Selection Some Promise Genotypes of Wheat (*Triticum aestivum* L.) Under Local Conditions of Qatar

Dr. Hayel ALWawi (Corresponding author).
Expert of Crops and Wild Plants Unit, Division of Research and Extension Agricultural, Doha, Qatar
Tel: 974-5525-5037 E-mail: hael_1975@yahoo.com

Received: August 15, 2011 Accepted: August 29, 2011 Online Published: December 29, 2011
doi:10.5539/jas.v4n3p189 URL: http://dx.doi.org/10.5539/jas.v4n3p189

Abstract

Ten wheat (*Triticum aestivum*) genotypes namely G1, G2, G5, G8, G11, G12, G16, G17, G19, G20 were entered from CIMMYT and were screened for desirable characteristics during the growing seasons of 2007/2008 and 2008/2009 respectively. Both trials were conducted in the Department of Agricultural Research (Rawdat AL Faras Station) under prevailing local Qatar environmental conditions. The analysis of variance (ANOVA) showed significant differences ($P < 0.01$) between genotypes for all studied characteristics except the seed yield ($P > 0.05$). The mean of seed yield was 4375kg / ha for the genotypes while it was 2500 kg / ha for the local Check Doha - 88. Dunnett test showed significant differences ($P < 0.05$) between the genotypes G2, G5, G8, G20 and Doha - 88 for seed yield. The correlation was positive between t days to heading and days to maturity (r = 0.759*). This study recommends the selection of genotypes with the highest seed yield namely G2 and G5

Keywords: *Triticum aestivum*, Germplasm, Screening, Selection, Qatar

1. Introduction

Wheat (*Triticum aestivum* L.) is one of the most important and widely cultivated crops in the world, used mainly for human consumption and support nearly 35% of the world population. Nearly 95% of wheat grown today is hexaploid, used for the preparation of bread and other baked products (Debasis and Khurana, 2001). Many consumers in Qatar prefer wheat produced organically (without agrochemicals) for direct consumption, and in baking bread and other processed products such as harees with meat, mash. Doha – 88 (licensed at 1988) is the lonely local genotype of wheat in Qatar, and there aren't any improved varities. The mandate of the bread wheat breeding program at International Maize and Wheat Improvement Center (CIMMYT) is to develop broad-based and high yielding bread wheat germplasm for the developing countries to enhance wheat production worldwide (Kohli *et al.,* 1991). Analysis of environmental and genotypic factors is always important in plant breeding (Jackson *et al*., 1996; Yan and Hunt, 1998). Terminal heat stress is a common abiotic factor for reducing the yield in certain areas of West Asia and North Africa (Ferrera *et al.,* 1993). Heat stress is an important constraint to wheat productivity affecting different growth stages specially anthesis and grain filling. It has already been established that heat stress can be a significant factor in reducing the yield and quality of wheat (Stone and Nicolas 1995; Aziz *et al.,* 2009). Grain yield was negatively related to the thermal time accumulated above the base temperature of 31C° (Ferris *et al.,* 1998; Mian *et al.,* 2007). High temperature above 32C° has been reported reducing grain yield and grain weight (Bluementhal *et al.,* 1995, Gibson and Paulsen, 1999, Wardlaw *et al.,* 2002). Therefore, in Qatar environment there is a dire need to develop genotypes that are either tolerant to terminal heat stress or that mature early without yield losses and thus escape the stress. CIMMYT Genebank contains a large number of wheat entries which collected from different country, these genotypes distributed and tested under hot environments like Qatar. So, this research achieved through a scientific cooperation program between the Department of Agriculture Affaire in Qatar and CIMMYT (Table 1) to improve and develop some new varieties of wheat under local conditions (high temperature with full irrigation) in Qatar.

The major goal of this work to study some Agronomic and yieldcharacteristics, then selection some promise genotypes which had a high seed yield under high temperature.

2. Materials and Methods

Ten genotypes of wheat G1,G2,G5,G8,G11,G12,G16,G17,G19,G20 and local check Doha - 88 were separately sown in a randomized complete block design (RCBD) with three replications during 2007/ 2008 - 2008/ 2009 at

fields of the Department of Agricultural Research (Rawdat AL Faras Station) in Qatar environment (high temperature: Table*).

Seeds were sown in 15 rows of 5 m length with spacing 25 cm between rows on November of 2007/ 2008 2009 –2008/. Plots were fertilized with super phosphate (P2O5: 46% P) and Urea (46%N). Hand weeding and pesticide application were done after seedlings emergence. Irrigation water was applied according to the recommended plant requirements. All other agronomical practices were adopted. When maturity was achieved, the genotypes were harvested per each plot and data were recorded to plant height (cm), days to heading, seed yield (kg/ha), length of spike (cm) and days to maturity (days from agriculture to maturity). Analysis of variance (ANOVA), Coefficient of variability (CV%), Correlation coefficient (r), Standard Error (SE ±) and Dunnett test were performed using SPSS 15 software.

3. Result and Discussion

Mean of plant height was (77.93) cm, day to heading (88.69), day to maturity (146.3), length of spike (11.04) cm, seed yield (4375) kg / ha for genotypes (table 2). Analysis of variance (ANOVA) showed that differences between genotypes were significant for all studied characteristics ($P < 0.01$) except seed yield ($P > 0.05$). (table 3). The genotype 5 had the highest seed yield (4711) kg / ha, followed genotype 2 (4649) kg / ha, then genotype 20 (4640) kg / ha while the seed yield for local check was (2500) kg / ha (table 2). In other hand, Dunnett test for seed yield showed a high significant ($P < 0.01$) between the genotypes and local check (table 4). The correlation analysis revealed that special attention should be given to the importance of days to heading, The selection to maturity thinkable by selection to heading because the correlation was a significant strong positive correlation ($r = 0.75$*) between days to heading and days to maturity (table 5). Our results are in accordance with (May and Van Sanford, 1992; Joshi *et al.,* 2007) who reported positive correlation between days to heading and days to maturity.

4. Conclusion

The result suggests to selection the G2, G5, G8 and G 20 that showed maximum seed yield under local conditions in Qatar. This study revealed that these genotypes can be utilized in breeding programs for development of wheat varieties having heat tolerance at terminal growth stage.

References

Aziz, U, R., Imran, H., Nadeem, A., Mumtaz, H, M., Arif, Khan., Jehanzeb, F. & Muammad, A. A. (2009). Screening wheat germplasm for heat tolerance at terminal growth stage. *Plant Omics Journal,* 2(1):9-19.

Bluementhal, C., Bekes, F., Gras, P. W., Barlow, E.W.R. and Wrigley, C.W. (1995). Influence of wheat genotypes tolerant to the effects of heat stress on grain quality. *Cereal Chem,* 72:539-544.

Debasis, P. & Khurana, P. (2001). *Wheat biotechnology*: A minireview. E. J. B, ISSN: 0717-3458.

Ferrera, O. G, Rajaram, S & Mosaad, M. G. (1993). *Breeding strategies for improving wheat in heat stressed environments.* Proc. Int. Conf. Wad Medani, Sudan and Dinajpur, Bangladesh. Pp: 24-32.

Ferris, R., Ellis, R. H., Wheeler, P. R., & Hadley, P. (1998). Effect of high temperature stress at anthesis on grain yield and biomass of field grown crops of wheat. *Annl Bot,* 82: 631-639. http://dx.doi.org/10.1006/anbo.1998.0740

Gibson, L. R, & Paulsen, G. M. (1999). Yield component of yield grown under high temperature stress during reproductive growth. *Crop Sci,* 39: 1841-1846. http://dx.doi.org/10.2135/cropsci1999.3961841x

Jackson, P., M. Robertson, M. Cooper & G.L. Hammer. (1996). The role of physiological understanding in plant breeding: From a breeding perspective. *Field Crops Res.*, 49:11-37. http://dx.doi.org/10.1016/S0378-4290(96)01012-X

Joshi A. K, Mishra, B, Chatrath, R, Ferrara, G.O & Singh, R. P. (2007). Wheat improvement in India: Present status, emerging challenges and future, prospects. Euphytica, 157:431- 446. http://dx.doi.org/10.1007/s10681-007-9385-7

Kohli, M. M, Mann, C & Rajaram, S. (1991). Global status and recent progress in breeding wheat for the warmer areas. Pp. 225-241, DA Saunders, ed. *Wheat for the nontraditional warmer areas.* Mexico, D.F: CIMMYT.

May, L. & Van Sanford, D. A. (1992). Selection for early heading and correlated response in maturity of soft red winter wheat, *Crop Science*, Vol. 32. http://dx.doi.org/10.2135/cropsci1992.0011183X003200010011x

Mian, M. A., Mahmood, A., Ihsan, M & Cheema, N. M. (2007). Response of different wheat genotypes to post anthesis temperature stress. *J Agric Res,* 45:269-276.

Stone, P. J & Nicolas, M. E. (1995). Effect of heat stress during grain filling on two wheat varieties differing in heat tolerance grain growth. *Aust J Plant Physiol,* 22: 927-934. http://dx.doi.org/10.1071/PP9950927

Wardlaw, I. F., Blumenthal, C., Larroque, O. & Wrigley, C. W. (2002). Contrasting effects of chronic heat stress and heat shock on grain weight and flour quality in wheat. *Functional Plant Biol.,* 29:25-34. http://dx.doi.org/10.1071/PP00147

Yan, W. & L. A. Hunt. (1998). Genotype-by-environment interaction and crop yield. *Plant Breed. Rev.,* 16: 135-178.

Table *. Mean of temperature and annual rainfall in Qatar during the stages of wheat growth

Temperature	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.
	23.3°	19.3°	17°	18.5°	29°	35°	37°
Annual rainfall	10	4.6	12.5	15.2	42	2	0

*Mean of years (2007 / 2008 – 2008 / 2009).

Table 1. Code and source of genotypes

Genotype Number	Genotype code	Nursery name	Trial ID	Source
G 1	PBW343	27ESWYT	40205	CIMMIT
G 2	SERI / RAYON	27ESWYT	40205	CIMMIT
G 5	MILAN/S87230//HUITES	27ESWYT	40205	CIMMIT
G 8	WEAVER/3SAPI/TEAL//HUI/4CROC-1/	27ESWYT	40205	CIMMIT
G 11	REH/HARE//2*BCN/3/CROC-1/	27ESWYT	40205	CIMMIT
G 12	TOBA97/ATTILA	27ESWYT	40205	CIMMIT
G 16	TILHI/PASTOR	27ESWYT	40205	CIMMIT
G 17	WH542/2*PASTOR	27ESWYT	40205	CIMMIT
G 19	WBLL1*2/TUKURU	27ESWYT	40205	CIMMIT
G 20	CHEN/AE.SQ//WEAVER/3/SSERI1	27ESWYT	40205	CIMMIT
G 21	DOHA-88	Local Chek	Local Chek	QATAR

Table 2. Mean of studied characteristics for (10) genotypes compared with local check (Doha-88)

genotype number	days to heading	Plant height(cm)	days to maturity	length of spike(cm)	seed yield (kg/ha)
G 1	86	70	143	11	4391
G 2	85.3	74.3	147	11	4649
G 5	91	68.7	150.7	11	4711
G 8	88.3	87.7	145	11.7	4533
G 11	86.7	85	143	9.2	4044
G 12	91	79.3	149	12	4249
G 16	86.3	65.3	143	10	4276
G 17	90.3	80	146.3	11.3	4124
G 19	91.7	79	150.3	11	4133
G 20	90.3	90	145.7	12.2	4640
Local Check	86	76	147	11	2500
Mean of Genotypes	88.69	77.93	146.3	11.04	4375
SE ±	0.4	1.4	0.5	0.1	168
%CV	2.9	10.3	1.9	7.8	23

Table 3. Analysis of Variance (ANOVA) for studied characteristics

Characteristics	Source of variations	Sum of Squares	df	Mean Square	F	Sig.
days to heading	Between Genotypes	179.515	10	17.952	16.011	0.000**
	Within Genotypes	24.667	22	1.121		
	Total Variation	204.182	32			
plant height (cm)	Between Genotypes	1864.727	10	186.473	20.789	0.000**
	Within Genotypes	197.333	22	8.97		
	Total Variation	2062.061	32			
days to maturity.	Between Genotypes	234.97	10	23.497	35.245	0.000**
	Within Genotypes	14.667	22	0.667		
	Total Variation	249.636	32			
seed yield (kg/ha).	Between Genotypes	11208692.52	10	1120869.3	1.326	0.277 N.S
	Within Genotypes	18593058.39	22	845139.02		
	Total Variation	29801750.9	32			
length of spike (cm)	Between Genotypes	21.803	10	2.18	28.78	0.000**
	Within Genotypes	1.667	22	0.076		
	Total Variation	23.47	32			

Table 4. Dunnett test for seed yield kg / ha genotypes of wheat compared to local Check (Doha-88)

95% Confidence Interval Lower Bound	Sig.	Std. Error	Mean Difference (I-J)	Local check Doha-88 (J)	Genotype (I)
-74.90	0.06	750.61	1891.13	21	1
182.86	*0.03	750.61	2148.90	21	2
245.09	*0.02	750.61	2211.13	21	5
67.29	*0.04	750.61	2033.33	21	8
-421.60	0.14	750.61	1544.43	21	11
-217.13	0.08	750.61	1748.90	21	12
-190.46	0.08	750.61	1775.56	21	16
-341.60	0.11	750.61	1624.43	21	17
-332.70	0.11	750.61	1633.33	21	19
173.96	*0.03	750.61	2140.00	21	20

Table 5. Correlation coefficient (r) for the studied characteristics

Correlations	plant height	maturity	seed yield	spike length
heading	ns 0.296	*0.759	ns -0.067	ns 0.53
plant height		ns -0.048	ns -0.083	ns 0.347
maturity			ns 0.21	ns 0.434
yield				ns 0.466

** significant at 0.01 level, *significant at 0.05 level, ns: not significant.

ISSN 1916-9752 E-ISSN 1916-9760