J. of Plant Production, Mansoura Univ., Vol. 13 (8):543 - 549, 2022

Journal of Plant Production

Journal homepage & Available online at: www.jpp.journals.ekb.eg

Evaluation of Grain Yield and Its Components of some Bread Wheat Promising Lines under Low Input Conditions in Upper Egypt Region

Cross Mark

Shaimaa E. Ibrahim*; M. M. Mohiy and Omnya M. A. El-Moselhy

Wheat Research Department, Field Crops Research Institute, ARC, Egypt

ABSTRACT

Twenty bread wheat (*Triticum aestivum* L.) genotypes were obtained from the Low Input Breeding Program at El Gemmeiza Agricultural Research Station. Four field experiments during two seasons 2017/2018 and 2018/2019 were done to evaluate these genotypes under normal and stress conditins at El-Mataana Agricultural Research Station. The experimental design was randomized complete block design, with three replications. Each season two experiments were done. The first experiment was represented normal conditions. Five times of irrigation with 70 Kg N/fed were used. However, the second experiment represented low input conditions two times of irrigation with 35 kg N/fed was used. The results indicated that low input had a significant effect on decreased heading and maturity dates. Results cleared that Shandaweel 1 had the best performance under both normal and low input condition. According to Stress Susceptibility Index (SSI) Misr 2 and Shandaweel 1 were considered as highest tolerant genotypes. Regarding to factor analysis two factors were identified under both normal and low input conditions. Each factor consists of the most effective characters. Results for cluster analysis obtained three major clusters of genotypes were classified under both normal and stress conditions. The first cluster which considered as high yielding genotypes was consisted of eleven genotypes namely Line 1, Line 8, Giza 171, Sids 14, Misr 2, Shandaweel 1, Line 5, Line 9, Line 7, Misr 3, and line 11 under normal conditions. Meanwhile, it consisted only of five genotypes namely Giza 171, Misr 2, Shandaweel 1, Misr3 and Sids 14 under low input conditions.

***Keywords**:* Wheat, Stress conditions, Correlation, Factor analysis, SSI.

INTRODUCTION

Bread wheat (*Triticum aestivum* L.) is the considered as the main cereal crops in Egypt. Seasonally, about 1.4 million ha of wheat is planted by wheat. Egypt's wheat production reached approximately 9 million tons. While, the consumption of wheat grains is about 19 million tons (MALR, 2021). The national wheat production is inadequate to meet our local consumption since no feasible increase in the area dependable to wheat in old lands and the solution seems to be maximizing production per unit area (vertical expansion) and expanding wheat area into new lands (horizontal expansion) which distinguished by its low fertility and low of available water as well as many other problems. In Egypt the dramatically increasing population is estimated to be increased 123 million by 2030 (FAO, 2017) which will increase wheat requests. Finally, all efforts were attentive on the development of the yield potential for increasing wheat yield productivity to meet wheat requests of the major population.

Currently horizontal expansion faces two major problems: the extra application of nitrogen fertilizer and increasingly demand of water. Meanwhile, the vertical expansion of wheat which mostly grown under traditional flood irrigation. Increasing wheat productivity of unite area usually correspond with requires extraordinary amounts of water. This is the main challenge facing Agricultural sector. Recently climate changes caused increasing in global water shortage. This increasing in water shortage will, also, impact the way in which N fertilizer is accessed by plants and crop productivity (Swarbreck *et al*., 2019).

Fertilizer application is also one of the crucial inputs, making a substantial donation to improving nutritional quality and yield. But unfortunately, too much nitrogen (N) is being applied and more than 50% is lost to the environment, which in the end causes environmental pollution destruction, (Ashraf *et al.* 2019) and (Adeel *et al.* 2021). Nitrogen and water deficit can affect grain yield differently but several researches reported linked effect of low N and low water availabilities for the Mediterranean-type environment of South Australia (Angus and Van Herwaarden 2001 and Sadras *et al.* 2012). Relatively little knowledge is available about the interaction of water and nitrogen stress and their effects. In the coming years, breeding programs must consider and select new cultivars from low inputs program. In this matter, screening for more drought tolerance and less N (low input) to produce tolerable yield under one or two irrigations after planting in all plant life, has become a new strategy in wheat breeding programs.

Studied the behavior of wheat grain yield and its components under water stress conditions could be associated in improving the breeding programs by using appropriate indices for selecting wheat genotype (Jaynes *et al*., 2003). Simulating performance of wheat under water stress is a big challenge facing wheat modelers, as a result to the wide variations in grain yield under normal and water stress conditions (Gupta *et al*., 2001). Thus, factor analysis could be a suitable method. It is a multivariate

* **Corresponding author.**
E-mail address: shaimaaeldesoky729@yahoo.com
DOI: 10.21608/jpp.2022.146996.1137

analysis method that can studied the correlation between a large number of variables. This method can be used to estimate the components of yield and identify the vertical variables among the traits (Bramel *et al*., 1984).

The objective of the present investigation is to identify superiority of some promising lines that could be used under low- input stress in upper Egypt region.

MATERIALS AND METHODS

Experimental location:

The field experiments were carried out at the Experimental Farm of El-Mataana Agricultural Research Station, ARC, Egypt. - Luxor Governorate located at 25◦25'18"N 32◦32'06"E.

Plant material:

Thirteen promising lines of bread wheat (*Triticum aestivum* L.) were obtained from the Low Input Breeding Program at El Gemmeiza Research Station were evaluated with seven commercial cultivars. The name, selection history and origin of these twenty bread wheat genotypes are presented in Table 1.

Table 1. Name, pedigree, selection history and origin of wheat genotypes used for the experiment.

Name	Pedigree and selection history	Origin
Line1	SAAR/WBLL1// KAMB1*2/BRAMBLING CGM11-103743-5GM-3GM-OGM	EGYPT
2	Sids7/5/SAKHA12/5/KVZ//CNO67/PJ62/3/YD"s"/BLO"s"/4/K134/(60)/VEE/6/WAXWING/4/SNI/TRAP#1/3/KAUZ*2/TRAP//KAUZ CGM11-103803-1GM-1GM-0GM	EGYPT
3	CHILERO2/Gemmeiza3/6/Sids7/5/SAKHA12/5/KVZ//CNO67/PJ62/3/YD"s"/BLO"s"/4/K134/(60)/VEE CGM10-103517-1GM-4GM-2GM-OGM	EGYPT
4	FRET2*2/BRAMBLING/ 3 / HUBARA-5//BORL95/LAJ3302 CGM10-103520-2GM-2GM-4GM-OGM	EGYPT
5	CROC_1/AE.SQUARROSA(205)//BORL95/3/PRL/SARA//TSI/VEE#5/4/FRET2/5/WBLL1*2/BRAMBLING CGM10-103530-2GM-1GM-1GM-OGM	EGYPT
6	JADEED-5// KAMB1*2/KIRITATI CGM10-103640-2GM-1GM-1GM-OGM	EGYPT
7	KIRITATI/2*WBLL1/4 / OASIS/SKAUZ//4*BCN/3/2*PASTOR CGM10-103648-2GM-2GM-3GM-OGM	EGYPT
8	GEMMEIZA#11/4/CMH74A.630/SX//CNO79/3/SW89-5124*2/FASAN CGM09-10337-2GM-1GM-2GM-2GM-OGM	EGYPT
9	OTUS/3/SARA/THB//VEE /4/ GIZA#168 CGM09-10369-3GM-1GM-1GM-1GM-OGM	EGYPT
10	MILAN/DUCULA/7/CMH83.2517/ELVIRA/6/CMH79A955/4/AGA/3/4*SN64/CNO67//INIA66/5/NAC CGM09-10377-2GM-1GM-3GM-1GM-OGM	EGYPT
11	MAT/2*SKAUZ/3/KAUZ//KAUZ/STAR/4/WAXWING*2/KRITATI CGM10-103652-3GM-2GM-3GM-OGM	EGYPT
12	TEG/NEIXIANG.184//ELVIRA/5/SAKHA69/Seri82//SARHAD/3/PLO/TR810328/4/GIZA 168 CGM08-10169-3GM-2GM-1GM-1GM-1GM -OGM	EGYPT
13	TAG/GAMFRENCH/11/FLORKWA2/10/MAYA/YD/6/HK/MDA38/4/4777/3/REI//Y/KT/5/YR/7/KOEL/8/MOR/BOW/9/SERI CGM08-10196-4GM-1GM-3GM-3GM-2GM-OGM	EGYPT
Gemmeiza 12	OTUS/3/SARA/THB//VEE CCMSS97Y00227S-5Y-010M-010Y-010M-2Y-1M-0Y-0GM	EGYPT
Sakha 95	PASTOR//SITE/MO/3/CHEN/AEGILOPSSQUARROSA (TAUS)//BCN/4/WBLL1 CMSA01Y00158S-040P0Y-040M-030ZTM-040SY-26M-0Y-0SY-0S	EGYPT
Giza 171	SAKHA 93/GEMMEIZA 9 S.6-1GZ-4GZ-1GZ-2GZ-0S	EGYPT
Misr 2	SKAUZ/BAV92. CMSS96M03611S-1M-010SY-010M-010SY-8M-OY-OS.	EGYPT
Misr 3	ATTILA *2/PBW65*2/KACHU CMSS06Y00582T099TOPM-099Y099ZTM-099Y099M-10WGY-0B0- 0EGY	EGYPT
Shandaweel 1	SITE//MO/4/NAC/TH.AC//3*PVN/3/MIRLO/BUC CMSS93B00567S-72Y-0 10M-0 10 Y-0 10M-0HTY-0SH.	EGYPT
Sids 14	BOW"S"/Vee"S"//Bow"S"/TSI/3/Beni Sweef 1 SD293-1SD-2SD-4SD- Osd	EGYPT

Experimental procedure:

Randomized complete block design, with three replications were used to evaluate these genotypes during two seasons 2017/2018 and 2018/2019. The sowing dates were 23rd and 25th November, respectively. Each season two experiments were done. The first experiment is represented normal conditions. A recommended of nitrogen fertilization (70 Kg/fed) and irrigation (five irrigations) were used. The second experiment was represented stress condition under low nitrogen and irrigation. Only 35 Kg N /fed and Two irrigations were used through the whole growing season. The first irrigation was at planting and the second one was surface irrigation after 45 days from the establishment. The experimental plot consisted of 6 rows, each row was 3.5 m long and 20 cm apart.

Data collection:

Data for number of days from planting to heading (DH), number of days from planting to maturity (DM), plant height (PH, cm), No of spikes/m^2, No. of kernels/spike, 1000 kernels weight (g) and grain yield(ard/fad.) were estimated.

Data analysis:

Seasonally, collected data was subjected to individual analysis of variance (ANOVA). Levene (1960) was performed to test the homogeneity of individual error before doing the combined analysis over two seasons and environments. The combined ANOVA over seasons and environments was done using the generalized linear model procedures. ANOVA, appropriate for the specified experimental design performed according to Gomez and Gomez (1984) for each season with Gen-Stat (Version-2017) computer program (Payne *et al*., 2015). Differences among means were tested by LSD multiple range tests at 5% probability level. The analysis of variance and Pearson's correlation coefficients were calculated, then factor analysis of major factors analysis was done. The experimental data were analyzed statistically using Statistical Package for Social Sciences (SPSS) software (Version 25).

Stress susceptibility index (SSI): was calculated for each genotype based on the grain yield using the following formula (Fisher and Maurer, 1978).

Where:

SI is Stress Intensity= 1- (GYs / Gyp)

GYs is the mean of cultivar under stress condition, GYp is the mean of cultivar under non stress condition, GYs and GYp are the mean yields of all genotypes under stress and non-stress conditions, respectively.

RESULTS AND DISCUSSION

Yield Analysis and ANOVA

Results from Table 2 reported highly significant differences for seasons, environments, genotypes. In addition, their interactions had significant effect for most studied characters except the interaction between seasons, stress and genotypes which had significantly effects only on days to maturity. Data in Table 3 illustrated the mean values for the studied genotypes during the two seasons under normal and low input environments for all studied characters. Results indicated that low input environment had a significant effect on decreased heading dates by 10 days. Days to heading ranged from 72 days (line 2) to 80 days (Misr2) under Low input conditions. While it ranged from 82 days (line 4) to 89 days (Misr 2) under normal conditions. Similar trend was obtained by maturity dates. The earliest maturity was obtained from Line 2 (121 days), while Shandaweel 1 was the latest maturity (132 days) at low input conditions.

Table 2. Combined analysis of variance for grain yield and yield component over two seasons and environments.

S O V	df	HD	MD	PH	NSP/m^2	NK/SP	TKW	GY
Season	1	147.26**	683.44 **	2350.00 **	11690.10 **	680.07 **	128.56 **	195.22 **
Error	4	2.492	1.742	2.94	1681.80	57.25	27.85	20.93
Environments	1	6386.017**	7718.00 **	3382.50 **	579871.70 **	4734.82 **	5123.58 **	2321.67 **
Season * Environment	1	2.39*	47.70 **	424.00 **	495.94 **	228.15 **	82.88 **	12.47 **
Error	4	2.308	0.65	8.96	241.00	11.66	7.02	3.74
Genotypes	19	56.36**	94.73 **	502.12 **	2084.82 **	110.87 **	120.54**	210.05 **
Season * Genotypes	19	1.28	0.64	8.68 *	62.27	4.47	1.28	1.72
Environment * Genotypes	19	5.75 **	14.06 **	15.75 **	69.55	11.36	14.436 **	7.48 **
Season * Env * Genotypes	19	1.52	0.73 *	6.46	50.21	1.71	0.80	1.46
Error	152	1.93	0.67	8.96	241.00	11.66	7.02	3.74

*** and **. significant at the 0.05 and 0.01 level, respectively.**

Table 3. Means of Yield and Yield Components under Normal and Low input Conditions over Two Seasons.

Genotypes	DH (day)		DM (day)		PH (cm)		NSP		NKS		TKW (g)		GY (ard/fed)	
	Normal	Low input	Normal	Low input	Normal	Low input	Normal	Low input	Normal	Low input	Normal	Low input	Normal	Low input
Line 1	87	76	139	123	117	109	419	314	49	40	42.13	34.13	39.25	29.47
Line 2	81	72	133	121	97	92	398	297	44	37	51.78	37.79	29.47	24.69
Line 3	84	73	134	124	103	95	406	310	45	35	49.21	36.78	30.61	23.33
Line 4	80	73	136	126	103	93	412	309	41	35	49.29	37.73	31.16	23.84
Line 5	83	75	138	127	110	99	403	301	42	35	44.84	34.50	34.92	28.76
Line 6	82	73	132	124	118	112	401	306	42	34	50.52	39.11	32.70	27.07
Line 7	85	74	139	125	109	97	397	302	46	37	45.75	36.21	36.26	28.86
Line 8	88	76	139	127	95	90	380	289	45	34	48.31	37.48	37.59	30.26
Line 9	83	74	138	127	101	91	406	301	48	37	44.11	35.21	37.49	29.44
Line 10	86	75	138	128	98	92	402	302	46	35	43.93	34.33	27.55	22.66
Line 11	85	74	141	128	100	93	397	303	43	34	41.45	33.24	33.16	25.35
Line 12	86	75	138	124	108	102	395	303	40	34	42.86	33.77	30.13	23.83
Line 13	85	75	138	126	100	95	410	307	43	35	42.31	33.07	28.31	21.03
Gemmeiza 12	87	74	141	126	100	95	405	302	45	37	43.63	37.29	26.39	22.72
Sakha 95	88	77	141	129	108	102	395	301	46	34	39.71	31.81	28.69	22.91
Giza 171	88	77	139	129	110	99	427	321	53	42	51.48	41.70	38.15	32.94
Misr 2	89	80	143	131	115	106	421	327	52	41	47.53	42.01	38.14	35.71
Misr 3	86	76	140	132	103	98	409	316	48	40	43.87	35.46	35.23	29.11
Shandaweel 1	86	76	142	132	109	103	442	345	49	40	39.04	33.88	39.19	36.54
Sids 14	88	78	139	131	113	105	425	327	49	41	42.27	33.66	36.61	30.49
Mean	85	75	138	127	106	98	408	309	46	37	45	36	34	27
L.S.D stress	0.497		0.291		1.080		5.60		1.232		0.956		0.697	
L.S.D variety	1.572		0.919		3.414		17.708		3.895		3.022		2.206	
L.S.D stress*variety	2.223		1.300		4.829		25.043		5.508		4.273		3.12	

Meanwhile, Line 6 was the earliest maturity (132 days), and Misr 2 was the latest maturity (143 days) under normal conditions. Plant height is one of important traits in wheat breeding. The moderate height genotypes have documented as wide resistance to lodging and also produce great response to fertilizer uptake. Line 8 recorded 95 and 90 cm under both normal and low input conditions, respectively, and were to be the shortest genotype. According to number of spikes/plant shandaweel 1 recorded the greatest value 442 and 345 spikes under normal and low input conditions, respectively.

Meanwhile, Giza 171 had the greatest number of kernels/ spike under both environments. For thousand kernel weight, the heaviest kernels value was obtained from line 2 without significant different with Giza 171 under normal conditions while, Misr 2 had the heaviest kernels value under low input conditions. Regarding to grain yield Line 1 had a good performance under normal condition without significant differences among Shandaweel 1. Moreover, Shandaweel 1 had the best performance under both normal and low input condition.

Stress Susceptibility Index (SSI)

SSI results, shown in Table 4 indicated that variation reaction of the 20 examined wheat cultivars under normal and Low input conditions were detected. The examined genotypes might be grouped according to their performance under normal and low input conditions as follows: 1. Tolerant cultivars (with SSI lower than 0.5)

2. Moderately tolerant cultivars (0.5 ≥ SSI ≤ 1.0)

3. High susceptible cultivars (SSI ≥ 1.0).

Table 4. Stress susceptibility index (SSI) estimates based on grain yield for the twenty bread wheat genotypes under normal and low input conditions.

Genotype	SSI	Genotype	SSI
Line 1	1.35	Line 11	1.28
Line 2	0.88	Line 12	1.13
Line 3	1.29	Line 13	1.39
Line 4	1.27	Gemmeiza 12	0.75
Line 5	0.96	Sakha 95	1.09
Line 6	0.93	Giza 171	0.74
Line 7	1.11	Misr 2	0.35
Line 8	1.06	Misr 3	0.94
Line 9	1.16	Shandaweel 1	0.37
Line 10	0.96	Sids 14	0.91

Results indicated that according small values of SSI Misr 2 and Shandaweel 1were considered as highest tolerant genotypes. They recorded the 0.35 and 0.37, respectively. Several researches reported that the highest tolerant genotypes, which could be grown under stress conditions without a noticeable reduction in their yield (Anwar *et al*., 2011 and Ali and El- Sadek, 2016).

The best genotypes are followed by, Giza 171, Line 2, Gemmeiza 12, Sids 14, Line 10, Misr 3, Line 5, 6 and 12. Thus these genotypes were considered as moderate tolerant genotypes (0.5 ≥ SSI ≤ 1.0). On the other hand, Sakha 95 and the lines,1,3,4,9,11,12 and 13 were considered as sustainability genotypes to stress conditions with values for SSI greater than 1 (Clarke *et al.* 1992).

Correlation Analysis

Results of correlation analysis for studied variables under normal conditions obtained highly positive correlation between heading dates and maturity dates (DM), plant height (PH), No. of kernels/spike and grain yield with values 0.637**, 0.322**, 0.499** and 0.244**, respectively (Table 5). Also, highly positive correlation was detected between maturity dates and plant height, no. of spikes / m2 and grain yield with a value (0.392**), (0.363**) and (0.336**) respectively. Meanwhile, maturity dates had a highly negative correlation with 1000 – kernel weight (-0.239**). Data showed highly significant positively correlated between Plant height and no. of spikes/m2 (0.438**), no. of kernels/spike (0.403**) and grain yield (0.436**). Moreover, positive and highly significant between no. of spikes /m2 and no. of kernels/spike (0.392**) and grain yield (0.270**) . Also, high positive correlation was detected between no. of kernels/spike and grain yield (0.472**). These results obtained the influence of these characters in increasing the grain yield. Thus, it can help the plant breeder to make his selection decision based on the relative importance of these traits (Dokuyucu and Akkaya, 1999). Positive significant correlation between grain yield and number of spikes per plant was detected by some of researches (Kahrizi *et al*., 2010 and Naghavi *et al.* 2015).

Table 5. Pearson's correlation coefficients (r) between studied characters under normal conditions.

Traits	DH	DM	Plant Height	No of spikes /m^2	No of kernels / spike	1000 kernel weight	Grain yield (ard/ fed)
Days to heading(DH)	1	0.637**	0.322**	0.129	0.499**	-0.172	0.244**
Days to maturity (DM)		1	0.392**	0.363**	0.537**	-0.239**	0.336**
Plant height (PH)			1	0.438**	0.403**	0.096	0.436**
No of spikes /m^2				1	0.392**	0.012	0.270**
No of kernels / spike					1	0.161	0.472**
1000 kernel weight						1	0.093
Grain yield (ard/ fed)							1

*** and **. Correlation is significant at the 0.05 and 0.01 level, respectively.**

Data of correlation analysis under low input condition showed highly significant and positive correlation between days to heading and plant height, no. of spikes/m^2, no. of kernels/spike and grain yield. However, low correlation value between days to maturity and all studied characters was obtained. On the other hand, plant height had highly positive correlation with no of spikes /m^2, no. of kernels/spike and grain yield. Moreover, highly significant and positive correlation was detected between No. of spikes/m^2 no. of kernels/spike and grain yield. In addition, No. of kernels/ spike had high significant positive correlation for 1000-kernel weight and for grain yield. Similar trend was detected between the correlation results were also in agreement with (Agrama, 1996; Thapa *et al.* 2009; Kahrizi *et al*., 2010; Ojha,2012, and Naghavi *et al.* 2015).

Table 6. Pearson's correlation coefficients(r) between studied characters under low input conditions.

Traits	DH	DM	Plant Height	No. of spikes/m^2	No. of kernels/spike	1000 kernel weight	Grain yield ard/fed
Daysto heading(DM)	1	-0.056	0.462**	0.437**	.328**	.083	.484**
Daysto maturity(DM)		1	-0.107	-0.118	-0.120	-0.112	-0.007
Plant Height (Ph)			1	0.445**	0.288**	0.048	0.341**
No of spikes/m^2				1	0.410**	0.120	0.310**
No of kernels/spike					1	0.282**	0.441**
1000 kernel weight						1	0.223*
Grain yield ard/fed							1

Factor analysis

Factor analysis is multivariate statistical analysis used to identify the most important characters due to correlation coefficient among different characters. It a tool used to indirect selection through indices and removing ineffective characters (AL-Doss *et al*., 1997, and Tadesse and Bekele, 2001). For the current research, two factors were identified under both normal and low input condition. Each factor consists of the most effective characters. They explained 42.644% and 61.144% of total variance in normal conditions and explained 43.772 and 60.086% of total variance in stress conditions (Tables 7 and 8).

Table 7. Factor analysis for studied traits in wheat genotypes under normal conditions.

Traits	Component		Communalities
	Factor 1	Factor 2	
No of kernels / spike	0.797	0.151	0.658
Days to maturity (DM)	0.793	-0.390	0.781
Plant height (PH)	0.700	0.264	0.559
Days to heading (DH)	0.688	-0.441	0.668
Grain yield ard/ fed	0.641	0.299	0.500
No of spikes /m^2	0.589	0.229	0.399
1000 kernel weight	-0.023	0.845	0.715
Eigenvalues	2.985	1.295	
% of Variance	42.644	18.500	
Cumulative %	42.644	61.144	

Table 8. Factor analysis for studied traits in wheat genotypes under low input conditions.

	Component		Communalities
	Factor 1	Factor 2	
Days to heading (DH)	0.795	-0.249	0.694
Days to maturity (DM)	0.723	-0.364	0.655
Plant height (PH)	0.620	-0.102	0.395
No of spikes/m^2	0.709	-0.052	0.505
No of kernels/spike	0.657	0.387	0.581
1000 kernel weight	0.240	0.876	0.825
GY ard/fed	0.730	0.133	0.551
Eigenvalues	3.064	1.142	
% of Variance	43.772	16.314	
Cumulative %	43.772	60.086	

First factor included plant height (PH), no. of spikes/m^2, no. of kernels/spike and grain yield under normal condition. Thus, these characters can be used in selected to improve yielding for genotypes. Second Factor 2, which consisted of 18.500 % of the total variation, was mainly composed of 1000 kernel weight. These results, obtained the important of this character in improving the grain yield of genotypes. Similar results were obtained under stress conditions. The first factor which consisted of 43.722% of total variation. This factor included No. of days to heading (DH), and to maturity (DM), plant height (PH), no. of spikes /m^2, no. of kernels/spike and grain yield. Meanwhile, Factor 2, which presented 16.314 % of the total variation, was mainly composed of 1000 kernels weight. Thus, these results clear the important of thousand kernels weight in selection under normal and stress conditions. Meanwhile the other characters were less effective in selection.

Cluster analysis:

Cluster analysis was used to classify genotypes based on the correlation between their importance characters. Figure 1 obtained the cluster dendrogram under normal condition. The genotypes were grouped in three major clusters. Each cluster contained highly similar genotypes. The first cluster consisted of eleven genotypes namely Line 1, Line 8, Giza 171, Sids 14, Misr 2, Shandaweel 1, Line 5, Line 9, Line 7, Misr 3, and line 11. They considered as a high yielding group. The second major cluster consisted of four genotypes that namely Line 2, Line 3, Line 4 and Line 6. Which considered as moderately high yielding genotypes. Last major cluster consisted of four genotypes namely Line 10, Line 13, Line 12 and the Sakha 95 which considered as low yielding genotypes.

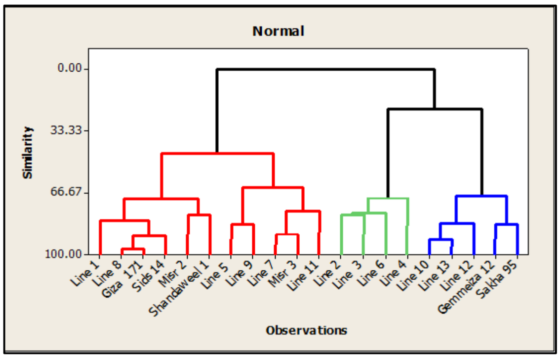

Fig. 1. Dendrogram showing the classification of genotypes under normal conditions.

Similar results are performed under low input condition. Three major clusters of genotypes are classified by cluster analysis (Figure 2). First cluster consists of five genotypes namely Giza 171, Misr 2, Shandaweel 1, Misr3 and Sids 14. They considered as a high yielding genotypes. Second group included Line 1, Line 6, Line 7, Line 5, Line 9, Line 8 and Line 2 they considered as moderately yielding genotypes. The third group was consisted of Lines 3, Line 12, Line 4, Gemmeiza 12, Line 13, Line 10, Sakha 95 and Line 11 were performed as low yielding genotypes. The results cleared that Giza 171, Sids 14, Misr2, Shandaweel1 and Misr 3 were the performed good under normal and low input conditions.

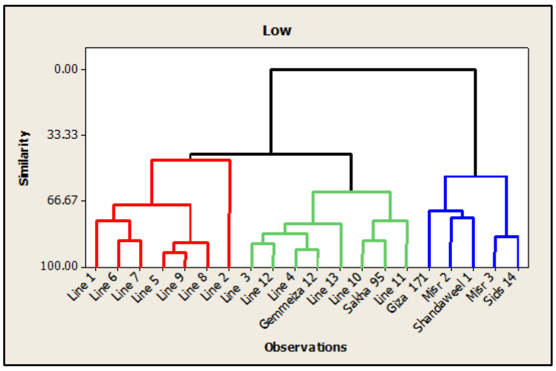

Fig. 2. Dendrogram using Euclidean Distance among groups showing the classification of genotypes under low input conditions

CONCLUSION

According to the results of this study Shandaweel 1 and Misr 2 can be selected to planting under low irrigation and nitrogen fertilization conditions (low input). Meanwhile, Sakha 95, Giza 171, Line 2, Gemmeiza 12, Sids14, Line 10, Misr 3, Line 5 and Line 12 can be selected as a moderately tolerant cultivars moderate tolerant nitrogen and irrgation stresses. In contrast, line 1, line6 and line 4 were the most susceptibile genotypes.

REFERENCES

Adeel, M.; T. Farooq; J. C. White; Y. Hao; Z. He and Y. Rui(2021). Carbon-based nanomaterials suppress tobacco mosaic virus (TMV) infection and induce resistance in Nicotiana benthamiana. J. Hazard Mater., 404, 124167.

Agrama H. A. S. (1996). Sequential path analysis of grain yield and its components in maize. Plant Breeding 115(5):343-346.

Al-Doss A. A., A. M. Assaeed and A. A. Al-Qarawi (1997). Multivariate analysis of seedling survival and establishment and their related growth attributes in Hammada elegans. J of King Saud Univ. Agri. Sci. 9(2): 247-256.

Ali, M. B. and A. N. El-Sadek (2016). Evaluation of drought tolerance indices for wheat (*Triticum aestivum* L.) under irrigated and rainfed conditions. Commun. Biom. Crop Sci., 11: 77-89.

Angus J. and A. Van Herwaarden (2001). Increasing water use and water use efficiency in dryland wheat. Agron. J. 93:290–298.

Anwar J., G.M. Subhani, M. Hussain, J. Ahmad, M. Hussain and M.Munir (2011). Drought tolerance indices and their correlation with yield in exotic wheat genotypes. Pak. J. Bot., 43(3): 1527-1530.

Ashraf, M. N.; T. Aziz; M. A. Maqsood; H. M. Bilal; S. Raza; M. Zia; A. Mustafa; M. Xu and Y. Wang, (2019). Evaluating organic materials coating on urea as potential nitrification inhibitors for enhanced nitrogen recovery and growth of maize (*Zea mays*). Int. J. Agric. Biol., 22, 1102–1108. 21.

Bramel, P. J., P. N. Hinnz, , D. E. Green and R. M. Shibles, (1984). Use of principal factor analysis in the study of three stem termination types of soybean. Euphytica,33,387- 400.

Clarke, J. M., R. M. De Pauw and T. M. Townley-Smith (1992)Evaluation of methods for quantification of drought tolerance in wheat. Crop Sci. 32, 728–732.

Dokuyucu, T. and A. Akkaya, (1999). Path coefficient analysis and correlation of grain yield and yield components of wheat (*Triticum aestivum* L.) genotypes. RACHIS Newsletter, 18, 17-20.

FAO, (2017). The future of food and agriculture trends and challenges. Rome. ISBN 978-92-5- 109551-5.

Fisher, R.A. and R. Maurer (1978). Drought resistance in spring wheat cultivars. I. Grain yield responses. Aust. J. Agric. Res., 29: 897-912.

Gomez, K.A. and A.A. Gomez (1984). Statistical procedures for agricultural research (2nd ed.). John Wiley and Sons, New York, 680p.

Gupta N.K., S. Gupta and A. Kumar (2001). Effect of water stress on physiological attributes and their relationship with growth and yield of wheat cultivars at different stages. J. Agronomy & Crop Science 186, 55–62.

IBM Corp. Released (2017). IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.

Jaynes, D. B., T. C. Kaspar, T. S. Colvin, and D. E. James, (2003). Cluster analysis of spatio temporal corn yield pattern in an Iowa field. Agronomy Journal, 95(3), 574-586. doi:10.2134/agronj2003.0574

Kahrizi, D., M. Maniee, R. Mohamadi, and K. Cheghamirza, (2010). Estimation of genetic parameters related to morpho-agronomic traits of Durum Wheat (*Triticum turgidum var. durum*). Biharean Biologist, 4(2), 93-97.

Levene, H. (1960). Robust Tests for Equality of Variances. to contribution to Probability and Statistics. (Edited by I. Olkin, *et al.*) Stanford: Stanford University Press, Chapter 25. pp. 278-292.

MALR, Ministry of Agriculture & Land Reclamation (2021). Bulletins of Food Ballance Sheet (2000-2019); Ministry of Agriculture & Land Reclamation (MALR): Cairo, Egypt, 2021.

Naghavi, M. R., M. Toorchi, M. Moghaddam, and M. R. Shakiba, (2015). Evaluation of diversity and traits correlation in spring wheat cultivars under drought stress. Notulae Scientia Biologicae, 7(3), 349-354. doi:10.15835/nsb.7.3.9592.

Ojha B.R. (2012). On-farm evaluation of yield and yield attributing traits of promising wheat genotypes at mid-western hills of Nepal. Journal of Plant Breeding, 7: 3-14.

Payne, R.W., Murray, D.A., Harding, S.A. , Baird, D.B., Soutar, D.M. (2015). Introduction to Gen-Stat for Windows (18th Edition). VSN International, 2 Amberside, Wood Lane, Hemel Hempstead, Hertfordshire HP2 4TP, UK.

Sadras V.O., C. Lawson, P. Hooper, and G.K. McDonald (2012). Contributi on of summer rainfall and nitrogen to the yield and water use efficiency of wheat in mediterranean-type environments of South Australia. Eur J Agron 36:41–54.

Swarbreck S.M., M.Wang, Y. Wang, D. Kindred, R .Sylvester-Bradley, W. Shi, S. Varinderpal, A.R. Bentley and H. Griffiths (2019). A roadmap for lowering crop nitrogen requirement. Trends Plant Sci. 24: 892–904.

Tadesse W. and E. Bekele (2001). Factor analysis of yield in grass pea (*Lathyrus sativus* L.). Lathyrus Lathyrism Newsletter., 2: 416-421.

Thapa D. B., R. C. Sharma, A. Mudwar, G. Ortiz-Ferrara, S. Sharma, R. K. Basnet, J. R. Witcombe, D. S. Virk, and K. D. Joshi (2009). Identifying superior wheat cultivars in participatory research on resource poor farms Field Crops Research. 112 (2): 124-130.

تقييم محصول الحبوب ومكوناته فى بعض السلالات المبشرة من قمح الخبز تحت ظروف المدخلات الاقل فى منطقة مصر العليا

شيماء الدسوقي إبراهيم ، محمد محى الدين محمد و امنية محمود امين المصيلحى

قسم بحوث القمح ـ معهد بحوث المحاصيل الحقلية ـ مركز البحوث الزراعية – مصر

الملخص

تم الحصول على عشرين تركيبًا وراثيًا من قمح الخبز من برنامج التربية للمدخلات الأقل بمحطة البحوث الزراعية بالجميزة، وتم تنفيذ التجربة فى محطة البحوث الزراعية بالمطاعنة. تم تنفيذ ٤ تجارب حقلية خلال موسمي الزراعة ٢٠١٨/٢٠١٧ و٢٠١٩/٢٠١٨ لتقييم قدرة هذه التراكيب على استخدامها كمصادر لاستنباط أصناف من قمح الخبز تحت ظروف المدخلات الأقل. استخدم تصميم القطاعات كاملة العشوائية في ثلاث مكررات. التجربة الأولى (الظروف العادية– تجربة المقارنة) تم ريها بـــ ٥ ريات خلال الموسم وتم اضافة جرعة السماد النيتروجينى الموصى بها (٧٠ كجم نيتروجين للفدان). أما التجربة الثانية – تجربة المدخلات الأقل (الاجهاد المائي والتسميدي) تم اعطاء جرعة التسميد وكانت ٣٥ كجم نيتروجين للفدان مع الرية الأولى ثم رية المحاياة بعد ٤٥ يوم من الزراعة (ريتان خلال الموسم). أشارت النتائج إلى أن المدخلات الاقل لها تأثير معنوى على تقليل عدد الأيام حتى الطرد وعدد الأيام حتى النضج. وأوضحت النتائج أن الصنف شندويل ١ كان الأفضل تحت كلا من الظروف المثلى وظروف المدخلات الأقل. كما أوضحت النتائج أن التركيبين الوراثيين شندويل ١، مصر ٢ كانا الأكثر قدرة على التحمل وذلك طبقا لدليل الحساسية. وأشار التحليل العاملى المرتبط بتحليل المكونات الأساسية إلى وجود عاملين. أظهر التحليل العنقودى لاختبار وتقسيم التراكيب الوراثية تحت كلا من الظروف العادية وظروف المدخلات الأقل. احتوت المجموعة الأولى على ١١ تركيب وراثى عبارة عن السلالة رقم ١، ٨، الصنف جيزة ١٧١، سدس ١٤، مصر ٢، شندويل ١ والسلالة ٥،٩،٧ والصنف مصر ٣ والسلالة ١١. وبالتالى كانت هذه التراكيب هى الأعلى انتاجية تحت الظروف العادية. في حين احتوت على خمسة تراكيب عالية الانتاجية وهى جيزة ١٧١، مصر ٢ ، شندويل ١ ، مصر ٣ وسدس ١٤ تحت ظروف المدخلات الأقل .