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***Research Article***

# EVALUATION OF YIELD AND SOME MORPHOLOGICAL TRAITS OF WHEAT UNDER DROUGHT STRESS

***Niknam Bahari**
*Young Researcher and Elite Club, Islamic Azad University, Abhar Branch, Iran*
**Author for Correspondence*

## ABSTRACT
Since drought has been recognized as one of the most important factors limiting growth and crop production, an experiment was conducted in a completely random block design with three replications on the farm in Moghan plain in Pars Abad city in crop year of 2012-13 to study yield and yield components of 15 genotypes of bread wheat. These traits yield per hectare, plant height, ear length, grain number per ear and grain weight per plant were studied. The results from variance analysis indicate a significant difference between studied genotypes in all measured traits. The total average of grain yield of genotypes under investigation was 2427.1 kg/ha in the experiment. Genotype 12 with 3126 kg/ha produced the most grain yield and genotype 9 produced the least (1650 kg/ ha) compared to their studied genotypes.

***Keywords:*** *Wheat, Drought Stress, Yield and Yield Components*

## INTRODUCTION
Grain crops are the most important food plants and supply 70% food for people on the earth and underlie nutrition and Human survival. Wheat and rice supply 60% of energy require for human and generally more than 3.4 energy and 1.2 protein requirements are supplied by grain crops (Emam, 2004). Since Iran is located in arid and semiarid region, Drought is always threatening wheat. Hence, in order to achieve a sustainable self-sufficiency we should use drought resistant varieties with high yield. In this regard, identification and production of resistant cultivars with high yield is of special place in research. Drought is one of physical stresses which have been identified as the most important factor limiting the growth and production of grain crops in most regions of world and Iran (Alizadeh, 2001). Blum (1996) remarked that drought is a multi-dimensional stress which influences plants in different organization levels. In plants responding to drought is complex, because it is a reflection of combining the effects of stress and related responses at all lower levels of the organization and in space and important factor controlling crops yield, influence almost all processes of plant growth (Siddique *et al.*, 1999). Grain yield and its related traits have a complication genetic control and multiple loci related to quantitative traits are responsible for it (Baum *et al.*, 2003). So that Muhammadi *et al.*, (2008) identified 15 cases for barky grain weight and 7 for grain yield. Grain yield and its stability have been always employed as main criteria in selecting and introducing cultivars in various regions of environmental stresses (Trethowan and Reynolds, 2007). In the other hands, grain yield is a quantitative trait and is controlled by many genes. Also heritability of this trait is low due to environmental effects and interaction between genotypes and environment; so selection based on grain yield may be less effective to improve it (Richards, 1996). Morphologic traits are simply and rigorously measurable and are of relative high heritability, so selection based on these traits may be a safe and fast way for screening plant communities and improvement of yield (Yap and Harvey, 1972). Emam *et al.*, (2007) found that despite the favorable humidity up to more than flowering, drought stress has a significant effect on grain yield since flowering to grain filling, and causes grain yield loss thus, in area where there is a risk of drought at the end of the growing season. So it is advised to use drought-resistant cultivars that are compatible with the region and are of high potential grain yield and less susceptible to drought stress. Abhari *et al.*, (2006) found that grain yield is mostly damaged in terms of humid stress; the reason is a reduction in number of ear per square meter grain per ear and 1000 grains weight. 1000 grains weight is one of the main wheat grain yield components and is determined by rate

and duration of grain filling. Grain filling rate is controlled by many genes but grain filling duration is affected by environment. Dencis *et al.,* (2000) introduced 1000 grains weight as one of the sensitive traits in water deficiency. Gooding *et al.,* (2003) found the most effect of drought stress on grain filling period between first and fourth days after pollination. Lemon (2007) reported that reduction in grain filling duration causes an increase in limiting accumulation of carbohydrates per grain, in protein percentage and a reduction in grain weight due to a convergence of this period of growing with hot and dry climate at the end of the season. Field experiments conducted on wheat in Texas showed that as average daily temperature increases $1^0$C in grain filling, 3.1 day is reduced in grain filling duration (Bruckner and Frohberg, 1987). Roostayi (2000) showed that choosing lines with average size may be effective in grain increasing for ear length but high 1000 grains weight. Ahmadi and Bajelan (2008) reported a very significant and positive correlation between 1000 grains weight and grain yield in humid stress and found that selection for 1000 grains weight is an efficient tool for improving drought resistance in early generations resulted by crosses. This study aims at finding genotypes with optimal agronomic characteristic in drought stress.

## MATERIALS AND METHODS

This study was conducted in Moghan plain in Pars Abad city in 2012-13. The used genotypes in this study were measured based on complete random block designs with three replications. Tillage operations include plow, leveler and furrows in fallow: phosphorus fertilizer from Ammonium phosphate source was used as a based and Nitrogen fertilizer from Urea source was used both as a based and top-dressing according to results from Laboratory analysis in department of soil and water research. Each of the lines in two rows of 3 m length and 20 cm spacing wore manually and uniformly planted. Seed rate was determined based on 450 seeds per square meter and 1000 grains weight. In order to prevent smut, consuming seeds were disinfected by fungicides Vitawax before planting. Also controlling weeds with broad and narrow leaves was done by Topic and Granstar poisons. After arriving the products the traits 1000 grains weight, ear length, grain weight per pant and seed number per ear, plant length of each genotypes were measured in 10 random plants from experimental plots. Also grain yield per plot was weighted and recorded after removing the marginal effects. Data after normality test were compared in average in a complete random block design by variance analysis and Duncan's multiple range tests in 5% probable level. We used SAS, 9.2, SPSS computer soft wares for data analysis.

## RESULTS AND DISCUSSIONS

Based on the results from variance analysis (table 1) there was a significant difference between studied genotypes in all traits. This origins from high diversity genetic between studied genotypes in studied traits. 1000 grains weight varies between studied genotypes from 42 gr (genotypes 12) to 29.8 gr (genotypes 2). Genotypes 5 and 12 had the most 1000 grains weight and placed in class (a) and genotype 2 was placed in statistical group with 29.8 averages (Figure 1). Plant height varies between studied genotypes from 99.2 cm (genotype 3) to 75.3 cm (genotype 2). Genotype 3 had the highest plant height and placed in class (a) and genotypes 2 and 9 had the lowest plant height among studied genotypes and placed in group e (figure 2). Genotypes 9 and 15 had the highest ear length and placed in class a (figure 3). Seed numbers per ear between studied genotypes varies from29 numbers (genotype 10) to 22 numbers (genotype 9). Genotype 10 had the highest seed number per ear among genotypes (figure 4). Statistical analysis of data related to grain yield showed that there is a significant difference between studied genotypes in grain yield 1% probable level. The significant difference between genotypes and cultivars for grain yield shows a wide existence genetic diversity between studied cultivars and genotypes. So in breeding programs there is a possibility of using existence diversity to produce high- yield cultivars. The total average of grain yield of studied genotypes was 2427.1 kg/ha in the experiment. Genotype 12 had the highest grain yield and genotypes 9 had the lowest compared to other studied genotypes (1650 kg/ha) (figure 5).

**Table 1: Variance analysis of studied traits in 15 wheat genotypes**

| | df | Mean of Square | | | | |
|---|---|---|---|---|---|---|
| | | Grain Yield | Plant height | Spike length | Number of grains per spike | 1000 grain weight |
| Rep | 2 | 5292.4 | 6.07 | 3.14 | 3.068 | 0.525 |
| Genotype | 14 | 228351.8** | 128.924* | 2.558** | 22.047** | 10.465** |
| Error | 28 | 28114.15 | 8.883 | 0.865 | 5.03 | 0.258 |
| C.V% | | 5.58 | 4.55 | 9.97 | 6.51 | 16.23 |

** And **, respectively, as significantly different at the 5 and 1 percent*

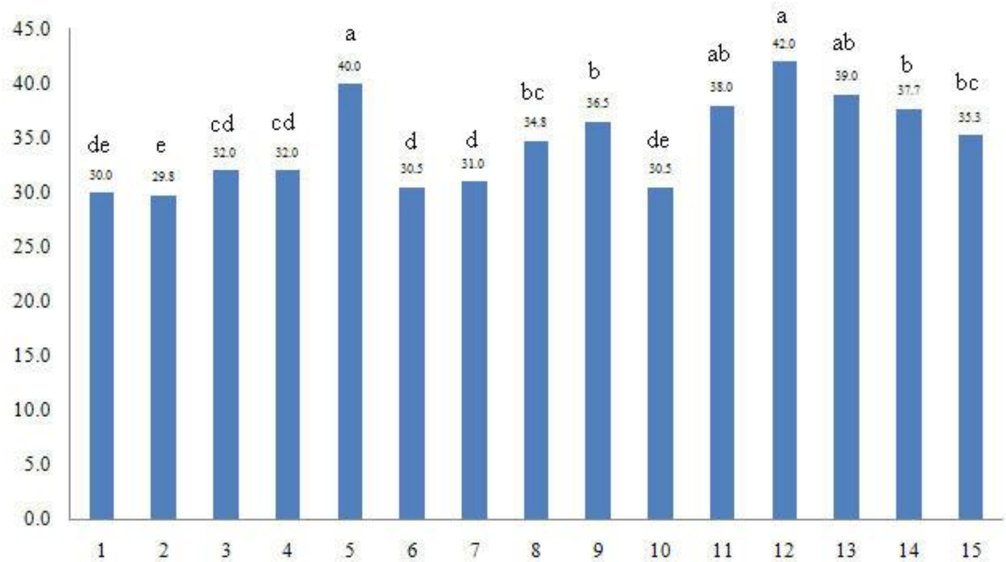


**Figure 1: Average comparison of studied genotypes in 1000 grains weight**

Dissimilar letters show a significant difference in 5% probable level in Duncan's multiple range tests

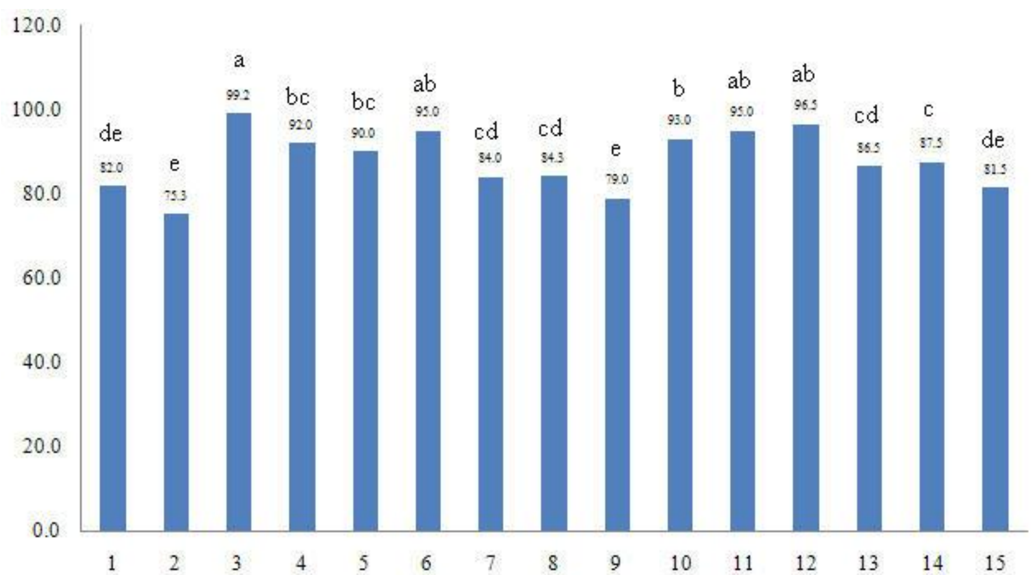


**Figure 2: Average comparison of studied genotypes in plant height**

Dissimilar letters show a significant difference in 5% probable level in Duncan's multiple range tests.

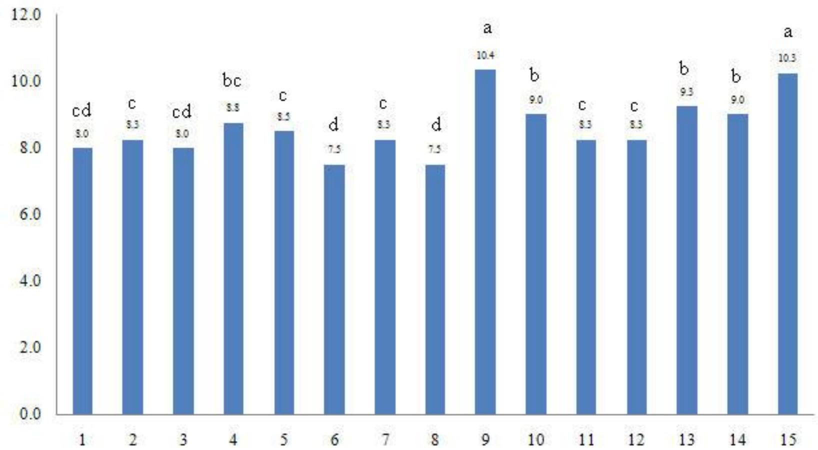


**Figure 3: Average comparison of studied genotypes in ear length**

Dissimilar letters show a significant difference in 5% probable level in Duncan's multiple range tests.

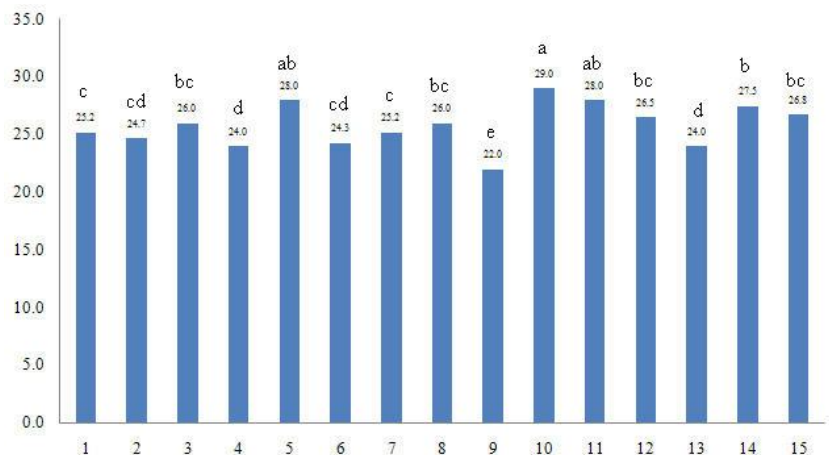


**Figure 4: Average comparison of studied genotypes in seed number per ear**

Dissimilar letters show a significant difference in 5% probable level in Duncan's multiple range tests.

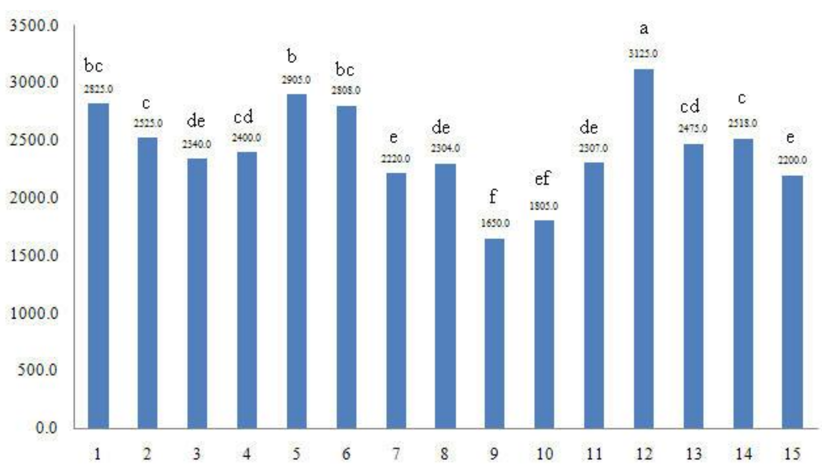


**Figure 5: Average comparison of studied genotypes in grain yield**

Dissimilar letters show a significant difference in 5% probable level in Duncan's multiple range tests.

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