

Research Article

Evaluation of yield traits in some primitive wheat genotypes to ensure sustainability of wheat production

Maysoun Mohamad Saleh^{1*}, Fariza. Alsarhan Alsarhan²

¹General Commission for Scientific Agricultural Research (GCSAR), Genetic Resources Department, Damascus, Syria

²General Commission for Scientific Agricultural Research (GCSAR), Al-Raqqa Research Center, Al-Raqqa, Syria

*Corresponding Author, Email: mzainsamasaleh@gmail.com

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ABSTRACT

Study was conducted at Al-Raqqa Research Centre in The General Commission for Scientific Agricultural Research in Syria during the growing seasons 2011/2012. Eight primitive wheat genotypes and two local cultivated varieties were planted in Randomized Complete Block Design in three replications, yield components (number of fertile tillers, number and weight of grains per spike and weight of thousand grain) were studied. Results showed that the genotype Persian 64 was significantly superior in three traits of yield components (number of fertile tillers, number and weight of grains per spike) comparing to the check sham5, and also the genotype Polish 194 was significantly superior in weight of thousand grain comparing to both checks sham3 and sham5 (53.12, 40.80, 40.02) g respectively with an increase rate 30.20% and 32.73% comparing to both checks sham3 and sham5 respectively. It is recommended to use the superior genotypes in breeding programs to ensure the sustainability of wheat production.

Keywords:

Genotypes, Primitive
Wheat, Yield Traits,
Correlation

INTRODUCTION

Wheat is a main cultivated crop in many countries in the world [1], used as food and fodder [2], and consider as the main crop in Mediterranean region [3]. In order to improve economy in general Breeders are still working to develop wheat yield [4] by using different genotypes of wheat [5] and exploit the genetic variation within it [6], and to improve selection [7] depending on yield traits [8].

Emmer wheat *Triticum dicoccum* is valuable for the high content of protein and gluten [9]. Each of *Triticum dicoccum*, *Triticum polonicum*, *Triticum persicum* are characterized as important primitive genotypes to develop wheat production.

Fertile tiller number and grain number per spike and thousand grain weight are very important traits to develop final production of wheat [10,11,12]. Correlation analysis is an effective tool in breeding programs [13] to increase yield [14] via yield traits [15]. Dogen [16] found that grain number per spike was positively correlated with grain weight per spike and thousand grain weight, and Mahmood et al. [17] also found positive correlation between grain number per spike and thousand grain weight.

Objectives of this study were to define variation between wheat genotypes regarding yield traits in order to develop seed production, and to be provide wheat breeders with the best significant genotypes, and to study the correlation between studied traits.

MATERIALS AND METHODS

Eight primitive tetraploid wheat genotypes and two local cultivated varieties were planted in Randomized Complete Block Design in three replications at Al-Raqqa research center in the general commission for scientific agricultural research in Syria during the growing seasons 2011/2012, each plot contained six rows, row

length was one meter, with distance of 25 cm between rows and 5 cm between plants in the same row, and the depth of planting was 3-5 cm.). Yield components were studied from ten selected plants:

- Fertile tillers number per plant: Number of fertile tillers of each genotype were counted at maturity in each replication and average was computed.
- Grain number per spike: The main spike was threshed manually and numbers of grains per spike were counted for each genotype.
- Grain weight per spike: Grain per spike was weighed using electric balance for each genotype in each replication.
- Thousand grain weight: 500 grains were counted randomly from each genotype and weighed on electric balance then adjusted to 1000 grain weight.

Results were analyzed by Genstat.12 program according to Duncan's multiple range test, and correlation was analyzed by SPSS.12 program.

RESULTS

Fertile tillers number/Plant

Significant variations were found between studied genotypes in Fertile tillers number, which ranged from 13.33 in Polish 194 to 26.33 in Emmer124, with a grand mean of 22.12 fertile tiller. Results showed that (Emmer124, Emmer94, Polish193, Persian64, Persian49) were all significantly superior in fertile tiller number (26.33, 26.00, 23.67, 23.67, 23.33) respectively with an increase rate (42.23, 40.54, 27.95, 27.95, 26.11) % comparing to the check sham5 (18.50) (Table 1). These results agree with many researchers [18-21].



Table 1. Fertile Tillers in Genotypes.

Geno	Fertile Tillers	Difference Rate% comparing to checks	
		Sham3	Sham5
Emmer67	18.67 b	-26.29*	0.92
Emmer94	26.00 a	2.65	40.54*
Emmer124	26.33 a	3.95	42.32*
Polish193	23.67 a	-6.55	27.95*
Polish194	13.33 c	-47.37*	-27.95*
Persian49	23.33 a	-7.90	26.11*
Persian57	22.33 ab	-11.84	20.70
Persian64	23.67 a	-6.55	27.95*
Sham3	25.33 a		
Sham5	18.50 b		
Mean	22.12		
CV%	11.4		

* refers to significant difference.

Grain number/Spike

Significant variations were found between studied genotypes in Grain number/spike, it ranged from the lowest number 41.33 in Persian49 to the highest number 81.33 Persian64, with a grand mean of 53.28 grain. Persian 64 was significantly superior in grain number per spike (81.33) comparing to both checks sham3 and sham5 (64.00, 61.50) respectively with an increase rate (27.08, 32.24) % respectively (Table 2). These results agree with the findings of Saleh [22] and others [23-26].

Table 2. Grain number/spike in Genotypes.

Geno	Grain number /spike	Difference Rate% comparing to checks	
		Sham3	Sham5
Emmer67	45.00 def	-29.69*	-26.83*
Emmer94	47.00 d	-26.56*	-23.58*
Emmer124	43.33 def	-32.30*	-29.54*
Polish193	56.33 c	-11.98*	-8.41*
Polish194	46.00 def	-28.13*	-25.20*
Persian49	41.33 def	-35.42*	-32.80*
Persian57	47.00 d	-26.56*	-23.58*
Persian64	81.33 a	27.08*	32.24*
Sham3	64.00 a		
Sham5	61.50 b		
Mean	53.28		
CV%	5.6		

* refers to significant difference.

Grain Weight/Spike

Significant variations were found between studied genotypes in Grain Weight/Spike, grand mean was 1.873 g, the range was from 1.267 equally in both genotypes (Polish193, Persian49) to 2.800 in Polish 194. Results refereed that both of Polish194 and persian64 were significantly superior in grain weight per spike (2.800, 2.733) g respectively with an increase rate (21.74, 18.83) % respectively comparing to check sham5 (2.300) g (Table. 3). These results are in agreement with many researchers [27,28].

Thousand Grain Weight g

Significant variations were found between studied genotypes in thousand Grain Weight, which ranged from 23.76 g in Polish193 to 53.12g in Polish194, with a grand mean of 34.9 g. Results indicated that Polish194 was significantly superior in thousand grain weigh (53.12) g with an increase rate (30.20, 32.7) % comparing to both

checks sham3 and sham5 (40.80, 40.02) respectively (table. 4). These results agree with many researcher [24,29-31].

Table 3. Grain weight /spike g in Genotypes

Geno	Grain weight /spike	Difference Rate% comparing to checks	
		Sham3	Sham5
Emmer67	1.300 c	-47.30*	-43.48*
Emmer94	1.433 c	-41.91*	-37.70*
Emmer124	1.500 c	-39.20*	-34.78*
Polish193	1.267 c	-48.64*	-44.91*
Polish194	2.800 a	13.50	21.74*
Persian49	1.267 c	-48.64*	-44.91*
Persian57	1.300 c	-47.30*	-43.48*
Persian64	2.733 a	10.78	18.83*
Sham3	2.467 ab		
Sham5	2.300 b		
Mean	1.837		
CV%	12.2		

* refers to significant difference.

Correlation

Results of correlation between studied traits showed a negative significant correlation between fertile tiller number and thousand grain weight (- 0.494**), while the correlation between number and weight of grains per spike was positively significant (0.620**) and also positive and significant between thousand grain weight and weight of grains per spike (0.659**) (Table. 5.) These findings agree with the findings of many scientists [9,16,22,32].

Table 4. Thousand Grain Weight g in Genotypes.

Geno	Thousand Grain Weight	Difference Rate% comparing to checks	
		Sham3	Sham5
Emmer67	33.12 bcd	-18.82	-17.24
Emmer94	26.66 cd	-34.66*	-33.38
Emmer124	33.65 bcd	-17.52	-15.92
Polish193	23.76 d	-41.76*	-40.63*
Polish194	53.12 a	30.20*	32.73*
Persian49	26.86cd	-34.17*	-32.88
Persian57	37.00 bcd	-9.31	-7.55
Persian64	33.65 bcd	-17.52	-15.92
Sham3	40.80 b		
Sham5	40.02 bc		
Mean	34.9		
CV%	19.9		

* refers to significant difference

Table.5. Correlation between Studied Traits.

	Fertile Tiller	Grain Number/ Spike	Grain Weight/ Spike	Thousand Grain Weight
Fertile Tiller	1			
Grain number/ Spike	0.146	1		
Grain weight/ Spike	-0.284	0.620**	1	
Thousand Grain Weight	-0.494**	0.075	0.659**	1

CONCLUSION

It was concluded that significant valuable variances were found between wheat genotypes in all studied trait. Emmer 124, Emmer 94, Polish 193, Persian 64, Persian 49 were all significantly superior in fertile tiller number, and Persian64 was significantly superior in both grain number and grain weight per spike, and Polish194 was significantly superior in both grain weight per spike and thousand grain weight. Correlation was positive and significant between number and weight of grain per spike as well as between grain weight per spike and thousand grain weight, while correlation was negatively significant between thousand grain weight and fertile number per spike.

Conflict of Interest

It is highly recommended to use the superior genotypes in breeding programs to ensure the sustainability of wheat production and to keep evaluating wheat diversity.

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