010)

Wheat, with the scientific name of Triticum estivum, is the first grain and most important crop in the world (Arzani, 2004) Its high adaptability and also its various uses in human nutrition has led wheat to be known as the most important grain in the world and especially in developing countries, and around 20% of food sources in the world is wheat (Sarani et al., 2006).

During the crop year of 2013-2014 in Iran, around 74.7 million tons of crops was produced and among which grains with 23.70 percent (17.55 million tons), legumes 0.83 percent, industrial crops 16.02 percent, vegetables 21.87 percent, cucurbits 12.50 percent, forage plants 24.89 percent and other crops 0.19 percent, and the highest rate of production was related to wheat with 14.28 percent. (Ahmadi et al., 2015).

Producing cultivars which could benefit from the available environmental resources could have a great role on increasing the region yield. However, despite the fact that currently there are cultivars produced which have a high yield comparing to the other cultivars, it takes a long time for the farmers to accept these cultivars and this factor could be considered as one of the reasons for the yield decrease. (Torabi et al., 2013).

Through assessing various traits such as number of days to spike emergence, height of the bush, maturity time, number of grain per spike, number of fertile tillers, harvest index, weight of thousand grains, grain yield, Ja'farzade (2009) reported a significant difference between 25 studied genotypes at 1%.

Through studying the ANOVA for the traits of number of days to spike emergence, height of the bush, maturity time, number of grain per spike, weight of thousand grains, grain yield, Amini (2003) reported a significant difference between studied genotypes at 1%.

MATERIALS AND METHODS

In order to determine some of main agronomic traits in Various Cultivars of Wheat in Ardabil region, an experiment was carried out in a randomized complete block design with three replications in Ardabil Islamic Azad University Agricultural Research Station in two agricultural years of 2014-2015 and 2015-2016. The studied cultivars included Pishgam, Gaskogen, Gaspard, Siosson and MV17

wheat genotypes were planted in controlled condition (without water limitation, nutrient elements limitation, pests and diseases) during 2014-2015 and 2015-2016 in a randomized complete block design with three replications. Each experiment plot was planted based on 500 seeds per square meter, with a length of 6 meters and in 6 rows with a distance of 20 cm. the seeds were planted in October 2014 and the irrigation was carried out according to the norms of the region, two times of irrigation in fall and three times of irrigation in spring.

Fertilizer Amount According to the results from laboratory analysis of the research department, soil, water, and phosphorus fertilizer from ammonium phosphate source in basal application and nitrogen fertilizer from urea source in two stages of basal and topdressing applications. Also, control of broadleaf and grass weeds was done through application of by Topic and Granstar herbicides and also by hand weeding.

In both agricultural years several samples were chosen from each experiment unit after taking out the marginal effects and all desired characteristics were studied on chosen bushes and ultimately, at harvest, after taking out the margins, yield of each plot was estimated and transformed into hectare. During the research, traits of number of days from planting to flowering were calculated.

Before conducting statistical analysis, data was tested for its normality. After reassuring the normality of the data distribution, data was analyzed through statistical methods such as analysis of variance and mean comparison by Duncan test at 5 percent.

To carry out the statistical calculation, SPSS software was used. Also, for drawing the diagrams, Excel was used.

RESULTS AND DISCUSSION

Bush Height

Results from ANOVA of bush height among the studied factors showed that there was no significant difference between any of the factors. (Table 1)

Undoubtedly, one of the main reasons for the increase in wheat grain yield during recent years has been breeding and introduction of cultivars with lower shoot height. Zhou et al. (2007) showed that during 1940 to 2000, the shoot height in the modified wheat in China had decreased significantly and this decrease had a negative significant correlation with grain yield, so that in this period, the shoot height decreased from 110 cm in the old cultivars to 70 cm in the new cultivars. (Zhou et al., 2007)

So far, in most breeding programs, lower heights have been chosen and this has led to an increase in lodging resistance, dedication of higher total biomass to the grain yield and positive response of management operations such as higher fertilizer response. (Soufizadeh and Zand, 2004; Reynolds et al., 2001) Also, results from other studies show that decrease in bush height not only leads to increase in performance of stored materials (Ehdaie et al., 2006), but also an increase in harvest index. (Brancourt-Hulme et al., 2003).

Number of Grains per Spike

Based on data ANOVA, the number of grains per spike is significantly related to the cultivar (Table 1), so that the cultivar of Pishgam had the highest number of grains per spike (with a mean of 67.65) and the other cultivars were in one statistical level and did now show any significant difference. (Diagram 1)

Also, ANOVA results suggested that there was no significant difference found between yeas and the interaction of year in cultivar. (Table 1)

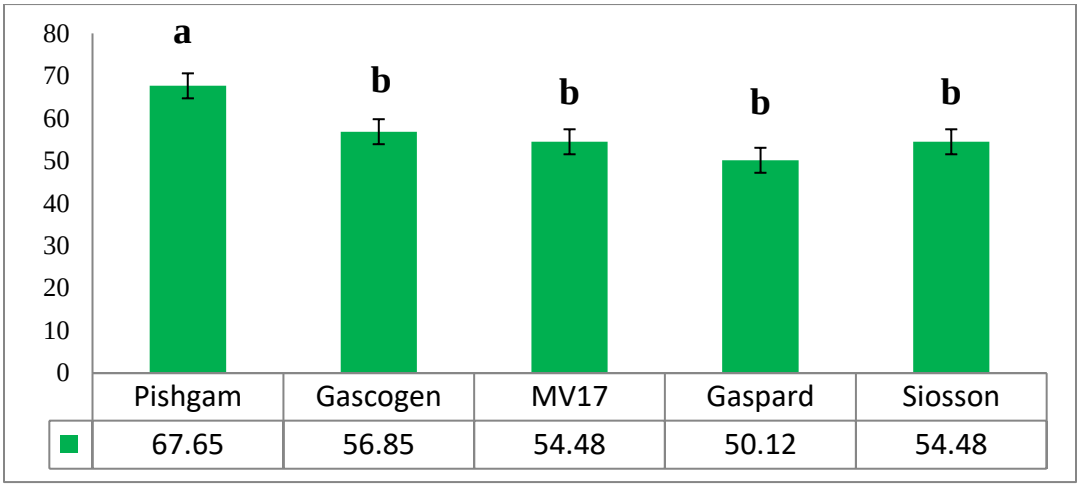


Diagram 1. Mean of Number of Grains per Spike for Cultivars of Wheat

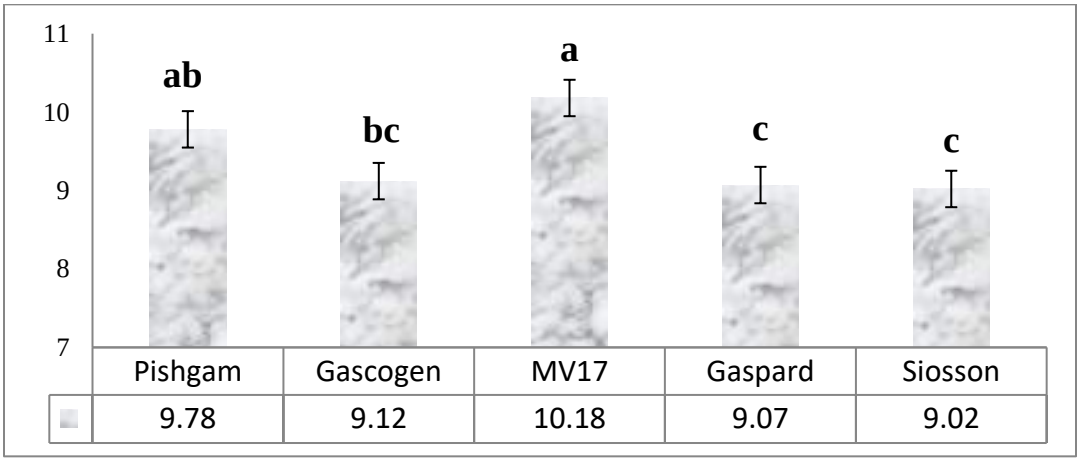
Duggan and Flower (2006) showed that wheat grain yield is measured through combining various components of grain yield, line C-80-10 as the highest number of grain per spike and grain wright. Similar findings have been reported by some of the researchers before.

Austin et al. (1989) showed that by the increase in grain yield in modern wheat cultivars, number of spikes per square meter increase by 14 percent and the number of grain per spike increased by 30 percent Royo et al. (2006) observed that by the increase in grain yield, the number of grains per square meter with a ratio of 0.55 percent per year. They came to this conclusion that the number of plant per meter, number of spikes per plant and number of grains per spike could increase the number of grain per square meter by 20, 29 and 51 percent, respectively.

What could be concluded from the experiment is that among the grain yield components, number of spikes per square meter and number of grains per spike had the highest role in the increase of yield, while rain weight had the lowest impact. In some cases, even the decrease in grain weight was reported. (Waddington et al., 1986).

Spike Length

Based on data ANOVA, the length of spike is significantly (α=1%) impacted by the cultivars. (Table 1) Also, results suggested that there was no significant difference found between the years and the interaction of year in cultivar. (Table 1) Mean comparison showed that among the studied wheat cultivars, the highest rate of this trait was related to the cultivar of MV17 with a mean of 10.18 cm which was in Group A along with the cultivar of Pishgam and they didn't show any significant difference in this trait. On the other hand, cultivars of Gaspard and Sayson were in one statistical level and were the lowest in this trait. (Diagram 2)



Digaram 2. Spike Length Mean in Various Wheat Cultivars

In a study conducted on 650 local lines in drought stress, Rustai et al. (2005) came to this conclusion that yield components are mostly related to the spike properties and have large positive coefficients for the number of grains per spike, length of spike, number of spikeletes per spike and number of fertile florets in spike.

1000 Grain Weight

ANOVA results suggested that there was a significant difference found between the studied cultivars on this trait at one percent. (Table 1) Results showed that there was no significant difference found between studied years and the interaction of year and cultivar. (Table 1) Mean comparison showed that cultivars of Gascogen and MV17 were in the best group based on this trait and they did not have any significant difference on this trait. On the other hand, cultivars of Pishgam, Gaspard, Sayson were at one statistical level and had the lowest grain weight. (Diagram 3)

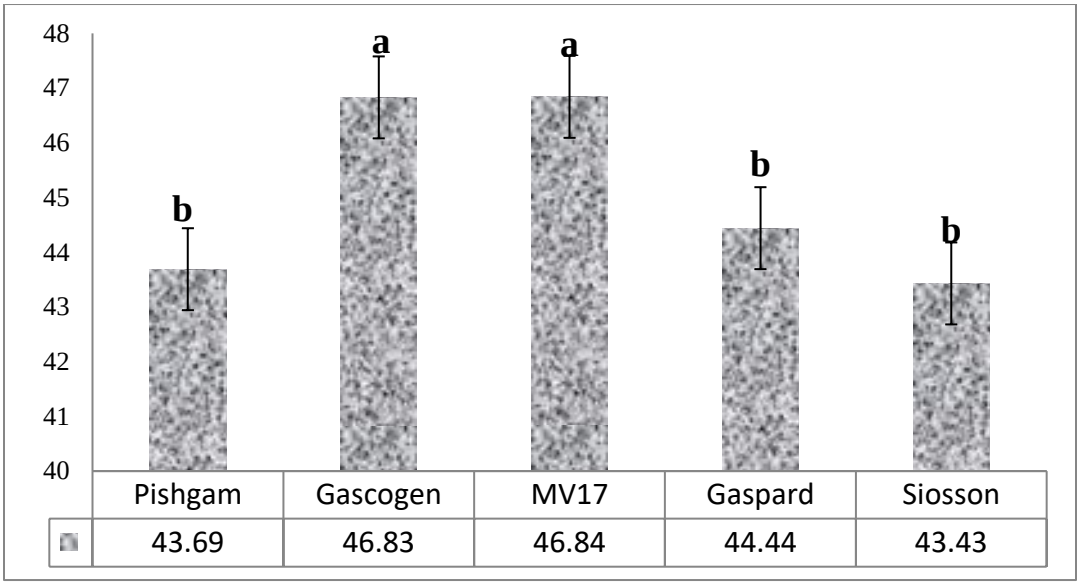


Diagram 3. Mean of 1000 Grain Weight for Various Wheat Cultivars

Grain weight is among the traits which has a high heritability, desirable genetic diversity and easy measurability and this leads this trait, similar to bush height, to be used as a criterion to measure the improvement in yield potential. Grain wright in winter and spring wheat cultivars has had a great increase during the past few decades. This increase in grain weight is relatively related to the spring cultivars, so that it could be claimed that this trait has been constant for the winter cultivars. (Soufizadeh et al., 2014)

Calderini et al. (1995) reported that during the genetic improvement in wheat yield potential, grain weight had decreased. Some other studies have shown that increase in grain weight had led to increase in irrigated wheat yield potential. In regards to the genetic improvement of potential yield and agronomic traits related to wheat cultivars released in winters of years 1969-2000 in Shandong Province of China, Zhou et al. (2007) showed that genetic improvement in potential yield had been largely accompanied with increase in grain weight per spike. However, despite the change in grain weight in winter wheat cultivars in this research, it has to be said that this trait has the potential to increase in wheat yield potential.

New cultivars have reached an increase in grain yield through an increase in terminal grains ratio and since terminal grains are lighter than basal grains, maybe this is one of the reasons the grain weight decreases through time. However, the terminal grains have an unbalanced ratio in losing crop due to the wastes regarding the small size of the grains during harvesting, winnowing and packing process. Increase in weight of terminal grains or even the capacity to distribute assimilates among the limited grains could be a method of increasing grain yield in regions with irrigated wheat with drought stress. (Mahfuzi et al., 2009)

Number of Days from Planting to Flowering

Results from ANOVA of number of days from planting to flowering among the studied cultivars and years indicated that there is a significant difference between cultivars and years at one percent. (Table 1) Data mean comparison indicated that among the studied wheat cultivars, the cultivar of Pishgam with a mean of 225.33 days

had the highest number of days from planting to flowering and the cultivar of Gascogne with a mean of 221.17 days, had the lowest number of days from planting to flowering. (Diagram 4) Also, results showed that among the years, the second year had a higher number of days from planting to flowering. (Diagram 5)

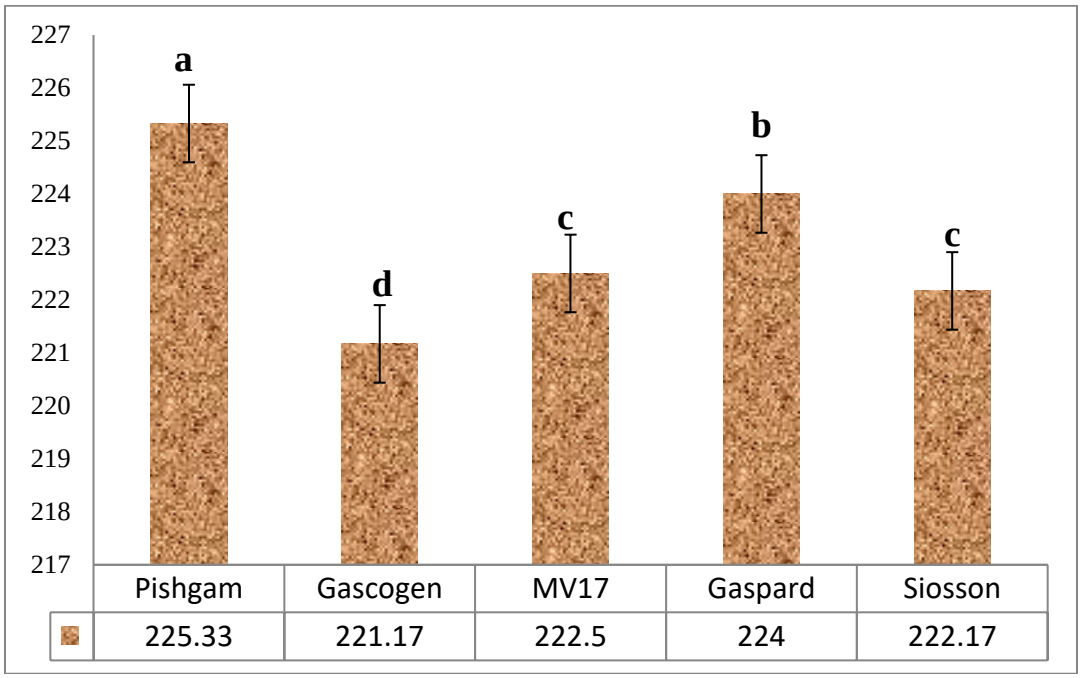


Diagram 4. Mean of Days from Planting to Flowering in various Wheat Cultivars

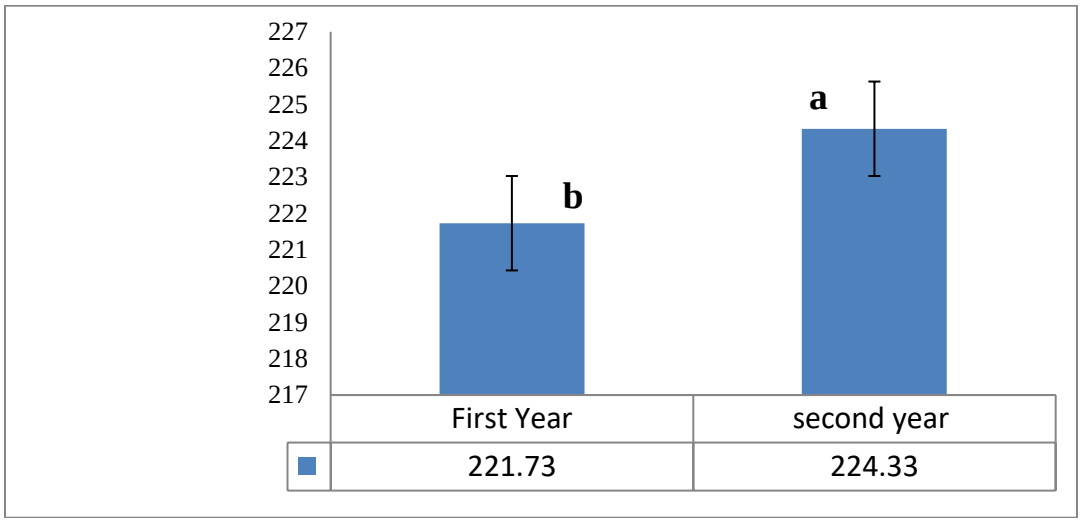


Diagram 5. Mean of Days from Planting to Flowering for the Second Year

By studying 300 durum wheat genotypes, Golabadi and Arzani (2003) showed that there is a considerable diversity for traits of grain yield, harvest index, number of spikes per area unit and number of grains per spike, and the grain yield has a positive and significant correlation with traits of harvest index, biologic yield, number of days to maturity, number of grains per spike and weight of grain per spike.

Grain Yield

Results from analysis of variance suggested that there was a significant difference in seed yield between various cultivars of wheat at one percent, and this could be due to the high genetic diversity among the studied cultivars (Table 1). Also, results indicated that there was no significant difference between the years and the year ×

cultivar interactions (Table 1). Results from mean comparison showed that the cultivar of Siosson with the mean of 6,627.7 kg per hectare had the highest seed yield and the lowest yield means were for cultivars of Gaspard and MV17, which were in the same statistical level and ranked last (Diagram 6).

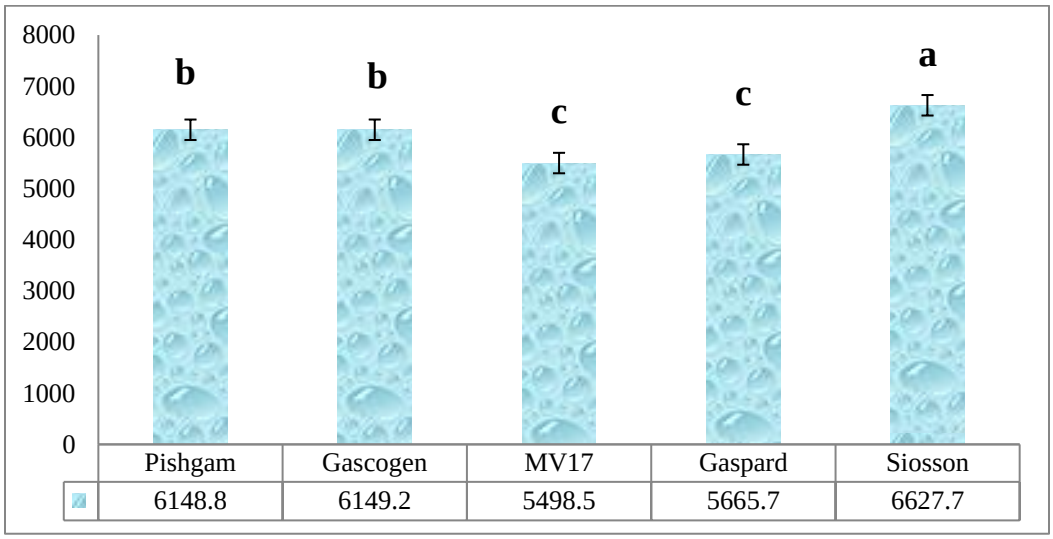


Diagram 6 Mean of Seed Yield in various Wheat Cultivars at the Research Center

Emergence of characteristics such as seed yield in plants is due to the impact of genetics and environmental factors and their interactions. Various genotypes might react differently to the environmental factors such as climate and planting date based on crop production and quality (Adugnd and Labuschagne, 2003).

Wheat seed yield is the result of simple and interaction effects of its yield such as the number of ears per unit, number of grains in ear and grain weight, plant growth environment, plant adaptation with the environment and the efficiency of using effective environmental factors on production and intra- and inter-plant competitions (Kiniry, 1993).

Mackay et al. (2010) expressed that the condition in perennial experiments in various cultivars is different, since yield increase is not retained through cultivar breeding only, but better crop improvement has a role as well (and any positive interaction), for it is an index of progress, as potential yield rate experiment is determined in the experiment year, and not the cultivar release year.

Actual yield in a certain region, in addition to physical factors such as climate and soil, is affected by managerial factors such as access to irrigation, consumption of inputs (chemical fertilizers and pesticides) and also substitution of older cultivars with new and yielding cultivars (Kropff et al., 1994).

In studying the cultivars, Zhou et al. (2007) observed that increase in seed yield in China during 1970 and 2000 was around 0.54. in a research in Spain to increase seed yield of Spanish and Italian cultivars released between1945 and 2000, Ruyu et al. (2007) observed that yield increase for Spanish and Italian cultivars were 0.36 percent and 0.44 percent, respectively.

Table 1. Analysis of Variance of Evaluated Characteristics for various Wheat Cultivars

S.O.V	df	Mean Square					
		Grain Yield	Spike Length	Number of Days from Planting to Flowering	1000Grain Weight	Number of Grains per Spike	Bush Height
Replication	2	1425503.33	2.39	0.43	2.63	135.16	24.23
Cultivar	4	1200051.78**	1.64**	16.12**	16.85**	259.64**	77.25 ns
Year	1	45864.30 ns	0.033 ns	50.70**	0.86 ns	5.21 ns	12.84 ns
Y * C	4	1583.55 ns	0.027 ns	0.62 ns	0.06 ns	2.10 ns	0.09 ns
Error	18	120061.70	0.31	0.58	2.89	40.44	32.29
CV (%)		5.76	5.86	0.34	3.78	11.21	7.36

* and ** Significantly at p < 0.05 and < 0.01, respectively.

REFERENCES

Adugna, W. and labuschagne, M, T. 2003. Parametric and nonparametric measures of phenotypic stability in linseed. Euphytica 129: 211- 218.

Ahmadi,k., glizadeh,h.a., ebadzadeh,h.r., hoseinpoor ,r., hatami,f.fazli,b.,kazemian,a. and vafiae,.m.2015 Agricultural statistics. first volume. Crops. Ministry of Agriculture, Department of Planning and Economy,Center for Information and Communication Technology.

Amini.a. 2003. Evaluation, Rehabilitation and maintenance of genetic resources of barley (Cereal Collections). Review final report of the research project, the research and agricultural education.

Arzani,a., 2008. Modified Crops. fourth edition. Isfahan University Press. 606p

Brancourt-Hulmel, M., G. Doussinault, C. Lecomte, P. Berard, B. Le Buanec, and M. Trottet. 2003. Genetic improvement of agronomic traits of winter wheat cultivars released in France from 1946 to 1992. Crop Sci. 43: 37-45.

Calderini, D. F., M. F. Dreccer, and G. A. Slafer. 1995. Genetic improvement in wheat yield and associated traits.A re-examination of previous results and the latest trends. Plant Breed. 114: 108-112.

Duggan B. L., and Fowler, D. B. 2006**.** Yield structure and grain potential of wheat on the Canadian prairies. Crop Science 46: 1479-1487.

Ehdaie, B., G. A. Alloush, M. A. Madore, and J. G.Waines. 2006. Genotypic variation for stem reserves and mobilization in wheat: I. Postanthesis changes in internode dry matter. Crop Sci. 46: 735–746.

Golabadani,m. Arzani, a. 2003 Genetic diversity and factor analysis for agronomic characteristics of durum wheat, Journal of Science and Technology of Agriculture and Natural Resources, Issue1. 115-126p.

Jafarzadeh. a 2009. Evaluate the yield of barley genotypes in the city anklet. Master's thesis Plant Breeding. Islamic Azad University of Ardabil.

Kiniry, R. J. 1993. Nonstructural carbohydrate utilization by wheat shaded grain growth. Agron. J. 85 : 844 – 849

Kropff, M.J., K.G., Cassman, S., Peng, R.B., Matthews, and T.L., Setter, 1994. Quantitative understanding of yield potential. In: Cassman, K.G. (Ed.), Breaking the Yield Barrier. Proceedings of a Workshop on Rice Yield Potential in Favourable Environments. International Rice Research Institute, Los Ban os, Philippines, pp. 21–38.

Mackay I., Horwell A., Garner J., White J., McKee J. and Philpott H. 2010. Reanalysis of the historical series of UK variety trials to quantify the contributions of genetic and environmental factors to trends and variability in yields over time. Theoretical and Applied Genetics 122, 225-238.

Mahfoozy,s. Jasemy,s.sh. and Esmaealzadeh,m. 2009 Study of basic seed weight and spike at the end of winter and facultative bread wheat grain yield. Journal of Seed and Grain. Volume2-25, Number 2. 137-151.

Nelson G.C., Rosegrant M.W., Palazzo A., Gray I., Ingerstoll C., Robertson R. 2010. Food security, farming, and climate change to 2050: scenarios, results, policy options. Research Monograph. International Food Policy Research Institute, Washington, DC. Doi: 2499/9780896291867.

Pingali, P., 2006. Westernization of Asian diets and the transformation of food systems: Implication for research and policy. Food Policy 32: 281-298.

Ray, D. K., N. D. Mueller, P. C. West, and J. A. Foley. 2013. Yield trends are insufficient to double global crop production by 2050. PLoS ONE, 8(6): e66428.

Reynolds, M. P.. P. R. Hobbs and H. J. I3roun. 2007. Challenges to international wheat improvement. J. Agric. Sci. 146: 223-227.

Roustaii, M., Sadeghzadeh Ahari, D., Hesami, A., Soleymani, K., Pashapour, H., Nader Mahmoodi, K., Poursiahbidi, M.M., Ahmadi, M.M., Hassanpour Hosni, M., and Abedaasl, G. 2003. Study of adaptability and stability of grain yield of breed wheat genotypes in cold and moderate-cold dryland areas. Seed and Plant, 19: 2. 263-275.

Royo, C., F. Alvaro, V. Martos, A. Ramdani, J. Isidro, D. Villegas and L.F. Garcia del Moral, 2007. Genetic changes in durum wheat yield components and associated traits in Italian and Spanish varieties during the 20th Century. Euphytica, 155: 259-270.

Sarani,s. Mesri,f. Emam jomeh,a. Ganbari,a. 2006. Optimal recovery of DNA from different varieties of wheat. Journal of Agriculture and Natural Resources Engineering.14:34.

Sofizadeh,s. zand,a. deyhimfard,r. Esmaealzadeh,s. 2014. Examine the trend of grain yield and some morphological characteristics of wheat, corn, and rice in recent decades. Journal of Iranian agronomy research. Volume 12, Number 3. 343-359.

Soufizadeh, S., and E. Zand. 2004. Influence of weed interference on wheat (*Triticum aestivum* L.) yield, nitrogen use efficiency and grain protein content. p. 102. In Proceedings 4th International Weed Science Congress. Durban, South Africa

Torabi,b. Soltani,a. Galeshi, s. Zainali, a. Kazemi, m. 2013. Prioritize the factors causing wheat yield gap in Gorgan. Journal of Crop Production. Volume 8. the first number.171-189.

Waddington, S. R.; Ransom, J. K. Osmanzai, M.and Saunders, D. A. 1986. Improvement in the yield potential of bread wheat adapted to northwest Mexico. Crop Science.26: 698-704.

Zhou, Y., Z. H. He, X. X. Sui, X. C. Xia, X. K. Zhang, and G. S. Zhang. 2007. Genetic improvement of grain yield and associated with traits in the northern China winter wheat region from 1960 to 2000. Crop Sci. 47: 245–253.