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THE PERFORMANCE OF SOME WHEAT LANDRACE GENOTYPES AND IMPROVED CULTIVARS UNDER STRESS ENVIRONMENTS

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ABSTRACT

Development of stress tolerant cultivars is an objective of many breeding programs, but success has been limited by inadequate screening techniques, and the lack of genotypes that show clear differences in response to well defined environmental stresses. Thirty four bread wheat landrace genotypes and six improved cultivars ; Sakha 69 , Giza 168 , El-Nelien , Giza 164 , Sids 1 and Gemmeiza 5 were evaluated to stress environments. The objective of this research was to identify wheat landraces having improved adaptation to heat stress. Two field trials were conducted at Kom-ombo Agricultural Experimental Research Station during two successive seasons 1999/2000 and 2000/2001 respectively. Two planting dates ; normal planting (D1=28th Nov.) and late planting (D2=29th Dec.) were used to study the effect of terminal heat stress on the yield , yield components , morphological and physiological traits. There was large genetic variability between landraces in their reaction to heat stress tolerance. Wheat genotypes showed different responses to these environments. Delaying sowing date reduced number of days to heading , number of days to physiological maturity , plant height “cm” , biological yield t/ha., grain yield t/ha., number of spikes/^{m2} , number of Kernels/spike and 1000-Kernal weight gm with an average of 12.57% , 14.23% , 8.91% , 13.15 % , 45.11% , 16.35 % , 14.85 % and 16.17 % as compared with the optimum sowing date. All genotypes exhibitied higher grain yield under normal sowing date as compared to late planting. In the average , high-yield potential check genotypes Giza 164 , Gemmeiza 5 , El-Nelien , Giza 168, Sids 1 and Sakha 69, as well as four landraces ; LR 38 , LR32 , LR37 and LR36, exhibited significant higher grain yield with low susceptibility index (S) under late planting (heat stress). On the other hand ; the ten top-yielding genotypes under normal planting date conditions included six landraces ; LR5 , LR21 , LR4 , LR38, LR31 and LR1, three Egyptian bread wheat check cultivars ; Giza 164 , Gemmeiza 5 and Sakha 69, and one Sudanese genotypes ; El-Nelian. Genotypes ; LR8 , LR10 , LR16, LR17, LR19, LR29, LR34 and LR37 produced the highest number of spikes/^{m2} under both sowing dates. The results indicated that heat stress tolerance could be due to high yield potential and / or low susceptibility index to stress. In general , this study indicates that the value of focusing on landraces as a gene pool to incorporate adaptation to stress environments .

INTRODUCTION

Wheat is major cereal crop in Egypt. Increasing wheat production is an ultimate goal to reduce the gap between production and consumption. Higher wheat prices and lower costs of production in relation to other crops have encouraged increased wheat cultivated area, approximately 25% in upper Egypt alone during the 2000 S. Moreover wheat production has been expanded in newly reclaimed areas in the desert around Egypt .

Considerable increases in day temperature during the period from anthesis (late February) to ripening of wheat are common in Upper Egypt.

The exposure to hot wind , even for a short time during this period adversely affects yield , grain size, and quality (Fischer and Maurer , 1976; Fischer and Byerlee , 1991) .

Developing high yielding wheat varieties tolerant to heat stress is a very important objective to increase wheat productivity , especially in the upper Egypt region. High yielding ability under heat stress could result from escape by selection for early maturing crops (Sullivan and Jordan 1991). Fischer (1985) proposed that, to avoid high temperature at critical stages such as grain filling , one should select seeding dates that ensure flowering at the coolest time during the growth cycle. Furthery Nachit and Katata (1991) and Ortiz Ferrara *et al.* (1989 , 1991) conducted field research based on different planting times , which proved to be an efficient tool for evaluation of large number of lines or families under heat stress and a complement to multilocational testing .

Landraces of wheat evolved over many generations of selection where the environments include drought and high temperature conditions , the landrace may have been selectively adapted to perform in a stable manner under stress conditions (Ehdaie *et al*., 1988)

In Egypt , wheat has been under cultivation for centuries and the old landraces are still growing in remote outyelding areas in the country. These progenitors or permissive cultivars are presumed to possess genes for adaptation to harsh environments. These landraces are a valuable germplasm resource that can be explode to increase what productivity under water stress (Fedak, 1985 ; Srivastava *et al*., 1988 ; Damania 1989 ; Abd El Ghani 1999) .

This study was an initial work to utilize this unique genetic diversity inherent in some old wheat landraces under heat stress in the fields of Upper Egypt. So , the objectives of this study were (i) to measure the effects of heat stress on the growth and developmental characters , as well as grain yield and its components in a set wheat , including Egypt landrace genotypes compare to improved cultivars , (ii) to measure and compare the stress-susceptibility index (Fischer and Maurer. 1978) of the different genotypes and (iii) to identify genotypes showing distinct differences in response to well defined types of environmental stress , for use in evaluation and development of stress tolerance screening techniques .

MATERIALS AND METHODS

Two field experiments were conducted to study the influence of heat stress on grain yield of some wheat genotypes. The experiments were planted at Kom-ombo Research station in 1999/2000 and 2000/2001 growing seasons. This site is clay texture and classified as heat stress region where the temperature raised from anthesis (late February) C° 25-27 to around C° 30-35 during grain filling .

Fourty bread wheat genotypes were tested under heat stress in both season. The genotypes included 34 landraces obtained from Genetic Resource Department FCRT and collected from farmers do not use the improved varieties. The six improved cultivars (one of them from Sudan) ; Sakha 69, Giza 168, El-Nelien , Giza 164, Sids 1 and Gimmeiza 5 were used as checks (Table 1). The heat stress environments were created by using two different sowing dates, 28 November (D1 = normal planting) and 29 December (D2 = late planting to impose heat stress).

Table (1): List of landraces cultivated at Kom-ombo area in 1999/2000 and 2000/2001 growing seasons.

Genotype No.	Genotype Name	Genotype No.	Genotype Name
1	Sakha 69	21	LR22
2	Giza 168	22	LR23
3	LR1	23	LR24
4	LR2	24	LR25
5	LR4	25	LR26
6	LR5	26	LR27
7	LR6	27	LR29
8	LR7	28	LR30
9	LR8	29	LR31
10	LR10	30	LR32
11	LR11	31	LR33
12	LR12	32	LR34
13	LR13	33	LR35
14	LR14	34	LR36
15	LR15	35	LR37
16	LR16	36	LR38
17	LR17	37	El-Nelien
18	LR18	38	Giza 164
19	LR19	39	Sids1
20	LR21	40	Gemmeiza 5

A randomized complete block design (RCBD) with three replications was used in each planting date. Each plot consisted of six rows 3.5 m. long and 20 cm apart. Seeds were hand sown in drills. The standard cultural practices were used in both seasons. At ripening , 2.8 m^2 from each of the four center rows was harvested.

Characters , sampling and measurements

1) Days to heading : The number of days from sowing to 50% of the heads appeared beyond the flag leaf sheath.
2) Days to physiological maturity : Recorded as the number of days from sowing to the date of physiological yellow stage of maturity.
3) Plant height : At harvest , measured in cm. from surface of the soil to the top of the spike of 10 main stems taken at random from each experimental plot.
4) Number of spikes/m^2 was used evaluated approximately two weeks perior to harvest .

5) Biological yield in ton/hectar: it represented the total yield i.e grain + straw .
6) Grain yield in ton/hectar : it was calculated on plot basis.
7) Number of kernels per spike : As an average of number of kernels from ten main spikes .
8) 1000-kernel weight in "gm" : it was determined from three random samples taken from each treatment.

A stress – Susceptibility index (S) was used to characterize each genotype in the stress environments and the index was calculated using genotype means and a generalized formula (Fischer and maurer 1978 clarke, *et al.* 1984) in which S = (1 – YD/YP)/D , where YD = mean grain yield in the stress environment , YP = mean grain yield in the nonstress environment = potential yield , and D = environment stress intensity = 1 – (mean YD of all genotypes / mean YP of all genotypes).

Statistical analysis :
Data were statistically analyzed using combined analysis of variance for the two seasons was under taken using the appropriate analysis of variance according to (Gomez and Gomez 1984) and treatment means were compared by lest significant difference (L.S.D) at 5% level of probability.

RESULTS AND DISCUSSION

The combined analysis of variance (Table 2) revealed highly significant differences between the two sowing dates and genotypes for days to heading , days to physicalogical maturity , plant height , biological yield , Grain yield , number of spikes/m^2 , number of kernels/spike and 1000-kernal weight. Genotype X environment interactions were highly significant for days to heading , days to physiological maturity , grain yield , number of kernels/spike and 1000-kernel weight indicate that wheat genotypes responded differently to the different environmental conditions , suggesting the importance of assessment of genotypes under different environments in order to identify the best genetic make up for a particular environment. On the other hand , no significant genotype x environment interaction for plant height , biological yield and number of spikes/m^2 were observed suggested that different genotypes similarly respond to heat stress. Similar results were obtained by Sharma and Singh (1972) , Abd El-Shafi *et al*. (2001) and El-Morshidy *et al.* (2001).

Results in (Table 3) confirmed that average number of days to heading ranged from 79.17 days for the cultivar Sakha 69 (No.1) to 94.33 for landrace genotype ; LR 6 (No. 7) with an average over all genotype of 85.16 days under normal planting date , while the number of days to heading ranged from 70.33 days for landrace genotype ; LR5 (No.6) to 80.33 days for landrace genotype ; LR22 (No. 21) with an average over all genotype of 74.45 days under the sowing date.

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Table (3) : Average performance of number of days to heading and susceptibility index (S) for different wheat landrace genotypes and cultivars at Kom Ombo conditions during 1999/2000 and 2000/2001 growing seasons.

Genotypes	1999/2000			2000/2001			Average		
	D1	D2	S	D1	D2	S	D1	D2	S
1	77.33	69.33	0.76	81.00	76.67	0.46	79.17	73.00	0.62
2	76.67	69.00	0.74	82.33	77.67	0.52	79.50	73.33	0.63
3	85.00	76.33	0.75	88.33	82.33	0.58	86.67	79.33	0.67
4	79.00	70.67	0.81	83.67	79.33	0.44	81.33	75.00	0.63
5	83.67	70.67	1.17	90.67	78.00	1.20	87.17	74.33	1.18
6	81.33	70.00	1.03	81.33	70.67	1.12	81.33	70.33	1.07
7	92.67	77.33	1.22	96.00	83.00	1.16	94.33	80.17	1.19
8	81.67	70.67	0.99	94.00	84.33	0.88	87.83	77.50	0.93
9	96.00	75.33	1.56	83.33	73.33	1.03	89.67	74.33	1.34
10	91.00	75.33	1.30	91.33	82.67	0.81	91.17	79.00	1.07
11	85.00	72.33	1.10	93.00	82.33	0.98	89.00	77.33	1.04
12	80.67	71.33	0.88	84.00	72.67	1.12	82.33	72.00	1.00
13	85.00	70.33	1.24	86.33	75.67	1.06	85.67	73.00	1.16
14	84.33	70.33	1.22	84.00	72.33	1.19	84.17	71.33	1.21
15	79.33	70.33	0.80	84.67	79.33	0.57	82.00	74.83	0.69
16	85.67	70.33	1.29	90.33	78.00	1.14	88.00	74.17	1.22
17	81.00	71.00	0.91	85.33	72.00	1.34	83.17	71.50	1.11
18	81.00	72.33	0.76	82.67	79.00	0.38	81.83	75.67	0.58
19	85.67	73.67	1.03	88.00	81.00	0.68	86.83	77.33	0.87
20	80.00	73.33	0.61	93.67	80.00	1.25	86.83	76.67	0.93
21	82.00	77.33	0.42	92.67	84.33	0.77	87.83	80.83	0.59
22	83.33	72.00	1.00	92.33	77.67	1.36	87.83	74.83	1.17
23	81.00	71.33	0.88	80.33	70.00	1.10	80.67	70.67	0.98
24	82.00	70.33	1.02	84.67	73.67	1.14	83.83	72.00	1.08
25	84.33	71.33	1.11	88.00	74.33	1.33	86.17	72.83	1.21
26	81.33	70.67	0.97	81.33	71.33	1.05	81.33	71.00	1.01
27	85.00	71.33	1.18	86.33	72.33	1.39	85.67	71.83	1.28
28	86.00	71.67	1.26	95.67	83.33	1.13	90.83	77.50	1.19
29	78.67	68.67	0.94	86.33	74.67	1.12	82.50	71.67	1.03
30	87.00	70.67	1.38	93.00	83.00	0.92	90.00	76.83	1.16
31	92.00	78.00	1.12	91.00	82.00	0.85	91.50	80.00	1.00
32	83.67	71.33	1.09	82.67	76.33	0.65	83.17	73.83	0.89
33	85.67	72.33	1.12	86.67	76.33	1.02	86.17	74.33	1.07
34	81.67	69.67	1.08	85.67	73.00	1.27	83.67	71.33	1.17
35	81.67	70.33	1.02	82.67	70.67	1.21	82.17	70.50	1.11
36	80.00	72.33	0.67	85.33	73.67	1.17	82.67	73.00	0.91
37	80.00	69.67	0.95	84.33	77.00	0.74	82.17	73.33	0.85
38	80.67	72.00	0.79	97.67	82.00	1.37	89.17	77.00	1.08
39	77.67	71.67	0.57	83.67	74.00	0.99	80.67	72.83	0.77
40	77.67	70.00	0.73	85.33	73.33	1.17	81.50	71.67	0.94
Mean	83.08	71.82	-	87.24	77.08	-	85.16	74.45	-
C.V%	2.83	3.14	-	2.56	3.34	-	2.69	3.25	-
L.S.D. 0.05									
Date (D)	0.80			1.48			0.77		

Genotypes (G)	2.60	2.72	1.88
DXG	3.68	3.85	2.66

It is clear that delaying sowing date reduced number of days to heading by an average of 12.57% as compared with the normal sowing date. Genotypes No.6 , 12 , 14 , 17 , 23 , 24 , 26 , 27 , 29 , 34 , 35 and 40 were earlier in number of days to heading with no significant differences between each other under late planting. In optimim sowing date , the earlier in number of days to heading genotypes No. 1 , 2 , 23 and 39 with no significant differences between each other. The four genotypes also had a low susceptibility index (S). these results are in harmony with those obtained by El-Morshidy *et al.* (2001). Pirasteh and Welsh (1980) , found that temperature and temperature x cultivars were highly significant effected days to heading in wheat. French *et al*. (1979) showed both high temperature and increasing day length markedly reduced the flowering stages.

The performance of genotypes is presented in (Table 4). Average number of days to physiological maturity ranged from 129.50 days and 113.00 days for landrace genotype ; LR18 (No.18) to 143.83 and 123.00 days for landrace genotype ; LR7 (No.8) with an average 137.57 and 117.99 days over all genotypes under normal and late sowing date , respectively. It is clear that delaying planting date caused a reduction in number of days to physiological maturity by an average 14.23% when compared the optimum sowing date Genotypes No. 10 , 18 , 20 , 26 , 29 , 39 and 40 were earlier in physiological maturity under late planting with no significant differences between each other. The earlier genotypes (7 genotypes) included two check (Sids 1 and Gemmeiza 5). These findings are in agreement with the results obtained by Behera (1994) and Abd El-Shafi *et al*. (1999). However , early genotypes would escape the stress , specially when the stress occurred toward the end of the growing season (Blum 1988 and Sulivan and Jordan 1991)

Data presented in (Table 5) shows that average plant height ranged from 101.33 cm for cultivar Giza 168 (No.2) to 134.83 cm for landrace genotype ; LR8 (No.9) with an average over all genotypes 119.40 cm under normal planting date , while plant height ranged from 92.50 cm for cultivar Giza 168 (No.2) to 124.17 cm for landrace sowing genotype ; LR26 (No.25) with an average of 108.76 cm under late sowing date. A slight reduction (8.91%) in plant height due to delaying planting was also observed (Table 5). The tall genotypes with low susceptibility index under late sowing were landrace genotype LR26, LR37, LR8, LR35 and LR17. Ortiz-Ferrara *et al.* (1991) and Blum (1996) reported that increasing plant height is conductive to high yield potential drought and heat stress.

Data presented in (Table 6) showed that average biological yield t/ha. ranged from 11.93 t/ha. for landrace genotype; LR35, to 20.59 t/ha. for landrace genotype; LR1 with an average over all genotypes of 17.27 t/ha. under optimum sowing date. Meanwhile average biological yield ranged from 9.28 t/ha. for landrace genotype ; LR35 to 15.15 t/ha. for landrace genotype LR32 with an average of 11.89 t/ha. under late planting. The results indicate that late planting reduced the mean biological yield by about 5.38 t/ha. or 31.15% as compared with timely sowing. Genotypes (No. 8 , 30 , 32 , 34 and

35) were the highest genotypes in biological yield , with no significant differences between each other.

Table (4) : Average performance of number of days to physiological maturity and susceptibility index (S) for different wheat landrace genotypes and cultivars under Kom Ombo conditions during 1999/2000 and 2000/2001 growing seasons.

Genotypes	1999/2000			2000/2001			Average		
	D1	D2	S	D1	D2	S	D1	D2	S
1	133.67	123.33	0.58	136.33	115.00	1.03	135.00	119.17	0.82
2	130.67	123.67	0.40	140.67	116.00	1.15	135.67	119.83	0.82
3	133.00	122.33	0.60	138.67	120.33	0.87	135.83	121.33	0.75
4	133.67	119.33	0.81	138.33	115.00	1.11	136.00	117.17	0.97
5	135.67	123.67	0.65	138.67	116.67	1.03	137.17	120.17	0.85
6	136.33	115.67	1.14	141.33	117.67	1.10	138.83	116.67	1.12
7	141.67	115.33	1.40	142.67	121.33	0.98	142.17	118.33	1.18
8	144.33	122.67	1.13	143.33	123.33	0.92	143.83	123.00	1.02
9	137.00	119.67	0.95	132.00	115.67	0.81	134.50	117.67	0.88
10	140.33	117.67	1.22	140.33	113.00	1.27	140.33	115.33	1.24
11	141.00	116.33	1.32	143.33	122.00	0.99	142.17	119.17	1.14
12	134.33	120.67	0.76	143.00	117.67	1.17	138.67	119.17	0.99
13	136.33	124.33	0.66	141.33	117.67	1.10	138.83	121.00	0.90
14	136.33	118.67	0.96	141.67	120.33	0.99	139.00	119.50	0.98
15	133.33	116.67	0.94	141.33	118.00	1.10	137.33	117.33	1.03
16	128.67	123.33	0.31	141.33	116.33	1.16	135.00	119.83	0.79
17	134.00	116.67	0.97	141.67	119.00	1.05	137.83	117.83	1.02
18	128.67	114.67	0.82	130.33	111.33	0.96	129.50	113.00	0.89
19	136.67	117.67	1.03	141.00	120.67	0.95	138.83	119.17	0.98
20	132.33	117.67	0.83	142.67	113.33	1.35	137.50	115.50	1.12
21	135.00	118.33	0.93	142.33	121.33	0.97	138.67	119.83	0.95
22	139.67	118.33	1.15	141.67	120.00	1.01	140.67	119.17	1.07
23	132.67	118.33	0.81	129.67	116.00	0.69	131.17	117.17	0.75
24	144.67	117.67	1.41	135.33	118.33	0.81	140.00	118.00	1.10
25	132.33	122.67	0.53	135.67	121.00	0.71	134.00	121.83	0.63
26	132.67	112.67	1.12	133.33	115.67	0.87	133.00	114.17	0.98
27	138.00	115.67	1.20	136.33	120.00	0.77	137.17	117.83	0.97
28	145.00	116.67	1.45	142.00	121.33	0.96	143.50	119.00	1.19
29	132.33	116.67	0.87	141.33	114.33	1.27	136.83	115.50	1.09
30	138.67	116.67	1.19	143.33	117.33	1.21	141.00	117.00	1.20
31	143.33	120.33	1.21	142.00	116.33	1.18	142.67	118.33	1.19
32	135.67	116.67	1.04	139.33	120.00	0.91	137.50	118.33	0.97
33	140.33	120.33	1.07	133.00	115.67	0.86	136.67	118.00	0.96
34	141.00	117.33	1.26	133.33	118.00	0.75	137.17	117.67	1.00
35	138.67	114.67	1.30	133.33	117.67	0.76	136.00	116.17	1.02
36	137.00	118.67	1.01	138.33	119.33	0.89	137.67	119.00	0.94
37	135.00	114.33	1.15	136.00	119.00	0.81	135.50	116.67	0.97
38	133.33	114.67	1.05	137.33	117.00	0.97	135.33	115.83	1.01
39	136.00	115.67	1.13	140.00	115.33	1.16	138.00	115.50	1.14
40	134.33	112.67	1.21	138.33	116.00	1.06	136.33	114.33	1.13
Mean	136.34	118.23	-	138.80	117.750	-	137.57	117.99	-
C.V%	2.64	2.98	-	2.60	1.70	-	2.62	2.43	-

L.S.D. 0.05			
Date (D)	0.95	1.44	0.89
Genotypes (G)	4.03	3.30	2.60
DXG	5.69	4.67	3.68

Table (5) : Average performance of plant height "cm" and susceptibility index (S) for different wheat landrace genotypes and cultivars under Kom Ombo conditions during 1999/2000 and 2000/2001 growing seasons.

Genotypes	1999/2000			2000/2001			Average		
	D1	D2	S	D1	D2	S	D1	D2	S
1	102.33	98.00	0.42	106.33	100.00	0.72	104.33	99.00	0.57
2	106.33	96.67	0.98	96.33	88.33	0.99	101.33	92.50	0.99
3	130.00	116.00	1.16	115.00	103.33	1.17	122.50	109.67	1.17
4	116.67	106.67	0.92	118.33	106.67	1.14	117.50	106.67	1.03
5	118.00	106.67	1.06	130.00	118.33	1.04	124.00	112.50	1.05
6	116.67	108.00	0.77	136.33	118.33	1.55	126.50	113.17	1.17
7	113.00	108.00	0.50	130.00	118.33	1.04	121.50	113.17	0.78
8	113.00	98.00	1.43	120.00	113.33	0.64	116.50	105.67	1.03
9	139.67	121.67	1.41	130.00	118.33	1.04	134.83	120.00	1.24
10	126.67	106.33	1.70	126.33	116.67	0.91	126.50	11150	1.32
11	116.67	111.67	0.46	135.00	121.67	1.14	125.83	116.67	0.81
12	121.67	105.00	1.48	121.33	106.00	1.46	121.50	105.50	1.47
13	123.33	106.00	1.51	115.00	106.67	0.83	119.17	106.33	1.20
14	120.00	101.67	1.65	125.00	109.33	1.45	122.50	105.50	1.55
15	125.00	103.00	1.87	125.00	115.00	0.92	125.00	109.00	1.41
16	120.00	113.00	1.60	115.00	105.33	0.97	117.500	109.17	0.77
17	129.67	118.00	0.97	126.33	118.33	0.76	128.00	118.17	0.87
18	131.67	111.67	1.64	135.00	123.33	1.00	133.33	117.50	1.32
19	110.00	98.33	1.14	111.33	100.67	1.14	110.67	99.50	1.14
20	108.33	101.67	0.66	116.33	108.33	0.82	112.33	105.00	0.74
21	113.33	103.00	0.95	110.00	105.00	0.52	111.67	104.00	0.75
22	106.33	98.00	0.84	105.00	93.33	1.25	105.67	95.67	1.03
23	104.67	93.67	1.16	135.00	123.33	1.00	119.83	108.50	1.07
24	101.67	95.00	0.70	126.33	118.33	0.76	114.00	106.67	0.73
25	133.00	125.00	0.67	136.33	123.33	1.13	134.67	124.17	0.89
26	130.00	118.00	0.97	128.33	114.33	1.26	129.17	116.17	1.11
27	124.67	108.00	1.44	120.00	106.67	1.31	122.33	107.33	1.38
28	131.67	113.33	1.50	120.00	108.33	1.12	125.83	110.83	1.33
29	123.33	118.33	0.43	106.33	98.33	0.90	114.83	108.33	0.64
30	126.33	116.67	0.85	110.00	103.33	0.70	118.17	110.00	0.78
31	131.67	119.00	1.01	100.00	91.67	0.96	115.83	105.33	0.99
32	116.67	108.00	0.77	120.00	111.67	0.80	118.33	109.83	0.78
33	126.67	118.33	0.71	135.00	120.67	1.23	130.83	119.50	0.96
34	126.67	118.33	0.71	116.33	108.33	0.82	121.50	113.33	0.76
35	129.67	120.00	0.83	130.00	121.67	0.74	129.83	120.83	0.78
36	116.67	106.67	0.92	100.00	91.67	0.96	108.33	99.17	0.94
37	119.67	116.00	0.36	110.00	103.33	0.70	114.83	109.67	0.51
38	120.00	108.00	1.08	106.33	96.67	1.08	113.17	102.33	1.08

39	111.67	105.00	0.64	108.33	101.67	0.71	110.00	103.33	0.67
40	105.00	100.00	0.51	106.33	98.33	0.90	105.67	99.17	0.70
Mean	119.70	108.61	-	119.09	108.91	-	119.40	108.76	-
C.V%	3.90	6.80	-	5.17	7.90	-	4.58	7.37	-
L.S.D. 0.05									
Date (D)	3.15			1.33			0.90		
Genotypes (G)	6.98			8.46			5.48		
DXG	N.S			N.S			N.S		

Table (6) : Average performance of biological yield t/ha. and susceptibility index (S) for different wheat landrace genotypes and cultivars under Kom Ombo conditions during 1999/2000 and 2000/2001 growing seasons.

Genotypes	1999/2000			2000/2001			Average		
	D1	D2	S	D1	D2	S	D1	D2	S
1	18.57	12.44	0.91	14.05	10.73	0.93	16.31	11.59	0.92
2	15.95	11.78	0.72	16.31	9.87	1.56	16.13	10.83	1.05
3	22.97	12.71	1.23	18.21	12.50	1.24	20.59	12.61	1.24
4	17.14	12.29	0.78	14.88	9.63	1.39	16.01	10.96	1.10
5	18.93	12.31	0.96	16.07	12.03	0.99	17.50	12.17	0.97
6	19.99	11.92	1.11	17.50	12.27	1.18	18.75	12.09	1.13
7	19.64	13.14	0.91	15.24	11.07	1.08	17.44	12.10	0.98
8	15.48	12.26	0.57	18.09	15.70	0.52	16.78	13.98	0.53
9	22.74	15.36	0.89	14.17	9.97	1.17	18.45	12.66	1.00
10	18.33	12.50	0.88	15.83	11.53	1.07	17.08	12.02	0.95
11	20.59	11.55	1.21	16.07	13.60	0.60	18.33	12.57	1.00
12	16.55	11.31	0.87	16.07	13.47	0.64	16.31	12.39	0.77
13	22.50	13.00	1.16	15.83	12.87	0.74	19.16	12.93	1.04
14	18.21	10.71	1.13	13.57	10.27	0.96	15.89	10.49	1.09
15	17.62	10.48	1.12	17.26	12.83	1.01	17.44	11.65	1.06
16	13.57	10.72	0.58	21.31	12.73	1.59	17.43	11.73	1.05
17	18.33	10.36	1.20	17.62	10.27	1.64	17.98	10.31	1.36
18	17.97	10.24	1.19	15.48	9.50	1.52	16.73	9.87	1.31
19	21.43	10.02	1.21	17.02	11.07	1.38	19.22	11.54	1.28
20	18.69	12.99	0.84	15.71	11.57	1.04	17.20	12.28	0.91
21	19.28	11.31	1.14	14.76	9.40	1.43	17.02	10.35	1.25
22	16.07	11.43	0.79	11.07	8.60	0.88	13.57	10.01	0.84
23	16.31	11.90	0.74	13.21	10.00	0.96	14.76	10.95	0.82
24	17.02	11.31	0.92	14.76	11.30	0.92	15.89	11.30	0.92
25	16.19	10.83	0.91	12.38	9.30	0.98	14.28	10.07	0.94
26	18.57	10.48	1.20	12.74	10.73	0.62	15.65	10.60	1.03
27	21.19	12.86	1.08	12.98	9.40	1.08	17.08	11.13	1.11
28	18.45	10.48	1.19	17.62	11.07	1.46	18.03	10.77	1.29
29	18.33	10.43	1.19	17.26	13.60	0.83	17.80	12.01	1.04
30	19.88	14.70	0.72	17.97	15.60	0.52	18.93	15.15	0.64
31	21.90	10.00	1.50	17.02	11.63	1.25	19.46	10.82	1.42
32	21.55	13.81	0.99	16.07	13.80	0.55	18.81	13.80	0.85

33	12.62	8.33	0.94	11.31	10.23	0.37	11.96	9.28	0.71
34	18.45	13.09	0.80	19.05	14.67	0.90	18.75	13.88	0.83
35	20.47	15.12	0.72	16.43	13.07	0.80	18.45	14.09	0.75
36	18.93	11.67	1.06	16.19	14.66	0.37	17.56	13.17	0.80
37	21.90	13.43	1.07	15.47	12.73	0.70	18.69	13.08	0.96
38	18.21	12.31	0.89	18.57	13.37	1.10	18.39	12.84	0.96
39	15.47	11.00	0.80	16.78	13.70	0.72	16.13	12.35	0.75
40	20.71	12.26	1.12	17.14	14.03	0.71	18.93	13.15	0.98
Mean	18.67	11.92	-	15.88	11.86	-	17.27	11.89	-
C.V%	13.76	16.18	-	14.27	17.82	-	14.02	17.02	-
L.S.D. 0.05									
Date (D)	1.26			0.65			0.85		
Genotypes (G)	2.57			2.47			1.78		
DXG	N.S			N.S			N.S		

Table (7) : Average performance of grain yield t/ha. and susceptibility index (S) for different wheat landrace genotypes and cultivars under Kom Ombo conditions during 1999/2000 and 2000/2001 growing seasons.

Genotypes	1999/2000			2000/2001			Average		
	D1	D2	S	D1	D2	S	D1	D2	S
1	6.78	3.60	0.96	4.93	3.03	0.93	5.85	3.31	0.96
2	5.79	3.82	0.70	5.46	2.91	1.13	5.63	3.36	0.89
3	6.96	3.17	1.12	4.81	2.76	1.04	5.88	2.96	1.10
4	6.20	2.54	1.21	4.80	2.50	1.17	5.50	2.52	1.20
5	6.56	2.91	1.14	5.50	3.48	0.89	6.03	3.19	1.04
6	6.91	3.07	1.14	5.51	3.11	1.06	6.21	3.09	1.11
7	5.46	2.39	1.15	4.70	2.44	1.17	5.08	2.42	1.16
8	3.74	2.51	0.67	4.89	3.46	0.71	4.31	2.98	0.68
9	5.40	3.35	0.78	4.32	2.57	0.98	4.86	2.96	0.86
10	4.08	2.56	0.76	5.14	3.06	0.98	4.61	2.81	0.86
11	6.30	3.12	1.03	5.03	2.95	1.00	5.66	3.04	1.02
12	5.15	3.04	0.84	5.39	3.04	1.06	5.27	3.04	0.93
13	6.24	3.01	1.06	4.59	3.09	0.80	5.41	3.05	0.97
14	5.58	2.79	1.03	4.18	2.54	0.95	4.88	2.66	1.00
15	5.28	2.53	1.06	5.59	3.59	0.87	5.43	3.06	0.96
16	4.07	2.81	0.63	6.74	3.34	1.22	5.41	3.08	0.95
17	6.00	2.85	1.07	5.48	2.56	1.29	5.74	2.71	1.17
18	6.01	2.59	1.16	4.82	2.35	1.24	5.41	2.47	1.20
19	4.86	2.45	1.01	5.09	2.70	1.14	4.98	2.58	1.06
20	6.85	3.03	1.14	5.32	2.55	1.27	6.08	2.79	1.20
21	5.76	2.72	1.08	4.59	2.30	1.21	5.17	2.51	1.14
22	3.84	2.58	0.67	2.99	1.98	0.82	3.42	2.28	0.73
23	4.26	2.70	0.75	3.72	2.20	0.99	3.99	2.45	0.85
24	5.34	3.00	0.90	4.19	2.53	0.96	4.77	2.77	0.93
25	5.23	2.67	1.00	3.64	2.11	1.09	4.44	2.34	1.04
26	6.21	2.66	1.17	3.93	2.71	0.75	5.07	2.69	1.04
27	6.18	3.23	0.98	3.54	2.11	0.98	4.86	2.67	0.99
28	5.70	2.66	1.09	5.07	2.55	1.21	5.39	2.61	1.14
29	5.88	2.39	1.22	5.89	3.18	1.12	5.89	2.78	1.16
30	5.78	3.19	0.92	4.99	3.63	0.66	5.38	3.41	0.81
31	5.53	2.22	1.23	4.76	2.58	1.11	5.15	2.40	1.18
32	5.54	3.24	0.85	4.89	3.03	0.92	5.21	3.14	0.88
33	4.02	1.99	1.03	3.46	2.18	0.90	3.74	2.09	0.98
34	5.28	3.01	0.88	5.81	3.63	0.91	5.54	3.32	0.89
35	4.93	3.36	0.65	4.92	3.36	0.77	4.93	3.36	0.70
36	6.96	3.44	1.04	4.89	3.65	0.61	5.93	3.54	0.89
37	7.92	4.11	0.99	4.88	3.07	0.90	6.40	3.59	0.97
38	7.08	3.77	0.96	6.76	3.72	1.09	6.92	3.75	1.01
39	5.91	3.13	0.96	5.24	3.52	0.80	5.57	3.32	0.89
40	7.08	3.26	1.10	6.29	4.06	0.86	6.69	3.66	1.00
Mean	5.72	2.94	-	4.92	2.90	-	5.32	2.92	-
C.V%	11.95	15.75	-	12.27	17.08	-	12.12	16.42	-
L.S.D. 0.05									
Date (D)	0.30			0.20			0.21		
Genotypes (G)	0.65			0.62			0.45		
DXG	0.95			0.88			0.64		

Table (8) : Average performance of number of spike/m^2 an susceptibility index (S) for different wheat landrace genotypes and cultivars at Kom Ombo conditions during 1999/2000 and 2000/2001 growing seasons.

Genotypes	1999/2000			2000/2001			Average		
	D1	D2	S	D1	D2	S	D1	D2	S
1	510.67	439.33	0.85	399.33	340.33	0.89	455.00	389.83	0.87
2	491.33	427.33	0.80	414.00	368.00	0.67	452.67	397.67	0.74
3	510.00	440.33	0.83	477.33	389.00	1.12	493.67	414.67	0.97
4	547.33	416.67	1.46	381.67	315.67	1.05	464.50	366.17	1.29
5	525.33	370.00	1.81	499.00	364.33	1.64	512.17	367.17	1.73
6	504.67	396.00	1.32	498.67	384.33	1.39	501.67	390.17	1.36
7	564.67	447.33	1.27	372.33	313.00	0.97	468.50	380.17	1.15
8	540.00	466.67	0.83	385.33	323.33	0.97	462.67	395.00	0.89
9	534.00	475.00	0.67	485.33	422.00	0.79	509.67	448.50	0.73
10	569.67	459.33	1.19	484.00	398.33	1.07	526.83	428.83	1.13
11	487.67	458.33	0.36	497.00	405.00	1.12	492.33	431.67	0.75
12	526.33	461.33	0.75	479.67	406.67	0.92	503.00	434.00	0.83
13	509.67	463.33	0.56	487.67	403.67	1.04	498.67	433.50	0.79
14	566.00	452.33	1.23	434.67	357.67	1.07	500.33	405.00	1.16
15	535.33	467.33	0.78	396.67	309.67	1.33	466.00	388.50	1.01
16	535.33	431.67	1.18	478.67	411.67	0.85	507.00	421.67	1.02
17	584.00	409.00	1.84	501.67	420.00	0.99	542.83	414.50	1.44
18	560.33	406.33	1.68	462.00	361.67	1.32	511.17	384.00	1.52
19	531.67	469.67	0.71	486.00	411.00	0.93	508.83	440.33	0.82
20	488.33	420.00	0.85	358.67	306.33	0.88	423.50	363.17	0.86
21	519.00	454.67	0.76	448.00	370.00	1.05	483.50	412.33	0.90

22	505.33	477.00	0.34	374.67	318.00	0.92	440.00	397.50	0.58
23	515.33	429.33	1.02	341.67	294.33	0.84	428.50	361.83	0.95
24	560.00	485.33	0.81	405.00	348.67	0.84	482.50	417.00	0.83
25	527.33	422.33	1.22	485.33	378.00	1.34	506.33	400.17	1.28
26	537.67	442.33	1.08	374.00	389.67	- 0.25	455.83	416.00	0.53
27	567.67	471.33	1.03	479.33	378.33	1.28	523.00	424.83	1.14
28	486.67	408.33	0.98	440.00	360.00	1.10	463.33	384.17	1.04
29	520.00	435.67	0.99	448.33	386.67	0.83	484.17	411.17	0.92
30	517.33	442.00	0.89	493.33	391.67	1.25	505.33	416.83	1.07
31	507.33	469.00	0.46	461.67	393.00	0.90	484.50	431.00	0.67
32	552.00	473.00	0.88	480.33	388.33	1.16	516.17	430.67	1.01
33	523.67	399.00	1.46	483.33	412.67	0.88	503.50	405.83	1.18
34	502.33	408.67	1.14	450.00	366.67	1.12	476.17	387.67	1.13
35	522.67	407.00	1.35	496.67	436.67	0.73	509.67	421.83	1.05
36	449.33	401.00	0.66	470.00	379.33	1.16	459.67	390.17	0.92
37	509.67	457.67	0.62	418.33	384.00	0.49	464.00	420.83	0.56
38	495.00	433.33	0.76	468.33	393.00	0.98	481.67	413.17	0.87
39	541.33	454.00	0.99	442.00	390.00	0.71	491.67	422.00	0.86
40	511.00	424.33	1.04	448.33	376.67	0.97	479.67	400.50	1.00
Mean	524.80	439.32	-	447.21	373.68	-	486.00	406.50	
C.V%	7.24	8.44	-	12.12	12.04	-	9.63	10.14	
L.S.D. 0.0512.04									
Date (D)	19.84			7.51			8.28		
Genotypes (G)	42.46			56.36			35.28		
DXG	N.S			N.S			N.S		

These five genotypes also had a low susceptibility index (S). in optimum planting date , the highest biological yield genotypes were No. 3, 13, 19, 30, 31, 32 and 40 (seven genotypes) including on check (Gemmeiza 5). Genotypes No. 30 and 32 (LR 32 and LR34), respectively, produced the highest biological yield under both sowing dates. Similar finding was obtained by Abd El-Shafi *et al.* (2001)

The performance of genotypes is presented in (Table 7) : Results indicated that grain yield of the various genotypes ranged from 3.42 t/ha. for landrace genotype; LR23 (No. 22) to 6.92 t/ha.. For the cultivar Giza 164 (No. 38) with an average over all genotypes of 5.32 t/ha. under normal sowing date. Meanwhile the grain yield ranged from to 2.09 t/ha. for landrace genotype; LR 35 (No. 33) to 3.75 t/ha. for the cultivar Giza 164 (No. 38) with an average of 2.92 t/ha. under late sowing date. Delay planting reduced grain yield by about 2.40 t/ha. or 45.11% as compared with the normal planting date (D1). These data confirm earlier work (Randall and Moss 1990) where grain yield was negatively correlated with increasing mean maximum temperature. In the average ; the ten top-yielding genotypes under normal planting date conditions included six landraces (LR5 , LR21 , LR4 , LR38 , LR31 and LR1) , three Egyptian breadwheat cultivars (Giza 164, Gemmeiza5 and Sakha69) and one Sudanses genotypes (El-Nelian). On the other hand, high-yield potential check genotypes Giza 164 , Gemmeiza 5 , El-Nelien, Giza 168, Sids 1 and Sakha 69, as well as four landraces (LR38, LR32, LR37 and LR36) exhibited significalt higher grain yield with low susceptibility index (S) under late planting (heat stress).

Most of top-yielding genotypes under heat stress (late planting) possessed also significantly higher grain yield under normal planting date (non-stressed environment) Table 7. The primary interesting findings are that the landrace genotype ; LR38 possessed high yield potentiality under normal planting date as well as lower reduction under late planting. However , the cultivars Giza 168, Sids 1 and the landraces genotypes ; LR32 , LR37 and LR36 exhibited only high yield potentiality under late planting. These results indicated that heat stress tolerance could be due to high yield potential and/or low susceptibility index (S) to stress (Fischer and Wood 1979).

Determinations of yield components in wheat and their association to development phases is quite important in determing the yield potential under stress conditions (Fischer , 1985 and Throne and Wood, 1987).

Heat tolerance wheat genotypes must possess one or more characteristics for which selection may be practiced (Acevedo *et al*., 1991). Sensitivity to heat stress is expressed as reduction of spike bearing tillers , number of grains per spike and grain-filling duration (Shpiler and Blum, 1986 ; Behl *et al.*, 1993).

Results in (Table 8) indicated that average number of spikes/m^2 ranged from 423.50 spike/m^2 for landrace genotype ; LR21 (No. 20) to 542.83 spike/m^2 for landrace genotype ; LR17 (No.17) with an average 486.00 spikes/m^2 under normal planting date , while the number of spikes/m^2 ranged from to 361.83 for landrace genotype ; LR24 (No.23) to 448.50 spike/m^2 for landrace genotype ; LR8 (No.9) with an average of 406.50 spike/m^2 under late planting. Genotypes No. 9 , 10 , 16 , 17 , 19 , 27 , 32 and 35 produced No. of spike/m^2 under both sowing dates under Upper Egypt conditions. In general, number of spikes per square meter was slightly affected by sowing date (16.35% reduction in the average) determining that the studied genotypes were able to maintain their tillering capacity under terminal heat stress in Upper Egypt. The mean maximum air temperature in Upper Egypt during the early stages of wheat growth ranged between 20-22 Cº , while average temperature ranged from about 15-18 Cº. Fischer (1985), reported that mean temperature of 16-20 Cº is favorable for crown root initiation and tillering development in hot environments.

Data presented in (Table 9) showed that average number of kernels/spike ranged from 38.17 kernel for landrace genotype ; LR16 (No. 16) to 66.67 kernels for the cultivar Giza 164 (No.38) with an average 49.24 kernels/spike under normal sowing date (D1). Meanwhile the average number of kernels/spike ranged from 31.33 kernel for landrace genotype; LR16 (No.16) to 54.50 kernels for landrace genotype ; LR21 (No. 20) with an average of 41.93 kernels/spike under late sowing date (D2). As expectedly, number of kernels per spike was also sleightly affected under late planting by prevailing temperature during the spike development phase, the reduction was relatively small (14.85%). Shpiler and Blum (1986) indicated that wheat genotypes were able to maintain a long duration of spike development under terminal heat stress. High air temperature (26 Cº) for about 6 to 8 days prior to apex double ridge through terminal spikelets formation in late planting reduced the number of spikelets/spike (Frank *et al.,* 1987). A least part of the low fertility associated with high temperature at booting stage was related to poor pollen development (Dawson and Wordlow, 1989). There is a good evidence for a reduction in grain number/ear associated with high temperature during the stage of booting, i.e. the stage of pollen and embryo Sac mother cell mitosis (Saini *et al.,* 1984 and Zeng *et al.*, 1985) .

Results in (Table 10) confirmed that average 1000 kernel weight ranged from 36.17 gm for landrace genotype ; LR23 (No. 22) to 51.33 gm for the cultivar Giza 164 (No. 38) with an average of 42.55 gm over all genotypes under optimum sowing date (D1) , while the average 1000-kernel weight ranged from 32.0 gm for landrace genotype ; LR 19 (No. 19) to 43.67 gm for the cultivar Giza 164 (No. 38) with an average of 35.67 gm under late sowing date. In this study , the results revealed that 1000-kernel weight had an inverse association with the prevailing temperature. The results indicated that late planting significantly decreased 1000-kernel weight by about 16.17%. The genotypes significantly the lower kernel weight reduction under heat stress conditions possessed also high yield potential under late planting. This result could be due to that grain maturity may be affected by high temperatures and resulted in shrinked kernels (Ismail , 1985). These results are in harmony with Sharma and Singh (1972) and El-Morshidy *et al*. (2001).

In general , it could be concluded that breeding for heat stress tolerance could involve combining good yield potential in the absence of stress with an appropriate phenology to provide maximum escape of stress in the target environments (Blum , 1988).

In Upper Egypt , wheat sowing by mid-November ensure optimum crop yield by avoiding and dry winds during the grain filling period.

Table (9) : Average performance of number of kernels/spike and susceptibility index (S) for different wheat landrace genotypes and cultivars at Kom Ombo conditions during 1999/2000 and 2000/2001 growing seasons.

Genotypes	**1999/2000**			**2000/2001**			**Average**		
	D1	**D2**	**S**	**D1**	**D2**	**S**	**D1**	**D2**	**S**
1	50.33	48.00	0.25	47.00	41.67	0.82	48.67	44.83	0.51
2	49.00	46.00	0.34	45.00	40.67	0.69	47.00	43.33	0.50
3	46.00	39.67	0.84	45.33	40.33	0.80	45.67	40.00	0.82
4	60.00	48.33	1.24	47.00	39.33	1.14	53.50	43.83	1.20
5	56.00	45.67	1.15	40.00	34.00	1.03	48.00	39.83	1.11
6	57.67	44.67	1.44	45.67	39.67	0.90	51.67	42.17	1.22
7	54.33	41.67	1.49	55.67	47.67	1.00	55.00	44.67	1.25
8	42.00	38.00	0.56	47.67	40.67	1.06	44.83	39.33	0.81
9	47.00	37.67	1.27	48.67	41.67	0.99	47.83	39.67	1.13
10	43.67	35.67	1.12	36.67	32.33	0.85	40.17	34.00	1.01
11	41.00	34.00	1.13	45.67	40.33	0.84	43.33	37.17	0.98
12	66.67	51.67	1.44	39.33	32.67	1.23	53.00	42.17	1.38
13	43.67	37.00	1.02	46.67	40.00	1.03	45.17	38.50	1.02
14	48.67	39.33	1.22	37.33	31.33	1.16	43.00	35.33	1.20
15	53.33	48.33	0.56	45.67	40.67	0.79	49.50	44.50	0.66
16	38.33	32.00	1.05	38.00	30.67	1.40	38.17	31.33	1.21
17	54.33	45.33	1.06	41.67	38.00	0.63	48.00	41.67	0.89
18	50.00	39.33	1.33	49.00	41.67	1.03	49.50	40.50	1.19
19	63.33	57.33	0.60	48.00	40.00	1.21	55.67	48.67	0.85
20	57.67	54.00	0.40	64.33	55.00	1.05	61.00	45.50	0.72
21	58.67	54.67	0.43	35.33	30.67	0.95	47.00	42.67	0.62
22	59.33	56.67	0.28	44.67	40.67	0.65	52.00	48.67	0.43
23	56.33	48.00	0.95	45.00	40.67	0.69	50.67	44.33	0.85
24	41.33	37.00	0.62	40.67	35.00	1.07	41.00	36.00	0.83
25	47.00	37.00	1.36	45.67	38.67	1.11	46.33	37.83	1.24
26	59.67	47.33	1.32	43.00	37.00	1.01	51.33	42.17	1.21
27	44.00	35.33	1.26	46.33	40.00	1.04	45.17	37.67	1.15
28	53.67	42.00	1.39	39.00	32.00	1.31	46.33	37.00	1.37
29	38.33	33.33	0.83	38.67	34.33	0.81	38.50	33.83	0.82
30	69.00	57.67	1.02	48.33	41.33	1.05	58.67	49.50	1.04
31	50.00	46.67	0.38	39.00	35.33	0.68	44.50	41.00	0.51
32	44.33	37.00	1.05	36.00	30.67	1.00	40.17	33.83	1.04
33	47.33	40.33	0.94	47.00	40.33	1.03	47.17	40.33	0.98
34	52.67	50.33	0.32	39.33	33.67	0.98	46.00	42.00	0.59
35	43.33	40.67	0.39	44.33	39.33	0.81	43.83	40.00	0.59
36	47.67	41.33	0.85	56.67	48.67	0.98	52.17	45.00	0.91
37	54.00	37.33	1.97	56.00	48.67	0.95	55.00	43.00	1.48
38	64.00	50.67	1.33	69.33	55.67	1.43	66.67	53.17	1.37
39	58.67	47.33	1.23	70.00	56.33	1.41	64.33	51.83	1.31
40	69.33	50.00	1.78	59.00	52.33	0.82	64.17	51.17	1.37
Mean	52.04	43.86	-	46.44	39.99	-	49.24	41.93	-
C.V%	5.00	6.43	-	6.03	7.31	-	5.49	6.85	-
L.S.D. 0.05									
Date (D)	1.17			2.85			1.38		
Genotypes (G)	3.06			3.23			2.23		
DXG	4.34			N.S			3.15		

Table (10) : Average performance of 1000-kernel weight, gm. and susceptibility index (S) for different wheat landrace genotypes and cultivars under Kom Ombo conditions during 1999/2000 and 2000/2001 growing seasons.

Genotypes	1999/2000			2000/2001			Average		
	D1	D2	S	D1	D2	S	D1	D2	S
1	47.67	39.33	1.03	44.00	38.33	0.83	45.83	38.83	0.94
2	42.33	35.33	0.97	37.67	33.67	0.74	40.00	34.50	0.87
3	40.67	36.00	0.67	33.33	31.00	0.45	37.00	33.50	0.58
4	45.00	39.33	0.78	45.00	40.33	0.67	45.00	39.83	0.73
5	42.33	38.00	0.60	38.00	34.00	0.68	40.17	36.00	0.64
6	44.33	38.67	0.75	48.33	42.67	0.75	46.33	40.67	0.75
7	40.67	35.67	0.72	37.00	31.33	0.93	38.83	33.50	0.82
8	38.00	32.33	0.88	43.67	37.00	0.98	40.83	34.67	0.93
9	39.00	36.33	0.40	39.33	32.00	1.20	39.16	34.17	0.78
10	39.67	31.67	1.19	39.00	33.00	0.99	39.33	32.33	1.09
11	47.00	32.67	1.80	38.00	32.00	1.02	42.50	32.33	1.47
12	44.67	40.67	0.53	43.00	37.67	0.85	43.83	39.17	0.68
13	34.67	32.00	0.45	40.67	33.67	1.16	37.67	32.83	0.81
14	45.00	38.67	0.83	40.67	37.33	0.53	42.83	38.00	0.69
15	42.67	33.67	1.24	46.67	34.67	1.66	44.67	34.17	1.45
16	44.00	37.00	0.94	43.67	34.00	1.47	43.83	35.50	1.19
17	44.00	34.00	1.34	42.00	37.33	0.71	43.00	35.67	1.05
18	49.00	38.33	1.28	50.33	42.00	1.06	49.67	40.17	1.18
19	40.67	30.00	1.55	40.33	34.00	1.01	40.50	32.00	1.29
20	50.67	43.00	0.89	37.33	31.00	1.09	44.00	37.00	0.98
21	46.00	42.00	0.55	36.33	30.33	1.06	41.17	36.17	0.77
22	39.67	35.67	0.59	32.67	31.33	0.26	36.17	33.50	0.45
23	41.67	38.00	0.52	41.67	36.00	0.87	41.67	37.00	0.69
24	43.33	32.67	1.45	41.67	31.33	1.56	42.50	32.00	1.50
25	38.33	30.33	1.23	39.00	35.00	0.66	38.67	32.67	0.95
26	51.67	38.67	1.46	47.00	41.33	0.77	49.33	40.00	1.15
27	40.67	36.33	0.67	37.00	33.00	0.69	38.83	34.67	0.68
28	51.67	38.00	1.56	40.00	33.00	1.07	45.83	35.50	1.36
29	38.33	33.00	0.82	42.00	34.00	1.23	40.17	33.50	1.02
30	35.67	28.00	1.27	48.33	39.67	1.15	42.00	33.83	1.20
31	37.33	39.33	1.26	45.00	37.00	1.14	41.17	33.17	1.19
32	37.67	32.00	0.89	40.00	33.00	1.13	38.83	32.50	1.07
33	50.67	37.67	1.51	43.67	34.33	1.33	47.17	36.00	1.43
34	39.67	34.33	0.79	42.00	35.00	1.07	40.83	34.67	0.93
35	43.67	33.33	1.44	44.33	34.33	1.40	44.00	33.83	1.42
36	37.00	33.00	0.63	47.00	38.00	1.23	42.00	35.50	0.95
37	50.00	42.00	0.94	45.33	41.00	0.61	47.67	41.50	0.79

38	54.33	45.33	0.98	48.33	42.00	0.84	51.33	43.67	0.92
39	42.00	36.00	0.85	51.67	41.67	1.29	46.83	38.83	1.07
40	40.33	33.33	1.02	41.00	33.33	1.20	40.67	33.33	1.11
Mean	43.04	35.79	-	42.05	35.54	-	42.55	35.67	-
C.V%	2.85	4.75	-	3.61	6.24	-	3.24	5.54	-
L.S.D. 0.05									
Date (D)	0.97			0.35			0.46		
Genotypes (G)	1.67			2.15			1.36		
DXG	2.37			3.04			1.92		

However, the progress is often slow since the target environment is not uniform and stage specific of heat stress can not be ensured .

Therefore, evaluation of materials in multilocations can help in minimizing year to year and location to location variations .

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تقييم سلوك بعض السلالات الوراثية المحلية للقمح بالمقارنة بالاصناف المحسنة تحت ظروف البيئة القاسية

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تم تقييم ٣٤ سلالة وراثية محلية للقمح بالمقارنة بستة اصناف محسنة من قمح الخبز وهى سخا ٦٩ ، جميزة ٥ ، سدس ١ ، جيزة ١٦٤ ، جيزة ١٦٨ والصنف السودانى النيلين من حيث درجة تحملها للظروف البيئية القاسية . ولقد كان هدف هذا البحث هو انتخاب سلالات من قمح الخبز المحلية والتى لها القدرة على تحمل ظروف الحر العالية بمنطقة مصر العليا .
ولقد اجريت تجربتين حقليتين خلال موسمى ١٩٩٩/٢٠٠٠ ، ٢٠٠٠/٢٠٠١ بمحطة البحوث الزراعية بكوم امبو واستخدم فى هذا البحث ميعادين زراعة وهما ميعاد الزراعة الامثل (٢٨نوفمبر) وميعاد الزراعة المتأخر (٢٩ ديسمبر) لتعريض النباتات للحرارة خلال فترة تكوين الحبوب وذلك لدراسة تأثير درجات الحرارة المرتفعة على المحصول ومكوناته والصفات المورفولوجية والفسيولوجية .
ولقد اظهرت النتائج وجود تباين وراثى كبير بين السلالات المحلية فى تحملها لدرجات الحرارة العالية بمنطقة مصر العليا . كما ادى تعريض النباتات للحرارة العالية فى الميعاد المتأخر الى نقص فى عدد الايام من الزراعة الى التزهير ، ميعاد النضج الفسيولوجى ، طول النبات ، المحصول البيولوجى ، محصول الحبوب ، عدد السنابل فى المتر المربع ، عدد حبوب السنبلة و وزن الالف حبة بمقدار ١٢,٥٧% ، ١٤,٢٣% ، ٨,٩١% ، ١٣,١٥% ، ٤٥,١١% ، ١٦,٣٥% ، ١٤,٨٥% ، ١٦,١٧% بالمقارنة بالزراعة فى الميعاد الامثل بالمنطقة . وتحت ظروف الزراعة المتأخرة (٢٩ ديسمبر) تفوقت اصناف جيزة ١٦٤ ، جميزة ٥ ، النيلين السودانى ، جيزة ١٦٨ ، سدس ١ و سخا ٦٩ بالاضافة الى اربعة سلالات وراثية محلية وهى السلالة ٣٨ و السلالة ٣٢ والسلالة ٣٧ و السلالة ٣٦ اعطت محصول عالى وانخفاض معامل حساسية. ومن ناحية اخرى اعطت السلالات تحت الدراسة محصولاً عالياً تحت ميعاد الزراعة الامثل بالمقارنة بميعاد الزراعة المتأخر .
وتحت ظروف الزراعة المثلى (٢٨ نوفمبر) اعطت ١٠ سلالات محصول عالى وتشمل على ٦ سلالات محلية وهى السلالة ٥ ، السلالة ٢١ ، السلالة ٤ ، السلالة ٣٨ ، السلالة ٣١ و السلالة ١ وثلاثة اصناف من قمح الخبز المصرى وهى جيزة ١٦٤ ، جميزة ٥ و سخا ٦٩ بجانب الصنف السودانى النيلين . اعطت السلالات الوراثية المحلية السلالة ٨ ، السلالة ١٠ ، السلالة ١٦ ، السلالة ١٧ ، السلالة ١٩ ، السلالة ٢٩ ، السلالة ٣٤ و السلالة ٣٧ اعلى عدد من السنابل فى المتر المربع تحت كلاً من ميعادى الزراعة الامثل والمتأخر . وقد اظهرت النتائج المتحصل عليها من البحث ان السلالات التى لها القدرة على تحمل الحرارة العالية ترجع الى ذات قدرة عالية او معامل حساسية للحرارة اقل او كلاهما معاً .
ومما سبق يتضح اهمية السلالات الوراثية المحلية من حيث قدرتها العالية على الاقلمة تحت ظروف متباينة من الاجهاد الحرارى مما يعطى اهمية كبيرة بالنسبة لمربى النبات فى استخدامها لتحسين واستنباط الاصناف الجديدة تحت ظروف الحرارة العالية بمنطقة مصر العليا .

Table (2) : Combined analysis of variance of days to heading (DH) , days to maturity (DM) , plant height in cm (PLH) , Biological yield t/ha. (B.Y) , Grain yield in t/ha. (G.Y) , No. of spikes/^{m2} (S/^{m2}) , No. of kernels/spike (No. K/S) and 1000-kernel weight in gm (1000 K.W) of wheat landrace genotypes and cultivars under Kom-Ombo conditions during 1999/2000 and 2000/2001 growing seasons.

Source of variance	Mean squares (MS)								
	d.f	DH	DM	PLH	B.Y	G.Y	S/^{m2}	No. K/S	1000 K.W

Year	1	2664.919 **	118.008 *	2.852	244.149 **	20.896 **	615402.019 **	2688.533 **	46.252 *
Environments (E)	1	13770.919 **	46020.833 **	13578.769 **	3476.867 **	690.408 **	758509.502 **	6424.033 **	5678.752 **
Error	4	9.342	12.577	12.817	11.381	0.696	1069.265	29.890	3.408
Genotypes (G)	39	117.873 **	57.648 **	705.254 **	22.753 **	3.394 **	5733.310 **	443.692 **	116.449 **
GXE	39	18.748 **	27.491 **	30.906	5.492	0.846 **	1604.729	22.059 **	13.970 **
Error	312	5.550	10.609	47.078	4.979	0.323	1944.965	7.778	2.905
C.V %	-	2.95	2.55	6.01	15.30	13.79	9.88	6.12	4.36

*** , ** significant at the 5 and 1 % level , respectively**