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YIELD AND YIELD TRAITS OF DURUM WHEAT (*Triticum durum desf.*) AND BREAD WHEAT (*Triticum aestivum* L.) GENOTYPES UNDER DROUGHT STRESS

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Field experiment was conducted to study the effect of water stress on yield and yield traits of durum wheat and bread wheat genotypes. Water stress caused significant reduction in plant height (PH), peduncle length (PL), spike number/m^2(SN), spike length (SL), spike width (SW), spikelets number/spike (SNS), spike mass (SM), grain number/spike (GNS), grain mass/spike (GMS), biological yield (BY), thousand kernel mass (TKM), grain yield (GY) and harvest index (HI). Wheat traits such as SN, SM, BY, TKM, GY were more vulnerable to drought stress. Positive significant correlation of GY with SN, BY and HI under rain-fed condition was found. Genotypes of durum wheat were more sensitive to drought than that bread wheat genotypes. The significant and positive correlation of GY with Stress Tolerance Index (STI), Mean Productivity (MP) and Geometric Mean Productivity (GMP) indicated that these indices were more effective in identifying high yielding, drought tolerance genotypes.

Key words: bread wheat, drought stress, durum wheat, genotypes, yield traits

INTRODUCTION

Low water availability is the main environmental factor limiting plant growth and yield worldwide, and global change will probably make water scarcity an even greater limitation to plant productivity across an increasing amount of land (CHAVES *et al*., 2009). About 35% of the 650.000 ha of wheat grown areas are rain-fed in Azerbaijan and an average grain yield is quite low (2-3 t/ha) in such areas, which is mainly due to deficit of water (ALLAHVERDIYEV *et al*., 2015). In Azerbaijan in the rain-fed field conditions wheat are exposed to a gradual increase in drought with a concomitant increase in temperature from the jointing stage (Feekes growth stage 6) to the grain ripening (Feekes growth stage 11). Developing wheat genotypes with suitable morpho-physiological and agronomic traits is a main goal of wheat breeding programs to increase yield potential, stability and adaptation, to improve tolerance to abiotic stresses such as drought, heat,

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salinity (SAIDI *et al*., 2000). The ability of a cultivar to produce high and satisfactory yield over a range of stress and non-stress environments is very important (RASHID *et al*., 2003). In general, breeding for drought tolerance involves combining good yield potential in the absence of the stress and the selection of high heritable traits that provide drought stress tolerance (JONES, 2007). Drought caused reductions in days to 50% heading, plant height, number of tillers, spike length and width, thousand kernel mass, biological and grain yield, harvest index of wheat genotypes (BAYOUMI *et al*., 2008; AL-TABBAL, 2011). Different drought indices which provide a measure of drought based on yield loss under drought conditions in comparison to normal conditions have been used for screening drought-tolerant genotypes (MITRA, 2001).

The objectives of our research were to study the effect of soil water deficit on yield and yield traits of durum and bread wheat genotypes, and to identify traits relating high grain yield and drought tolerance.

MATERIALS AND METHODS

Field experiment was done during the 2013-2014 growing season at the Research Institute of Crop Husbandry, located in Apsheron peninsula (latitude 40°26´N, longitude 49°52´E, altitude 27 m below sea level), Baku. Eight durum wheat genotypes (Garagylchyg 2, Vugar, Shiraslan 23, Barakatli 95, Alinja 84, Tartar, Sharg, Gyrmyzybugda), fourteen bread wheat genotypes (Nurlu 99, Gobustan, Akinchi 84, Giymatli 2/17, Gyrmyzy gul1, Azamatli 95, Tale 38, Ruzi 84, Pirshahin1, 12^{nd}FAWWON№97, 4^{th}FEFWSN№50, Gunashli, Dagdash, Saratovskaya29) were used in this study. Seeds were planted on 25-26 October, at an average density 400 seeds m^{-2} with sowing machine in 1mx10m plots, consisting of 7 rows placed 15 cm apart. Seeds from each genotype were sown with three replications both under irrigated and rain-fed plots. Irrigated plots were watered with the appearance of seedlings, at stem elongation, and grain filling stages. Rain-fed plots were not irrigated during ontogeny. Annual precipitation was around of 380 mm. PH, PL, SN of genotypes were determined at physiological maturity. Before harvest 10 spikes from each genotype collected for the determination of SL, SW, SNS, SM, GNS, GMS. After harvest TKM, GY were determined. Soil moisture content (% of the field capacity) was determined in the 0-20, 20-40, 40-60 cm depths and was about 60% under irrigated, 30% under rain-fed conditions during grain filling stage. Drought indices were expressed by the following formula: $STİ=(Y_p x Y_s)/(\hat{Y}_p)^2$ (FERNANDEZ, 1992), Tolerance $(TOL)=(Y_p-Y_s)$ (Rosielle and Hamblin, 1981), $MP=(Y_s+Y_p)/2$ (ROSIELLE and HAMBLIN, 1981), $GMP=\sqrt{Y_p x\ Y_s}$ (Kristin et al., 1997), Stress Susceptibility Index $(SSI)=1-(Ys/Yp)/1-(\hat{Y}_s/\hat{Y}_p)$ (Fischer and Maurer,1978), Yield Index $(Yİ)=Y_s/\hat{Y}_s$(Gavuzzi et al., 1997), Yield Stability Index $(YSI)= Y_s/Y_p$ (Bouslama and Schapaugh, 1984). Where Y_p is mean yield of the genotype under irrigated condition, Y_s is mean yield of the genotype under rain-fed condition, $\hat{Y}_p$ mean yield of all genotypes under irrigated condition and $\hat{Y}_s$ mean yield of all genotypes under rain-fed condition. Mean values and standard errors of yield traits were calculated by Excel program. Correlation among traits was calculated by SPSS 16 software.

RESULTS

In the field, the stages of development of the wheat from booting to ripening is usually accompanied with strengthened of drought. Sharg, Gyrmyzybugda, Dagdash and Saratovskaya 29 were the tallest genotypes, while Nurlu 99, Gyrmyzy gul 1were the shortest genotypes across irrigated and rain-fed plots. Wheat traits PH and PL less influenced by drought, on an average was reduced by 9%, and 12%, respectively (Figure 1). A significant reduction of PH and PL were detected in genotypes Barakatli 95, Alinja 84, Akinchi 84, 12^{nd}FAWWON№97 with less reduction in genotypes Garagylchyg 2, Nurlu 99, Pirshahin1 and Gunashli. SN on an average was higher among genotypes of bread wheat (Table 1). This trait was very sensitive to water deficit, on an average was reduced by 17% and 15% among durum wheat and bread wheat genotypes.

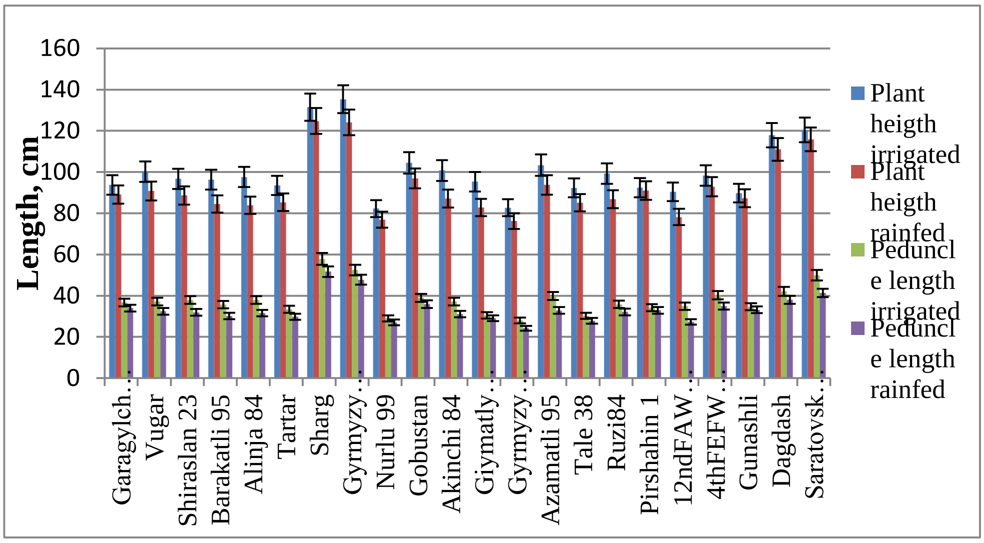

Figure 1. Plant height and peduncle length of wheat genotypes. Data are mean±SE from 30 replications

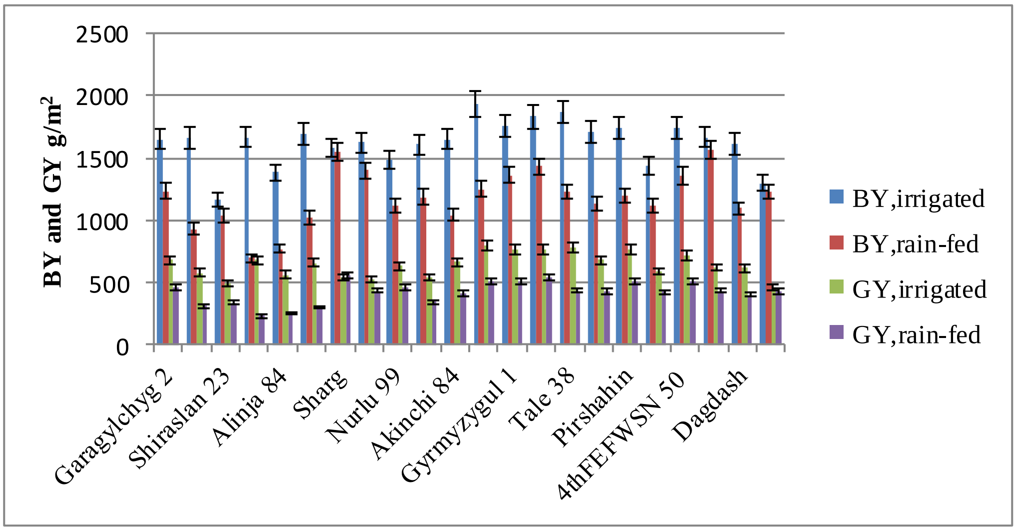

Figure 2. Biological yield and grain yield of wheat genotypes. Data are mean±SE from three replications

Table 1. Effect of water stress on yield traits of wheat genotypes. Note: I-irrigated, R-rain-fed

Genotypes		SN	SL,cm	SW,cm	SNS	SM,g	GNS	GMS,g	TKM	HI
				Triticum durum Desf.						
Garagylchyg 2	I	438	8,90	1,38	23,0	3,72	57,0	2,75	40,0	0,41
	R	368	7,83	1,18	18,2	3,00	54,2	2,14	36,6	0,37
Vugar	I	394	8,13	1,50	21,0	3,35	53,4	2,55	44,7	0,35
	R	287	7,47	1,27	19,5	2,47	45,5	1,83	32,8	0,33
Shiraslan23	I	347	8,20	1,42	21,8	3,04	52,7	2,25	43,4	0,42
	R	336	7,67	1,37	19,5	2,40	46,2	1,78	32,5	0,32
Barakatli 95	I	403	8,13	1,30	20,0	3,36	51,8	2,54	46,6	0,41
	R	220	7,67	1,05	19,5	2,39	46,2	1,73	33,2	0,33
Alinja 84	I	318	8,87	1,28	21,7	3,08	48,2	2,33	48,6	0,41
	R	265	7,22	1,12	18,8	2,29	44,2	1,68	33,3	0,32
Tartar	I	326	9,68	1,52	22,3	4,41	62,7	3,18	51,0	0,39
	R	243	8,22	1,25	17,5	3,03	47,7	2,14	38,9	0,29
Sharg	I	322	8,47	1,61	21,4	3,72	48,4	2,71	54,2	0,35
	R	372	8,18	1,47	21,8	2,99	42,7	2,20	46,2	0,35
Gyrmyzybugda	I	456	9,21	1,16	19,8	3,38	51,4	2,59	43,9	0,33
	R	407	8,6	1,10	19,2	2,36	41,2	1,80	39,2	0,31
Mean	I	376	8,69	1,40	21,4	3,51	53,2	2,27	46,5	0,38
	R	312	7,65	1,23	19,3	2,62	45,9	1,91	36,6	0,33
Reduction, %		17	10	12	10	25	14	16	21	13
Triticum aestivum L.										
Nurlu 99	I	449	9,90	1,13	18,8	2,71	62,0	2,04	32,6	0,43
	R	363	8,38	1,12	15,5	2,16	47,5	1,61	33,2	0,41
Gobustan	I	476	10,45	1,10	17,3	2,56	52,4	1,93	32,1	0,34
	R	449	9,58	0,97	15,7	2,20	47,7	1,60	26,7	0,29
Akinchi 84	I	442	13,08	1,32	21,4	3,15	51,4	2,41	40,5	0,40
	R	326	10,32	1,10	16,8	2,18	41,2	1,76	35,6	0,39
Giymatli 2/17	I	452	9,38	1,46	21,0	3,31	62,0	2,59	41,2	0,41
	R	347	8,62	1,28	19,0	2,80	46,0	2,22	39,5	0,40
Gyrmyzy gul1	I	658	8,52	1,23	17,3	2,22	48,7	1,78	35,3	0,44
	R	578	7,85	1,07	16,0	1,66	41,2	1,28	27,8	0,37
Azamatli 95	I	470	10,85	1,43	18,3	3,01	57,3	2,28	41,6	0,42
	R	446	10,02	1,22	15,8	2,28	53,4	1,69	34,7	0,38
Tale 38	I	560	9,60	1,17	17,2	2,79	44,8	2,04	44,0	0,42
	R	434	9,27	1,00	16,3	2,35	41,0	1,73	36,4	0,38
Ruzi 84	I	485	10,66	1,52	16,8	3,24	53,0	2,46	45,9	0,40
	R	393	9,8	1,08	16,6	2,40	51,0	1,86	39,1	0,38
Pirshahin1	I	459	10,54	1,38	16,4	3,11	50,0	2,33	45,6	0,44
	R	350	10,15	1,25	15,3	2,60	46,2	1,87	39,5	0,43
12ndFAWWON97	I	690	8,58	1,12	14,7	1,69	37,8	1,28	34,8	0,41
	R	566	7,33	0,92	13,2	1,20	29,8	0,92	29,9	0,38

4thFEFWSN№50	I	473	10,43	1,55	17,7	3,31	58,7	2,49	38,3	0,41
	R	400	9,90	1,36	16,8	2,39	46,8	1,70	36,1	0,38
Gunashli	I	484	10,64	0,94	15,6	2,37	40,0	1,78	43,3	0,40
	R	502	9,77	0,87	15,0	2,08	38,3	1,52	39,4	0,26
Dagdash	I	466	9,72	1,32	16,6	2,60	44,0	1,98	45,7	0,38
	R	381	9,44	1,18	17,3	2,37	42,2	1,79	37,8	0,38
Saratovskaya29	I	495	9,23	0,93	17,0	1,83	39,0	1,45	35,8	0,37
	R	498	8,29	0,84	16,3	1,60	36,1	1,26	32,9	0,33
Mean	I	504	10,11	1,26	17,6	2,71	50,0	1,89	39,8	0,41
	R	431	9,19	1,09	16,1	2,16	43,5	1,63	34,9	0,40
Reduction, %		15	9	13	8	20	13	14	12	2

Table 2. Correlations coefficients between various traits of wheat genotypes.

Irrigated

Rain-fed

	DH	PH	PL	SN	BY	SL	SW	SM	SNS	GNS	GMS	TKM	GY	HI
DH	1	0,562**	0,472*	0,266	0,233	-0,250	0,033	-0,144	0,190	-0,513*	-0,151	0,214	0,113	-0,141
PH	0,508*	1	0,964**	0,047	0,393	0,119	0,156	0,182	0,421	-0,130	0,204	0,442	0,206	-0,210
PL	0,494*	0,943**	1	-0,018	0,418	0,084	0,229	0,273	0,491*	-0,068	0,284	0,521*	0,211	-0,243
SN	0,163	-0,296	-0,338	1	0,650**	0,160	-0,504*	-0,695**	-0,627**	-0,490*	-0,683**	-0,298	0,544**	0,049
BY	-0,191	-0,192	-0,351	0,211	1	0,410	0,000	-0,024	-0,178	-0,127	-0,015	0,384	0,801**	-0,037
SL	-0,495*	-0,071	-0,112	0,072	0,303	1	-0,040	0,086	-0,394	0,199	0,119	0,288	0,449	0,243
SW	-0,003	0,062	0,072	-0,477*	0,359	-0,056	1	0,701**	0,621**	0,499*	0,695**	0,450*	0,223	0,287
SM	-0,114	0,133	0,111	-0,729**	0,346	0,001	0,755**	1	0,646**	0,684**	0,980**	0,654**	0,012	-0,011
SNS	-0,145	0,118	0,132	-0,747**	-0,059	-0,215	0,511**	0,752**	1	0,286	0,677**	0,415	-0,222	-0,209
GNS	-0,455*	-0,218	-0,257	-0,437*	0,405	0,121	0,597**	0,707**	0,576**	1	0,652**	0,138	0,025	0,158
GMS	-0,120	0,142	0,105	-0,716**	0,378	0,009	0,761**	0,994**	0,761**	0,729**	1	0,684**	0,056	0,053
TKM	0,232	0,333	0,313	-0,646**	0,104	-0,165	0,554**	0,657**	0,416	0,039	0,635**	1	0,374	0,097
GY	-0,298	-0,531*	-0,621**	0,313	0,861**	0,299	0,305	0,188	-0,126	0,373	0,212	0,009	1	0,559**
HI	-0,324	-0,782**	-0,719**	0,279	0,162	0,105	0,046	-0,142	-0,144	0,132	-0,145	-0,163	0,638**	1

*, ** significant at P<0,05 and P<0,01, respectively. Note: I-irrigated, R-rain-fed, DH-days to 50% heading, PH-plant height, PL-peduncle length, SN- spike number/m^2, BY-biological yield, SL-spike length, SW-spike width, SM-spike mass, SNS-spikelet number/spike, GNS-grain number/spike, GMS-grain mass/spike, TKM-thousand kernel mass, GY-grain yield, HI-harvest index

Table 3. Drought tolerance and susceptibility indices

Wheat varieties	STI	TOL	MP	GMP	SSI	YI	YSI
Triticum durum Def.							
Garagylchyg 2	0,75	227	568	556	0,96	1,09	0,67
Vugar	0,43	269	444	423	1,34	0,74	0,53
Shiraslan23	0,40	152	411	404	0,90	0,80	0,69
Barakatli 95	0,38	454	454	393	1,91	0,54	0,33
Alinja 84	0,34	312	404	373	1,59	0,59	0,44
Tartar	0,48	358	477	442	1,56	0,71	0,45
Sharg	0,73	-16	546	546	-0,08	1,33	1,03
Gyrmyzybugda	0,56	94	481	477	0,51	1,04	0,82
Triticum aestivum L.							
Nurlu 99	0,71	172	547	540	0,78	1,10	0,73
Gobustan	0,45	199	442	430	1,06	0,82	0,63
Akinchi 84	0,66	254	535	520	1,10	0,98	0,62
Giymatli 2/17	0,98	290	650	634	1,05	1,21	0,64
Gyrmyzy gul1	0,44	265	636	622	0,99	1,21	0,65
Azamatli 95	1,01	234	653	642	0,87	1,28	0,70
Tale 38	0,82	344	605	580	1,27	1,04	0,56
Ruzi 84	0,72	249	557	542	1,05	1,04	0,63
Pirshahin 1	0,96	251	639	626	0,94	1,23	0,67
12^{nd}FAWWON№97	0,60	166	502	495	0,81	1,00	0,72
4^{th}FEFWSN№50	0,89	207	615	606	0,83	1,22	0,71
Gunashli	0,65	186	526	518	0,86	1,04	0,70
Dagdash	0,60	215	510	498	1,00	0,96	0,65
Saratovskaya 29	0,47	30	438	438	0,19	1,01	0,93

We observed an increase of SN in some genotypes. SL on an average was higher among bread wheat genotypes, while SW was higher among durum wheat genotypes. SNS less affected by drought stress. SM was one of the most sensitive yield traits to water stress, on an average was reduced by 25% and 20% among durum wheat and bread wheat genotypes. Genotypes of durum wheat were superior in the GNS and GMS under both conditions. GNS was the highest in genotypes Tartar, Nurlu 99, Giymatli 2/17. The lowest GNS was detected in genotypes 12^{nd}FAWWON№97, Gunashli, Saratovskaya 29. The highest GMS was found in genotype Tartar. All spike components of genotypes Tartar, Akinchi 84, 12^{nd}FAWWON№97 were strongly affected by water deficit, so we can consider these genotypes as very susceptible to drought stress, whereas the genotypes Sharg, Gobustan, Giymatli 2/17, Tale 38, Gunashli, Dagdash, Saratovskaya 29 showed drought tolerance. TKM on an average was higher in genotypes of durum wheat than that bread wheat genotypes. Reduction in TKM was 21% and 12% in durum wheat and bread wheat genotypes, respectively. BY was one the most influenced yield traits (Figure 2). Water stress more affected on BY of genotypes of durum wheat Vugar, Barakatli 95, Alinja 84, Tartar and bread wheat Akinchi 84, Giymatli 2/17, Tale 38 and Ruzi 84 and Pirshahin 1. GY was the most influenced yield trait, was an average reduced by 39% and 33% in durum wheat and bread wheat genotypes (Figure 2). We observed an increase of GY in genotype Sharg. Deep reductions of GY were detected in genotypes Vugar, Barakatli 95, Alinja 84, Tartar, Gobustan, Akinchi 84, Tale 38, Ruzi 84. We consider these genotypes as drought sensitive. Less reduction of GY was observed in genotypes Gyrmyzybugda, Nurlu 99, 12ndFAWWON№97 and 4thFEFWSN№50, Saratovskaya 29. Despite the fact that, all spike components of genotype 12ndFAWWON№97 strongly affected by water stress, GY reduction was not severe. The HI was on an average higher among genotypes of bread wheat than that durum wheat genotypes (Table 1). The highest HI was detected in genotypes Nurlu 99, Giymatli 2/17 and Pirshahin1 under both conditions. More profound reduction of HI under rain-fed condition was detected in genotypes Shiraslan 23, Tartar, Tale 38 and Gunashli. Positive and significant correlations were detected between DH and PH, PL, whereas correlations between DH and SL, GNS, GY were negative (Table 2). We found the highest correlation between PH and PL. GY strongly and positively correlated with BY and HI under both irrigated and rain-fed conditions. The drought indices such as STİ, MP, and GMP, YI, YSI were relatively higher in genotypes Garagylchyg 2, Sharg, Nurlu 99, Azamatli 95, Pirshahin 1, 4thFEFWSN№50 with relatively lower values of SSI and TOL indicated a drought resistance in these varieties (Table 3). The SSI and TOL were higher in genotypes Vugar, Barakatli 95, Alinja 84, Tartar, Tale 38, Akinchi 84 indicated a drought sensitivity in these genotypes. Y_p and Y_s were positively and significantly correlated with STI, MP, GMP (Table 4). The highest positive significant correlation was revealed between Y_s and YI.

Table 4. Correlation coefficient between grain yield, tolerance and susceptibility indices

	Yp	Ys	STİ	TOL	MP	GMP	SSİ	Yİ	YSİ
Yp	1								
Ys	0,402	1							
STİ	0,654**	0,788**	1						
TOL	0,604**	-0,487*	-0,062	1					
MP	0,853**	0,820**	0,857**	0,100	1				
GMP	0,767**	0,893**	0,870**	-0,045	0,988**	1			
SSİ	0,362	-0,699**	-0,287	0,955**	-0,172	-0,306	1		
Yİ	0,404	1,000**	0,787**	-0,485*	0,821**	0,894**	-0,698**	1	
YSİ	-0,355	0,705**	0,298	-0,953**	0,179	0,314	-1,000**	0,704**	1

DISCUSSION

Drought stress caused decrease of leaf gas exchange parameters, area and dry mass of leaves per stem, leaf area index, chlorophyll a, b, carotenoids content and relative water content of durum and bread wheat genotypes (ALLAHVERDIYEV, 2015), an increase in the content of osmotically active compound proline (ALLAHVERDIYEV, 2016). Some traits of yield (PH, SNS, SL and SW) were comparatively less sensitive, whereas the other traits (SN, SM, BY, GY) were more sensitive to water shortage in rain-fed plots. Water stress caused reduction in PH and PL of wheat genotypes. MIRBAHAR *et al*., (2009) also observed that PH in bread wheat genotypes reduced significantly under water stress when it was compared with irrigated. SINGH and SINGH (2001) opined that less reduction in PH in stress conditions may be an important adaptive mechanism for environments characterized as drought tolerant in moisture stress. The differences in PH resulted from a reduction in PL of all cultivars when exposed to drought stress (IZANLOO *et al*., 2008). Negative significant correlation of PH and PL with GY and HI leads to the thought that these traits are not desirable under irrigated condition. Correlation between PH and GY, PL and GY was positive non-significant under rain-fed condition. The positive relationship between GY and morphological traits (PH, PL, SL, SW) under water stress conditions indicated that low growth rate of plants is one of the limiting factors of yield (VILLEGAS *et al*., 2001). Therefore, genotypes with greater growth rate (early vigor) under rain-fed condition would provide higher yield (KHAMSSI, 2012). SN on an average was higher among genotypes of bread wheat than that durum wheat. Our result was in agreement with MOAYEDI *et al*., (2010). The highest SN of genotypes Gyrmyzy gul1 and 12ndFAWWON№97 could be due to high tillering capacity. Positive significant correlation of SN with GY was in agreement with GARCIA DEL MORAL *et al*. (2003) and PROTIC *et al*., (2009). SL is a desirable trait under rain-fed condition, positively correlated with GY. IFTIKHAR *et al*., (2012) reported positive significant correlation of SL with GNS and GY at both genotypic and phenotypic levels indicating its utility as direct selection criteria to improve yield (DENCIC *et al*., 2000). DENCIC *et al*. (2000) concluded that SNS are more sensitive to drought stress in different cultivars of wheat. However our results showed that SNS relatively stable under rain-fed condition. Under water stress conditions, SNS declined, a prominent reduction occurred (~11%) when stress was given at tillering stage (VESSAR *et al*., 2007). SM was very sensitive to drought stress, strongly correlated with GMS and GNS. BY strongly associated with GY under both irrigated and rain-fed conditions. CHANDLER and SINGH (2008) observed that GY and BY particularly showed maximum sensitivity to moisture stress. The decrease in TKM may be due to disturbed nutrient uptake efficiency and photosynthetic translocation within the plant that produced shriveled grains due to hastened maturity (KHAKWANI *et al*., 2011). High positive significant correlation of HI with GY indicates that progress in GY of modern durum and bread wheat genotypes could be achieved via increased HI (JATOI *et al*., 2011). Positive significant correlation of SW with SM, SNS, GNS, GMS and TKM indicates that this trait could be desirable selection criteria for improvement of durum wheat grain yield. In addition, higher BY, SN, HI are favorable traits under rain-fed condition. We consider that optimal PH is also desirable trait under rain-fed condition.

The significant and positive correlation of GY with STI, MP and GMP indicated that these indices were more effective in identifying high yielding genotypes under irrigated and rain-fed conditions (GOLABADI *et al*., 2006). Bread wheat genotypes were superior for to their yield and yield traits and tolerance to drought stress than that durum wheat. It is likely that the tolerance to the water stress of the bread wheat compared with the durum wheat is due to the D genome in the bread wheat (MEKLICHE *et al*., 2015). The D genome originated from Aegilops L. represents an important source of useful genes for wheat breeding with particular emphasis on biotic and abiotic stress resistance (BELKADI *et al*., 2003).

Different approaches (agronomical, morpho-physiological, biochemical, molecular markers) are used to estimate the tolerance of wheat genotypes. Researches with combined approaches will have more success for the identification of the different mechanisms of adaptation and tolerance, identification of more resistant genotypes.

CONCLUSIONS

Drought stress is unfavorable limiting factor for growth and grain yield of durum and bread wheat genotypes. Yield traits, which positively and significantly correlated with grain yield, were more vulnerable to water shortage. Generally, bread wheat genotypes were more tolerant to drought stress than that durum wheat genotypes. Drought tolerance and susceptibility indices are helpful for screening wheat genotypes.

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PRINOS I KOMPONENTE PRINOSA GENOTIPOVA TVRDE (*Triticum durum desf*.) I HLEBNE PŠENICE (*Triticum aestivum* L.) U USLOVIMA SUŠE

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Izvod

Vršena su ispitivanja efekta suš na prinos i komponente prinosa u poljskim uslovima Suša je izazvala značajno smanjenje visine biljaka (PH), dužine pondukla (Pl), broja klasova (SN), dužieu klasa ((SL), širine klasa (SW) broj klasića po klasu (SNS) masu klasa (SM), broj zrna po klasu, mase zrna po klasu, biološki prinos (BY), masu hiljadu zrna (TKM), prinos zrna(GY) i žetveni indeks- (HI). Osobine kao što su SN, SM, BY, TKM, GY su bile mnogo osetljivije u uslovima suše. Utvrđene su značajne pozitivne korelacije prinosa, (GY sa brojem klasova (SN) ibiološkog prinosa (BY) i žetvenog prinosa (HI) u uslovima kiše u polju. Genotipivi tvrde pšenice su osetljiviji na stres suše u odnosu na genotipove hlebne pšenice. Utvrđene su značajne i sa indeksom toleranttnosti na sušu (STI) pozitivne korelacije prinosa (GY),prosečnom produktivnosti (GMP) i ti pokazatelji su mnogo efektivniji u identifikaciji visoko prinosnih genotipova tolerantnih prema suši.

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