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REGULAR ARTICLE

EVALUATION THE PERFORMANCE OF SOME PRIMITIVE WHEAT *TRITICUM DICOCCUM* GENOTYPES

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ABSTRACT

Seven wheat genotypes (*Triticum dicoccum*) and the local check sham5 variety were planted during growing season 2010/2011under rainfed conditions using RCBD with three replications. Yield components (number of total and fertile tillers, number and weight of grains per spike, weight of thousand grain and individual plant grain yield) were studied in two sites in order to define the differences between the studied genotypes in both sites and to provide the superior genotypes for breeding programs. Results showed that the genotype PW70 was significantly superior in (grain yield, number and weight of grain per spike) comparing to check. While, the genotypes (PW96, PW119, PW123) were significantly superior in thousand grain weight comparing to check, as well as the genotype (PW81, PW127) were significantly superior in total and fertile tillers number comparing to check. Most traits were significantly superior in Al-Ghab site.

Keywords: Genotypes, Sites, Primitive Wheat, Yield, Yield traits

INTRODUCTION

Wheat is one of the most widely cultivated cereal crops throughout the world [1], used for human consumption and to feed animals [2], and it considered as the main crop in Mediterranean Region [3]. Greater wheat production could be achieved in several ways, Plant breeders working to improve grain yield of wheat [4] through evaluating the variation between different genotypes [5] especially for yield traits [6].

Primitive wheat is the earliest cultivated form of wheat in which many researches insists on the importance of primitive species of wheat as a key to enhance the commercial varieties, so we need to evaluate variance in different genotypes of wheat especially for tillers and grain number and also thousand grain weight [7]. Emmer (*Triticum. dicoccum*) is one of the oldest cultivated wheat, originating about 11,000 y ago [8, 9].

Grain yield is a complex trait affected by other yield traits such as fertile tiller number and grain number per spike and thousand grain weight [10-13] evaluated 41 genotypes of wheat and their results showed significant differences in yield traits such as number of tillers per plant, grain number and thousand grain weight. [14] referred in his study to significant differences between wheat genotypes [15]. Evaluated twelve genotypes of wheat and found significant differences in thousand grain weight and number of fertile tiller and grain yield.

Objectives of this study were to exploit the variation between genotypes and to evaluate location effects on them as well as to define the superior genotypes in studied traits to be used in plant breeding programs.

MATERIALS AND METHODS

Seven genotypes of primitive wheat *Triticum dicoccum* were planted in tow sites Al-Ghab research centre (north of Damascus) and Izra research station (south of Damascus) belongs to the General Commission of Scientific Agricultural research (GCSAR) in Syria during season 2010/2011 under rainfed conditions, in addition to local

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variety Sham5 as control, the experiment was laid out in a Complete Randomized Block Design (RCBD) with three replications, each genotype was planted in plot which had six rows of one meter length and 25 cm space was left between rows while 5 cm space between plants, depth of planting was 3-5 cm. All recommended cultural practices like irrigation and pesticide control were conducted according to Agricultural ministry guides. Following traits were studied from ten selected plants:

- Total tillers number per plant: Numbers of all tillers of each genotype were counted at maturity in each replication and average was computed.
- Fertile tillers number per plant: Numbers 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.
- Grain yield per plant: Average grain yield per plant was weighed using electric balance for each genotype in each replication.

Analysis of variance (ANOVA) was held using Genestat.12 program, and Multiple comparisons between means were performed using Duncan's multiple range test (significance level 5%).

RESULTS AND DISCUSSION

Results of variance analysis indicated significant differences between genotypes in studied traits and between sites (table 1).

Total tillers number per plant

Significant differences were found between genotypes in number of total tillers, lowest number of total tillers was 11.83 tillers in control sham5 while the largest number of total tillers was 18.50 tillers in genotype PW118, grand mean for all genotypes in both sites was 14.38 tillers (table 1). Results showed that the genotypes (PW81, PW127) were significantly superior comparing to control sham5 in number of total tillers which was (12.17, 10.83, and 8.33) respectively for each of them as a result of the genetic variation between them. There were no significant differences between two sites in number of total tillers. Our findings are in agreement with [16-18] who referred to the high variability in primitive species of wheat such as *Triticum dicoccum* especially in number of total tiller in plant.

Fertile tillers number per plant

Significant differences were found between genotypes and sites in number of fertile tillers, genotype PW119 exhibited the lowest number of fertile tiller 6.50 tillers while genotype 119 produced the largest number of fertile tillers 12.17 tillers, grand mean for all genotypes in both sites was 9.18 tillers (table 1). Results showed that the genotypes (PW81, PW127) were significantly superior compared to control sham5 where the number of fertile tillers was (12.17, 10.83, 8.33) respectively for each of them, this could be explained because of the same genotypes were superior in total tillers number and also due to the genetic variation between genotypes [19].

Number of fertile tillers was significantly superior at Al-Ghab site than Izra (11.27, 7.08) for each of them respectively due to the difference in rainfall between two sites which affect the number of fertile tillers [20, 21].

Grain number per spike

Significant differences were found between genotypes and sites in Grain number per spike, grand mean for all genotypes in both sites was 38.90 grain ranged from the lowest number 32.83 grain in control sham5 to the highest number 54 grain in genotype PW70 (table 2). Genotype PW70 was significantly superior comparing to control sham5 variety in grain number per spike which was (54, 64.48), respectively for each of them.

Grain number per spike was significantly superior at Al-Ghab site comparing to Izra (44.60, 33.20) for each of them respectively due to the low rainfall in Izra comparing to Al-Ghab. Our findings agree with results of [22] who found that grain number per spike ranged from 24 to 60 grain, and with results of [23] who found in his research that grain number per spike was 27-36 grain, and with each of [24-26] who concluded that grain number per spike is affected by low rainfall.

Table 1: Total and Fertile tillers number per plant

Genotype	Total tillers number			Fertile tillers number		
	Izra	Al-Ghab	Mean	Izra	Al-Ghab	Mean
PW57	14.00	10.50	12.25 c	7.33	10.50	8.92 bcd
PW70	14.67	17.00	15.83 abc	8.00	12.33	10.17 abc
PW81	18.00	19.00	18.50 a	8.33	16.00	12.17 a
PW96	14.00	10.50	12.25 c	8.00	9.00	8.50 bcd
PW119	16.00	12.00	14.00 bc	4.33	8.67	6.50 d
PW123	14.33	12.00	13.17 bc	7.67	8.33	8.00 cd
PW127	15.00	19.33	17.17 ab	7.67	14.00	10.83 ab
sham5	9.67	14.00	11.83 c	5.33	11.33	8.33 cd
Mean	14.00a	14.29a	14.38	7.08 b	11.27 a	9.18

Table 2: Grain number and weight per spike

Genotype	Grain number per spike			Grain weight per spike		
	Izra	Al-Ghab	Mean	Izra	Al-Ghab	Mean
PW57	29.70	41.00	35.33 b	1.057	1.000	1.029 d
PW70	58.00	50.00	54.00 a	2.681	1.140	1.911 a
PW81	32.30	42.00	37.17 b	0.928	1.100	1.014 d
PW96	33.70	38.00	35.83 b	1.161	1.801	1.481 bc
PW119	25.30	53.00	39.17 b	0.907	2.597	1.752 ab
PW123	24.70	46.00	35.33 b	0.662	2.401	1.531 bc
PW127	31.30	52.00	41.67 b	1.020	1.378	1.199 cd
sham5	30.70	35.00	32.83 b	0.940	1.600	1.270 cd
Mean	33.20 b	44.60 a	38.90	1.169 b	1.627 a	1.398

Grain weight per spike (g)

Significant differences were found between genotypes and sites in Grain weight per spike which ranged from the lowest grain weight 1.014 g in genotype PW81 to the highest grain weight 1.911 g in genotype PW70, grand mean for all genotypes in both sites was 1.398 g (table 2).

Both genotypes PW70 and PW119 were significantly superior comparing to control sham5 in grain weight per spike which was (1.119 g, 1.725 g, 1.270 g), respectively for each of them. Grain weight per spike was significantly superior at Al-Ghab site comparing to Izra (1.627, 1.169) g, respectively for each of them because of the low rainfall in Izra resulted in lower grain weight comparing to Al-Ghab in which the amount of rainfall effects the final grain weight in wheat [27], these results agreed with [28] who found that grain weight in wheat spike was 1.28-1.45 g, and agreed with [23] who referred that grain weight in wheat spike was 1.87 g.

Thousand grain weight (g)

Significant differences were found between genotypes and sites in thousand grain weight which ranged from the lowest (27.35 g) in genotype PW81 to the highest (42.42 g) in genotype PW119, grand mean for all genotypes in both sites was 35.30 g (table 3).

Three genotypes (PW119, PW96, PW123) were significantly superior in thousand grain weight (42.42, 40.95, 39.68) g respectively for each of them comparing to control sham5 which was 38.02 g. Thousand grain weight was significantly superior at Al-Ghab site comparing to Izra (36.78, 33.83) g for each of them respectively as the amount of available water in Izra soil was lower than in Al-Ghab which effect the thousand grain weight and this result agree with the results of [29] and also with findings of [30, 31, 32, 33, 34] and also with [35] who reported that the thousand grain weight in his study was 39.54 g.

Grain yield per plant (g)

Significant differences were found between genotypes and sites in grain yield per plant which ranged from the lowest (9.26 g) in genotype PW57 to the highest (17.75 g) in genotype PW70, grand mean for all genotypes in both sites was 12.76 g (table 3). Results showed that the genotypes PW70 was significantly superior in grain yield per plant comparing to control sham5 which was (17.75, 10.58) g respectively for each of them, and this result could be explained because the same genotype was significantly superior in grain number and grain weight per spike comparing to control.

Grain yield per plant was also as other traits significantly superior at Al-Ghab site comparing to Izra (17.02, 8.94) g for each of them respectively as a reason of being affected by other yield traits and by rainfall amount. Our results in agreement with results of [36] who referred to the variation between wheat genotypes in grain yield.

CONCLUSION

Significant variances were found in studied traits and between genotypes and between sites**.** Genotype PW70 was significantly superior in (grain yield, number and weight of grain per spike) comparing to check, and the genotypes (PW96, PW119, PW123) were significantly superior in thousand grain weight comparing to check, as well as the genotype (PW81, PW127) were significantly superior in total and fertile tillers number comparing to check. Most traits were significantly superior in Al-Ghab.

Table 3: Thousand grain weight and grain yield per plant

Genotype	Thousand grain weight			Grain yield per plant		
	Izra	Al-Ghab	Mean	Izra	Al-Ghab	Mean
PW57	35.33	24.40	29.87 e	8.01	10.50	9.26 b
PW70	46.17	22.80	34.48 d	21.45	14.60	17.75 a
PW81	28.50	26.20	27.35 f	7.51	17.61	12.56 b
PW96	34.50	47.40	40.95 b	9.24	16.21	12.73 b
PW119	35.83	49.00	42.42 a	3.62	22.51	13.06 b
PW123	27.17	52.20	39.68 b	5.15	20.01	12.58 b
PW127	32.83	26.50	29.67 e	7.79	19.29	13.54 ab
sham5	30.33	45.70	38.02 c	5.16	16.00	10.58 b
Mean	33.83b	36.78a	35.30	8.49 b	17.02 a	12.76

RECOMMENDATION

Exploit the widely genetic variation found in wheat genotype and to invest all studied genotypes in wheat breeding program for yield improvement especially genotype PW70.

AUTHOR CONTRIBUTIONS

All authors had an equal contribution.

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