171
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SCREENING BREAD WHEAT GENOTYPES FOR DROUGHT TOLERANCE 1- GERMINATION, RADICAL GROWTH AND MEAN PERFORMANCE OF YIELD AND ITS COMPONENTS

[14]

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ABSTRACT

Seed germination decreased as osmotic potential became more negative. Inhibition of seed germination was greatest under the lowest osmotic potential, - 1.5 MPa. Cumulative germination after ten days ranged from 52.6% to 97.9% for the control compared to 27.4% to 69.8% at -1.5 MPa indicating more pronounced differences among genotypes at the lower osmotic potentials. Accordingly, ten bread wheat genotypes were selected and significantly varied for all traits tested under different irrigation treatments in each location. Reduction percentages for different studied traits under water stress treatments relative to control treatment was detected and susceptibility index was also calculated for each genotype under severe water stress treatment. The superior lines No.'s 27,13,15 and 5 had the highest grain yield/plant under severe treatment in both locations. The higher yielding capability of these genotypes obtained under drought stress may be primarily due to its higher yield potential under nonstress conditions and maximize production of number of spikes/plant and number of grains/spike under water stress conditions. The main effect of irrigation treatments was not significant for susceptibility index (S) of grain yield/plant under both environments tested, indicating that (S) was not affected by increasing water stress intensity. S values ranged from 0.924 for G1 to 1.54 for the local check variety G10.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is the world's most important crop. A crop of wheat is harvested somewhere in the world during every month of the year **(Briggle, 1980)**. Therefore, wheat is grown in so many different regions of the world. Wheat is considered to be the major cereal crop in Egypt as well as several other countries. Greater importance of bread wheat can be expected as a main source of food for the increasing populations of the world. It has many natural advantages as food, providing almost 20% of the total calories of man's nutrient requirements. The decreasing gap between production and consumption necessitates increasing wheat production in Egypt. Increasing of cereal crops is an important national goal to face the increasing food needs of Egyptian population.

The main objectives of the present study are

1- Screening and selection for Laboratory characteristics (germination experiment) related to drought resistance
2- Evaluating performance and degree of stress tolerance of the ten selected bread wheat genotypes tested under suitable and soil moisture deficit conditions.

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MATERIALS AND METHODS

Laboratory experiments

The germination experiments were carried out in betry dishes with tightly fitting lids in a germination chamber. The material used in this study included 30 bread wheat genotypes collected from different sources, 7 local landraces from North and Mid Sinai in addition to 22 selected introduced genotypes from ICARDA and the Local check (Sakha 69) which used as comparing variety. The pedigree and origin of the studied bread wheat genotypes are given in **(Table 1).**

Mannitol was used as an osmotic substrate to prepare aqueous solutions having 0.5, 1.0 and 1.5 atmospheres of osmotic potential. The concentrations of mannitol were calculated from the following formula.

$$P = g\,R\,T/mV \text{ , Where}$$

P = osmotic potential in atmosphere
g = grams of mannitol
R = 0.0825 liter atmospheres per degree per mole
T = absolute temperature
m = molecular weight of mannitol
V = volume in liters.

The radical length of 25 seedlings were measured at the end of ten days. In order to characterize the rate of seed germination in different osmotic potentials. Results were expressed in terms of a promptness index (P.I.).

$$PI = [nd1\ (7 - D1)] + [nd2\ (7 - D2)] + - - + [nd6\ (7 - D5)] \text{ , Where}$$

D = number of the day of observation, counting as 0 the day on which the test was begun,
nd = number of seeds observed to germinate on day of observation D.

A germination stress index (GSI), as described by Bouslama and Schapaugh (1984), was expressed in percent as follows

$$\frac{\textit{Promptness index of stressed seeds (PIS)}}{\textit{Promptness index of control seeds (PIC)}} \times 100$$

The data were analyzed as a randomized complete block design with four replications according to **Gomez and Gomez (1984).**

Field experiments

The present investigation was executed at the Experimental Farms, Faculty of Agricultural & Environmental Sciences, at two location (El Arish & Rafah) - Suez Canal University during rain-fed growing season (2006 / 2007). The material used in this experiment included 9 bread wheat genotypes that showed high tolerance to mannitol stress in the previously experiment and Local check (Saka 69) as comparative variety. Some selected physical and chemical properties of the soil are presented in **Table (2).**

Tow field experiments were conducted in split blocks design with four replicates was employed. Irrigation treatments were arranged in main plots and bread wheat genotypes were randomly distributed in sub-blocks. Each plot consisted of 5 rows. The row length was 2 m, row to row spacing was 0.2 m and plant to plant distance was 0.1 m. The recommended cultural practices for wheat production where followed according the local growers, except irrigation. Total rainfed during 2006/ 2007 growing season were 79.95mm. and 123.12mm. at Arish and Rafah locations, respectively. Four irrigation treatments were conducted in the investigated soils as follow:

T1: Rainfall according to ordinary seasons
T2: irrigation at 50 % of F.C.
T3: irrigation at 65 % of F.C.
T4: irrigation at 80 % of F.C.

RESULTS AND DISCUSSION

Analysis of variance indicates differences between genotypes in cumulative germination, and radical length after ten days of germination at different levels of osmotic potential **(Table 3).** The genotypes and treatments were significant at the 0.01 probability level for cumulative germination percentage and radical length. Also, genotypes x treatments interaction was significant at the 0.01 probability level for cumulative germination percentage and radical length. The genotypes x treatments x days interaction was also highly significant for cumulative germination indicating that some genotypes germinated more quickly for specific treatments than others.

Seed germination decreased as osmotic potential became more negative. Inhibition of seed germination was greatest under the osmotic potential, - 1.5 MPa. Cumulative germination after ten days ranged from 52.6% to 97.9% for the control

Table 1. Name/ Cross, pedigree and origin of 30 bread wheat genotypes tested

No.	Name/ Cross	Pedigree	Origin
1	MEXIPAK 65 (LONG-TERM CHECK)	II8156-0PAK	Mex/Syr
2	MIMUS	CM 100684-Juveniles-0B-0Y-0AP	Mex/Syr
3	KAUZ'S'/657CI.23R-3-6-2-2-1-2	ICW90-0511-0AP-0BR-3AP-0TS-0AP	Syria
4	CHAM4/SHUHA'S'	ICW91-0006-0Br-5AP-2AP-0L-0AP	Syria
5	FOW-2/SD8036	ICW93-0402-1AP-OL-3AP-0L-0AP	Syria
6	LOCAL GENOTYPE	Landrace	Elgodyrate
7	LOCAL GENOTYPE	Landrace	Sad Elrawafa 1
8	LOCAL GENOTPYE	Landrace	Sad Elrawafa 2
9	LOCAL GENOTPYE	Landrace	Nekhel 1
10	LOCAL GENOTYPE	Landrace	Nekhel 2
11	LOCAL GENOTYPE	Landrace	El Kosiema 1
12	LOCAL GENOTYPE	Landrace	El Kosiema 2
13	TRACHA-2//CMH76-252/PVN'S'	ICW93-0065-2AP-0L-0BR-0AP	Syria
14	NS732/HER//SHUHA	ICW91-0253-0TS-1AP-0TS-0AP	Syria
15	FOW-2/SD8036	ICW93-0402-1AP-OL-4AP-0L-0AP	Syria
16	FOW-2//NS732/HER	ICW93-0403-1AP-OL-11AP-0L-0AP	Syria
17	FOW-2//NS732/HER	ICW93-0404-1AP-OL-6AP-0L-0AP	Syria
18	TUI//CMH76-252/PVN'S'	ICW92-0214-0AP-1AP-4AP-0AP	Syria
19	NS732/HER//SHUHA'S'	ICW91-0157-3AP-0TS-4AP-0TS-2AP-0L-0AP	Syria
20	TEVEE'S'/KAUZ'S'	ICW91-0235-2AP-0TS-1AP-1AP-0L-0AP	Syria
21	Shi#4414/Crow's'	SWM11508-4AP-4AP-3AP-4AP-0AP	Mex/Syr
22	TSI/FEE"S"	CM-64335-3AP-1AP-4AP-0AP	Mex/Syr
23	TEVEE"S"/SHUHA"S"	ICW91-0295-4AP-0TS-3AP-0AP	Syria
24	NS732/HER//SHUHA'S'	ICW91-0208-2AP-0TS-3AP-0AP	Syria
25	NS732/HER//SHUHA'S'	ICW91-0292-0TS-3AP-0AP	Syria
26	W3918A/JUP/NS732/HER	ICW91-0084-6AP-0TS-4AP-0L-0AP	Syria
27	PIK/OPATA	CM94950-73yoghurt-0M-0Y-0RES-0AP	Mex/Syr
28	LIRA/SHA5	CP02645-11C0OY-030M-7yoghurt-2yoghurt-0M-0AP	Mix/Syr
29	BOBW-HITE#1/MN72131/PVN	ICW88-063-1AP-0L-1AP-0L-4AP-0TS-0AP	Syria
30	Sakha 69 (check variety)	Inia/PL-422011 7C/YR"S"Cn-15430-25-5-1980	Egypt

Table 2. Physical and chemical properties of the soil at the two experimental sites (El-Arish & Rafah)

Location	Soil depth (cm)	Organic matter (%)	pH.	Particle size distribution %			Soil Textures	Water Relationship%		
				Sand	Silt	Clay		F.C	W.P	S.P
El-Arish	0-30	0.03	8.10	95	4	1	Sand	11	.25	23
	30-60	0.01	8.12	93.2	4.8	1		10.7	2.32	22
Rafah	0-30	0.19	7.88	83.1	10.7	6	Loamy	16	0.9	28
	30-60	0.07	8.2	81.8	12	6	Sand	14.3	1.15	29

F.C : Field Capacity W.P : Wilting point S.P : Saturation point

Table 3. Mean squares of germination percentages and radical length for Lab. Screening experiment

S.O.V.	D.F.	Germination %	Radical length
Genotypes (G)	29	4337.64**	3.531**
Treatments (T)	3	67906.8**	461.65**
Reps (R)	3	15629.7**	83.69**
G x T	87	417.96**	11.95**
Error	357	11.088	0.224
C.V. %		5.24	9.47

**: Denote significant at 0.01 level of probability.

compared to 27.4% to 69.8% at -1.5 MPa indicating more pronounced differences among genotypes at the lower osmotic potentials.

The significance of the genotypes x treatments x days interaction indicates that relative differences among genotypes are dependent on the time course of the experiment. Some genotypes germinated earlier than others at the lower osmotic potentials (-1.0 and -1.5 MPa) but had similar cumulative germination after ten days. The greatest differences in germination between genotypes within such osmotic potential (-1.0 MPa) were observed between L13 (30.1%) and L28 (75.7%) as shown in **Table (4)**.

The germination stress index (GSI) was used to account differences in the rate of germination due to osmotic stress (**Bouslama and Schapaugh, 1984**).

High values of GSI indicate a high rate of germination. The GSI of different osmotic potentials at 0.0, -0.5, -1.0 and -1.5 Mpa are summarized in **Table (4)**. The rate of germination indicated by GSI, was inversely related to moisture stress. The highest GSI average over treatments was 81.9% for line 28 and the lowest was 43.8% for line 13.

Radical length also decreased as osmotic potential become more negative. In regard to the average of all osmotic potentials treatments among the genotypes tested, it is clearly observed that line 1 followed by line 4 and line 10, are the best genotypes **(Table, 5)**. According to these parameters (germination and radical length under the different osmotic potentials) lines No. 15, 13, 14, 28, 27, 24, 26, 20 and 5 were screened and symboled as G1, G2, G3, G4, G5, G6, G7, G8 and G9, respectively. The local variety, Sakha 69 used as a comparative genotypes (G10) in the field experiments located at Arish and Rafah farms of Suez Canal Univ.

Table 4. Promptness index (PI)of bread wheat genotypes after ten days period in mannitol at osmotic potentials (O P) of 0, -0.5, -1 and -1.5 Mpa as well as GSI

O P / Genotype	0	- 0.5	-1	-1.5	Mean	GSI%
L1	62.8	55.0	46.9	27.4	48.0	43.6
L2	67.0	59.7	48.5	33.9	52.3	50.6
L3	80.4	67.7	56.1	37.1	60.3	46.1
L4	81.6	75.3	60.1	49.4	66.6	60.5
L5	76.8	70.2	49.1	53.0	62.3	69.0
L6	67.3	55.9	44.3	42.2	52.4	62.7
L7	55.6	44.7	33.6	35.4	42.3	63.7
L8	59.6	53.7	37.7	43.4	48.6	72.8
L9	69.6	58.0	51.7	39.8	54.8	57.2
L10	66.4	55.7	40.4	42.2	51.2	63.6
L11	75.7	64.4	54.3	42.6	59.3	56.3
L12	62.4	46.0	37.9	39.4	46.4	63.1
L13	55.0	47.2	42.8	30.1	43.8	54.7
L14	69.2	58.1	50.9	37.1	53.8	53.6
L15	62.2	57.3	63.1	43.2	56.5	69.5
L16	91.2	79.7	56.0	55.8	70.7	61.2
L17	82.4	74.6	53.7	52.2	65.7	63.3
L18	92.8	81	69.6	47.8	72.8	51.5
L19	66.0	46.0	39.1	37.1	47.1	56.2
L20	58.4	49.6	37.0	40.9	46.5	70.0
L21	52.6	43.2	34.4	28.9	39.8	54.9
L22	53.4	49.1	32.6	31.5	41.7	59.0
L23	94.0	81.2	61.9	50.2	71.8	53.4
L24	65.7	56.3	49.4	47.0	54.6	71.5
L25	66.4	62.4	44.9	41.0	53.7	61.7
L26	83.1	70.0	60.6	58.2	68.0	70.0
L27	76.0	57.6	55.6	54.6	61.0	71.8
L28	97.9	84.1	75.7	69.8	81.9	71.3
L29	96.8	86.0	75.4	63.8	80.5	65.9
L30	66.4	55.4	47.1	44.3	53.3	66.7
Mean	71.8	61.5	48.8	45.5	56.9	63.7

L.S.D at 0.05 for:
genotypes (G)=2.31,
treatments (T)=0.84 and GXT= 9.75

Table 5. Radical length of bread wheat genotypes after ten days period in mannitol at osmotic potentials (O P) of 0, -0.5, -1 and -1.5 Mpa

Genotype \ O P	0	-0.5	-1	-1.5	Mean
L1	9.9	6.7	5.5	1.8	5.98
L2	6	5.1	3.7	2.4	4.30
L3	9	4.8	3.6	3.1	5.13
L4	9.1	5.7	6.1	2.6	5.88
L5	7.6	5.2	4.2	2.8	4.95
L6	5.8	5	3.4	3.5	4.43
L7	7.3	5.4	4.3	2.5	4.88
L8	7.5	6	3.8	3.1	5.10
L9	7.6	5.1	5.3	3.2	5.30
L10	7.3	6.2	3.8	4.3	5.40
L11	6.8	5.7	3.1	3.2	4.70
L12	7.9	4.6	5	2.8	5.08
L13	7.2	4.3	4.4	3.7	4.90
L14	7.5	6.3	3.8	2.4	5.00
L15	7.5	5.4	4.4	3.6	5.23
L16	7.8	5.3	4.7	3.1	5.23
L17	8.7	4.5	3.3	2.9	4.85
L18	7.5	4.1	3.6	3.3	4.63
L19	6.9	4.9	3.4	3.2	4.60
L20	6.8	3.6	3.2	3	4.15
L21	8.2	5.4	3.3	3.7	5.15
L22	5.7	4.6	2.8	2.9	4.00
L23	6.2	3.4	4	2.8	4.10
L24	6.3	4.6	3.3	3.3	4.38
L25	9.4	4.3	4.2	3.6	5.38
L26	7.9	4.2	3.8	3.1	4.75
L27	6.9	5.5	4.3	2.5	4.80
L28	7.4	6.5	3.8	2.7	5.10
L29	7.8	5.6	3.8	3	5.05
L30	8.3	5.2	4.5	2.5	5.13
Mean	7.53	5.11	4.01	3.02	4.92

L.S.D at 0.05 for:
genotypes (G)=0.33,
treatments (T)=0.12 and GXT=4.87

Grain yield, its components and susceptibility index

Data of grain yield/plant and its components, i.e. number of spikes/plant, number of grains/ main spike and 1000-grain weight measured for the ten bread wheat genotypes under 4 water regimes are shown in **Table (6)**. Grain yield/plant and its components were reduced significantly by moderate and severe soil moisture deficit treatments in both locations. Severe water stress had greater reduction in all components than moderate stress. Reduction was as much as in grain yield/ plant over the 3 water stress treatments of both locations relative to the control treatment. No. of spikes/plant was the most affected yield component by water stress (34.9% and 32.6% average of reduction) under Arish and Rafah conditions, respectively. Hence it is considered the main component which caused greater reduction in grain yield/plant under water stress treatments.

However, the least affected component by water stress was number of grains/main spike which averaged 8.57% reduction under Arish environment followed by 1000-grain weight (7.87%) at Rafah location, suggesting that these two components are less sensitive to drought stress as compared to the above yield component.

Fischer and Maurer (1978), Guttieri *et al* (2001) and Zhang *et al* (2006) observed that grain number/spike was reduced more relatively to other yield components as stress severity increased. **Ehdaie *et al* (1988)** reported that number of grains/ spike was the most affected yield component. **Thompson and Chse (1992)** displayed that reduced grain yield under moisture stress was a result of reduction in number of spikes/m^2, grains number/spike and individual grain weight.

For number of spikes/plant, the exotic lines, G7 followed by G5, G2 and G1 gave the highest mean performance at Arish location, while G5 and G1 had the highest means for this trait at Rafah environment under severe stress treatment. The check variety, Sakha 69 and G2 under Arish and Rafah conditions, respectively recorded the lowest means under severe stress for this trait.

For 1000- grain weight the highest means were recorded by the exotic line (G2) which gave average weight over the four treatments 33.53g and 35.53 g, followed by G6 which gave 33.01 and 35g under Arish and Rafah conditions, respectively. On the other hand, the local check variety Sakha 69 recorded the lowest means for this trait which ranged from 29.55g as average over the four treatments at Arish location to 31.55g under Rafah conditions.

From the above results, it should be mentioned that the genotypes which exhibited low reduction in grain yield/plant and/or its components under water stress conditions in both locations will be considered as more drought tolerant for one or more of these traits than the other genotypes evaluated in this study and *vice versa*. Furthermore, the yield components performed as tolerant ones can be used as simple screening method for evaluating the response of numerous bread wheat genotypes to drought stress.

Significant variation existing between the contrasting irrigation regimes and among genotypes under each irrigation treatments showed the presence of much variation among these variables in grain yield/plant and its components.

A drought susceptibility index which provides a measure of stress tolerance based on minimization of yield loss under stress as compared to optimum conditions, rather than on yield level under stress per se, which has been used to characterize relative drought tolerance of wheat genotypes **(Fischer and Maurer, 1978 and Clarke *et al* 1984)** is used in the present study. **Bruckner and Frohberg (1987)** and **Sharma and Thakur (2004)** suggested that the stress-susceptibility index should be calculated separately in different stress environments.

Fischer and Maurer (1978) found reasonable agreement between (S) values calculated separately between experiments in all, but a few genotypes. However, **Keim and Kronstad (1979)** reported that the ideal drought tolerance genotypes should produce economic yield under the most stress environments and positive response to more favorable environments.

As shown in **Table (6)**, application of grain yield / plant based on well watered and T_1 stress treatment, at Rafah location, indicated that (S) values ranged from 0.90 for G1 to 1.4 for the local check variety G10. Low stress susceptibility value (S< 1) is synonymous with higher stress tolerance **Fischer and Maurer (1978)**. This main parameter was true for G1, G2, G5 and G9 (the three Syrian lines No's 5, 13 and 15 as well as Mex/syr. Line No. 27) shared the highest potential under severe stress under the two experimental sites. Hence, these genotypes would be in the breeder point of view. These results are in harmony with those earlier obtained by **Siddique *et al* (1990), Afiah *et al* (2000); Saadalla (2001); Afiah & Moselhy (2001) and El-Shouny *et al* (2005).**

Table 6. Mean performance of grain yield/plant, its components and Susceptibility index under four water deficit treatments ($T_1 - T_4$) at Arish and Rafah locations

G.	T	No. of spikes/plant		No. of grains/spike		1000 grain weight		Grain yield/plant		Susceptibility index	
		Arish	Rafah	Arish	Rafah	Arish	Rafah	Arish	Rafah	Arish	Rafah
G1	T_1	3.70	4.70	29.0	31.0	29.5	32.5	3.07	6.07	0.95	0.90
	T_2	5.70	8.60	32.0	34.0	31.5	34.0	5.07	8.32	-	-
	T_3	8.70	9.60	35.0	37.1	34.5	36.0	6.11	9.32	-	-
	T_4	9.20	11.10	35.0	36.9	36.0	37.0	8.15	10.32	-	-
	mean	6.83	8.50	32.76	34.75	32.88	34.88	5.60	8.51	-	-
G2	T_1	3.75	3.75	28.0	29.8	30.2	33.2	3.01	6.01	0.97	0.93
	T_2	5.75	7.63	31.2	32.7	32.2	34.7	5.01	8.01	-	-
	T_3	8.75	8.40	34.3	36.0	35.2	36.7	6.38	9.26	-	-
	T_4	9.25	11.15	33.8	35.8	36.7	37.7	8.23	10.42	-	-
	mean	6.88	7.73	31.80	33.56	33.53	35.53	5.65	8.42	-	-
G3	T_1	3.45	4.45	29.9	31.9	28.4	31.4	2.76	5.76	1.02	1.02
	T_2	5.40	8.30	35.6	38.0	28.1	30.6	4.68	7.93	-	-
	T_3	8.45	9.35	35.8	37.9	33.4	34.9	6.48	8.76	-	-
	T_4	8.95	10.85	36.4	38.3	34.9	35.9	8.08	10.76	-	-
	mean	6.56	8.24	34.39	36.49	31.20	33.20	5.50	8.30	-	-
G4	T_1	3.45	4.45	31.4	33.1	27.7	30.7	2.71	5.71	1.01	0.96
	T_2	5.45	8.35	34.2	36.2	29.7	32.2	4.71	7.96	-	-
	T_3	8.45	9.35	37.0	39.0	32.7	34.2	6.08	8.96	-	-
	T_4	9.35	10.25	34.6	35.5	36.6	37.6	8.13	9.94	-	-
	mean	6.68	8.10	34.27	35.96	31.68	33.68	5.41	8.41	-	-
G5	T_1	3.78	4.78	27.1	29.1	30.6	33.6	3.12	6.12	0.96	0.96
	T_2	5.40	8.30	33.5	35.3	28.7	31.2	4.69	7.31	-	-
	T_3	8.40	9.30	36.6	38.1	31.7	33.2	6.69	8.81	-	-
	T_4	8.90	10.80	35.6	38.0	33.2	34.2	8.08	10.06	-	-
	mean	6.62	8.29	33.18	35.11	31.07	33.07	5.64	8.08	-	-
G6	T_1	3.40	4.40	30.6	32.7	26.7	29.7	2.81	5.81	0.99	0.93
	T_2	5.78	8.68	30.4	32.3	32.6	35.1	5.12	8.12	-	-
	T_3	8.78	9.68	33.2	35.2	35.6	37.1	6.23	9.87	-	-
	T_4	9.28	11.18	32.8	35.1	37.1	38.1	8.43	10.87	-	-
	mean	6.81	8.48	31.74	33.80	33.01	35.00	5.65	8.67	-	-
G7	T_1	3.85	4.60	28.0	29.4	30.1	33.1	2.69	5.69	1.02	0.93
	T_2	5.85	7.88	31.3	32.3	32.1	34.6	4.69	7.19	-	-
	T_3	8.85	8.25	34.2	35.2	35.1	36.6	6.41	8.69	-	-
	T_4	8.95	10.85	36.8	38.1	34.2	35.2	7.88	10.20	-	-
	mean	6.88	7.89	32.55	33.75	32.89	34.89	5.42	7.94	-	-
G8	T_1	3.40	4.40	32.8	34.7	26.1	29.1	2.68	5.68	1.04	0.96
	T_2	5.45	7.35	32.9	35.1	30.4	32.9	4.76	7.76	-	-
	T_3	8.40	9.30	38.7	41.0	31.1	32.6	6.53	9.18	-	-
	T_4	8.90	10.80	38.8	40.9	32.6	33.6	8.37	10.18	-	-
	mean	6.54	7.96	35.77	37.93	30.05	32.05	5.58	8.20	-	-
G9	T_1	3.60	4.60	28.8	30.8	29.2	32.2	3.15	6.15	0.95	0.92
	T_2	5.60	8.50	32.0	33.8	31.2	33.7	5.15	7.90	-	-
	T_3	8.60	9.50	35.0	36.9	34.2	35.7	6.55	9.40	-	-
	T_4	9.10	11.00	36.4	37.1	35.7	36.7	8.30	10.65	-	-
	mean	6.73	8.40	33.05	34.60	32.55	34.55	5.79	8.53	-	-
G10	T_1	3.25	4.25	27.2	28.0	26.2	29.2	2.06	2.56	1.11	1.54
	T_2	5.25	8.65	30.2	30.7	28.2	30.7	3.56	3.56	-	-
	T_3	8.25	10.15	32.7	34.1	31.2	32.7	4.25	5.56	-	-
	T_4	8.75	10.65	33.1	32.5	32.7	33.7	7.42	8.56	-	-
	mean	6.38	8.43	30.78	31.30	29.55	31.55	4.32	5.06	-	-

Table 6. Cont.

G.	T	No. of spikes/plant		No. of grains/spike		1000 grain weight		Grain yield/plant		Susceptibility index	
		Arish	Rafah	Arish	Rafah	Arish	Rafah	Arish	Rafah	Arish	Rafah
Mean of G. over all T.	T_1	3.56	4.44	29.27	31.04	28.47	31.47	2.81	5.56	-	-
	T_2	5.56	8.22	32.32	34.03	30.47	32.97	4.74	7.41	-	-
	T_3	8.56	9.29	35.23	37.02	33.47	34.97	6.17	8.78	-	-
	T_4	9.06	10.86	35.30	36.80	34.97	35.97	8.10	10.20	-	-
	Grand mean	6.69	8.20	33.03	34.72	31.84	33.84	5.46	7.99	-	-
R%	T_1	60.7	59.10	17.1	16.7	18.6	12.5	65.3	45.5	-	-
	T_2	38.6	24.30	8.4	8.1	12.9	8.3	41.5	27.4	-	-
	T_3	5.50	14.50	0.2	0.59	4.3	2.8	23.8	13.9	-	-
LSD 5%	G	0.08	0.10	0.63	0.63	0.45	0.33	0.29	0.13	-	-
	T	0.19	0.19	0.97	1.15	0.45	0.45	0.24	0.36	-	-
	GT	ns	0.37	1.95	2.29	0.89	0.89	0.49	0.72	-	-

R % : Reduction percentage = (T4 - T1 or T2 or T3 / T4) x 100
LSD for G, T and GT: least significant differences for genotypes (G), treatments (T) and their interaction (GT), respectively

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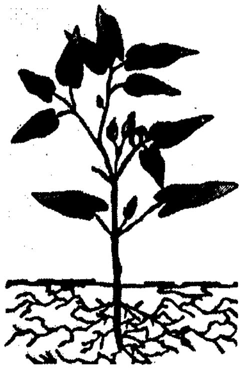
حوليات العلوم الزراعية
جامعة عين شمس ، القاهرة
مجلد(٥٣)، عدد (١)، ١٧١-١٨١، ٢٠٠٨



غربلة تراكيب وراثية من قمح الخبز لتحمل الجفاف
١- الإنبات وطول الجذير والمحصول ومكوناته

[١٤]

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- تم التقييم والإنتخاب على أساس الصفات المرتبطة بتحمل الجفاف لعدد (٣٠) تركيب وراثى مختلف من قمح الخبز وكذلك دراسة سلوك المحصول ومكوناته للتراكيب العشرة المختارة تحت ظروف الإجهاد المائى (زراعة مطرية مع ٣ مستويات للرى التكميلى) بموقعى رفح و العريش التابعين لكلية العلوم الزراعية البيئية بالعريش.
- تم وضع حبوب جميع التراكيب الوراثية المختبرة تحت ضغط مائى بواسطة مادة المانيتول وقد لوحظ إنخفاض فى معدل الإنبات كلما زاد الضغط السالب من صفر حتى ١,٥- MPa حيث تراوح المتوسط العام لمعدل الإنبات من ٥٢,٦-٩٧,٩% لمعاملة المقارنة حتى ٢٧,٤-٦٩,٨% تحت أقصى شد رطوبى مستخدم ، مما يشير إلى وجود إختلافات كبيرة بين المصادر الوراثية المختبرة ، وعليه تم غربلة تسعة أصناف للتقييم تحت الظروف الحقلية مقارنة بالصنف المحلى المعتمد (سخا ٦٩).
- تم تقدير المحصول وثلاثة من مكوناته الرئيسية مع حساب النسبة المئوية للنقص فى سلوك كل صفه استجابة للإجهاد المائى وكذلك معامل الحساسية للجفاف على أساس محصول الحبوب/نبات.
- حقق التركيب الوراثى G5 أقل نقص فى المحصول بزيادة مستوى الإجهاد المائى تحت ظروف منطقة العريش.
- وعموما يمكن التوصيه بإستخدام التراكيب الوراثية G1, G2, G5, G9 كأصول وراثية متميزة للزراعة المعتمدة على الأمطار الساقطة بموقعى العريش ورفح ، وذلك على أساس كل من الإنتاجية تحت معاملة الإجهاد المائى العالى ومعامل الحساسية للجفاف.

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