RESULTS AND DISCUSSION

A. Effect of Season :

The results of the combined analysis for all the studied traits are shown in Table (4C). Seasons mean squares were significant for all traits except biological yield , straw yield and harvest index , indicating that the mean performance of these traits differed from season to another . Results in Table (5) represents average of seasons effects on the studied traits . Its evident that grain yield (t/ha) , number of kernels per spike , 1000-kernel weight , harvest index and plant height mean values were significantly higher in the second season , whereas the other traits had the highest ones in the first season . These results indicated that the 1000-kernel weight and number of kernels per spike are the important components for high yielding.

B. Effect of Planting Dates (D) :

Planting date mean squares were highly significant for all the studied traits at separate season as well as the combined analysis (Table 4A ,4B and 4C) . Also the interaction effect between planting date and seasons mean squares were significant for all the studied traits except number of spike per m^2 and 1000-kernel weight . Such result indicate the effect of planting dates was fluctuated from season to another .

The mean values of the studied traits as affected by planting dates are presented in Table (6) . The highest mean values of the studied traits were detected when wheat plants were planted in D2 . For the harvest index and plant height the highest values were obtained when wheat was planted in D3 .

Table (4A) : Mean squares of the analysis of variance for grain yield , number of spikes / m^2 , number of kernels / spike , and 1000-kernel weight in season 1995/96 and 96/97 .

S.O.V	d.f	Grain yield		Number of spike /m^2		Number of kernels / spike		1000-kernel weight	
		1995	1996	1995	1996	1995	1996	1995	1996
Date (D)	3	6.37**	8.77**	10559.5**	7740.9**	6.4**	123.0**	203.7**	188.5**
Irrigation (I)	2	183.25**	196.4**	95279.5**	134277.0**	700.5**	2457.9**	4542.7**	2009.4**
Genotype (G)	7	5.19**	7.94**	6740.8**	18062.1**	116.7**	156.4**	63.5**	57.9**
D X I	6	0.70**	0.74**	1177.6**	1302.1**	7.5**	26.7**	17.9**	14.2**
D XG	21	0.14**	0.21**	304.5**	711.6**	5.9**	8.5**	4.9**	5.9**
G X I	14	1.23**	0.91**	774.6**	1869.7**	27.6**	11.7**	18.3**	14.2**
D X IXG	42	0.16**	0.28**	355.2**	335.4**	10.5**	11.4**	3.4**	7.8**
Error	285	0.026	0.11	114.4	602.3	1.04	2.83	1.23	2.6

* Significant at 0.05 level
** Significant at 0.01 level
ns Not significant

Table (4B) : Mean squares of the analysis of variance for biological yield , straw yield , harvest index , and plant height in season 1995/96 and 96/97 .

		Biological yield (t/ha)		Straw yield (t/ha)		Harvest index		Plant height (cm)	
S.O.V	d.f	1995	1996	1995	1996	1995	1996	1995	1996
Date (D)	3	57.81**	45.83**	35.82**	21.63**	0.023**	0.023**	1042.84**	1123.69**
Irrigation (I)	2	987.97**	913.93**	333.49**	263.07**	0.072**	0.103**	854.95**	28.17
Genotype (G)	7	57.07**	86.74**	29.95**	43.96**	0.008**	0.007**	478.85**	530.79**
D X I	6	3.23**	1.26**	2.35**	1.16	0.003**	0.006**	95.29**	78.00**
D XG	21	3.96**	1.63**	3.46**	1.04*	0.002**	0.001 ns	41.58ns	59.61**
G X I	14	8.12**	2.93**	4.49**	1.56**	0.003**	0.004**	29.86ns	102.68**
D X IXG	42	1.47**	0.81**	1.88**	0.60	0.003**	0.002 ns	32.62ns	71.28**
Error	285	0.36	0.48	0.375	0.61	0.0005	0.001	33.93	14.26

* Significant at 0.05 level
** Significant at 0.01 level
ns Not significant

Table (4C) : Mean squares of the combined analysis of variance for grain yield ,biological yield , straw yield , number of spike / m^2 , number of kernel /spike , 1000-kernel weight , harvest index and plant height .

S.O.V	d.f	Mean Squares Grain yield	Biological yield	Straw yield	Number of spike /m^2	Number of kernels /spike	1000-kernel weight	Harvest index	Plant height
Rep. (R)	3	0.035ns	0.634ns	0.54ns	769.28 ns	7.36ns	6.72ns	0.001	80.43
Year (Y)	1	4.06 **	2.063ns	11.92ns	80298.97 **	1178.6**	1886.89 **	0.04*	31827.0**
R X Y	3	0.016	1.943	2.05	1169.79	23.94	5.12	0.002	740.65
Date (D)	3	14.75 **	100.81 **	54.17**	18063.72 **	71.77 **	388.46 **	0.04 **	1458.95**
Irrigation (I)	2	368.06 **	1889.16 **	594.44**	227887.78 **	2886.32 **	6203.08 **	0.13 **	294.16**
Genotypes (G)	7	12.50 **	118.53 **	55.57**	21467.72 **	181.91 **	104.75 **	0.005 **	935.52**
Y X D	3	0.40 **	2.82 **	3.27**	236.63 ns	57.66 **	3.76 ns	0.006 **	707.58**
Y X I	2	11.59 **	12.74 **	2.13**	1668.40 **	272.18 **	349.07 **	0.046 **	588.95**
Y X G	7	0.63 **	24.97 **	18.34**	3335.16 **	91.19 **	16.71 **	0.01 **	74.11**
D X I	6	0.46 **	0.98 *	1.82**	1934.87 **	4.59 *	5.02 **	0.005 **	120.8**
D X G	21	0.12 *	2.28 **	1.88**	702.31 **	4.70 **	6.20 **	0.0014 *	52.91**
I X G	14	1.73**	9.02 **	4.09**	897.18 **	22.22 **	20.58 **	0.0034 **	38.03
Y X D X I	6	0.98 **	3.51 **	1.69**	544.88 ns	29.56 **	27.15 **	0.0029 **	52.49*
Y X D X G	21	0.23 **	3.30 **	2.63**	313.76 ns	9.61 **	4.59 **	0.0023 **	48.27**
Y X I X G	14	0.41 **	2.03 **	1.96**	1747.13 **	17.06 **	11.94 **	0.0034 **	94.51**
D X I X G	42	0.17 **	1.22 **	1.25**	416.00 ns	9.09 **	6.94 **	0.0022 **	57.5**
Y X D X I X G	42	0.30 **	1.06 **	1.22**	274.59 ns	12.85 **	4.31 **	0.0027 **	46.39**
Error	570	0.07	0.42	0.49	358.39	1.94	1.92	0.0009	24.09

* : Significant at 0.05 level ** : Significant at 0.01 level ns : Not significant

Table (5) : Means of grain yield (t/ha) , biological yield (t/ha) , straw yield (t/ha) ,number of spikes / m^2 , number of kernels / spike , 1000-kernel weight , harvest index and plant height for two seasons over planting dates , irrigation treatments and genotypes .

Season	Grain yield (t/ha)	Biological yield (t/ha)	Straw yield (t/ha)	Number of spikes / m^2	Number of kernels /spike	1000-kernel weight	Harvest index	Plant height (cm)
1995 / 1996	3.78 b	10.99 a	7.22 a	318.80 a	35.85 b	37.34 b	0.34 b	98.83 b
1996 / 1997	3.92 a	10.89 a	6.97 a	298.35 b	38.33 a	40.48 a	0.36 a	111.70 a
Mean	3.85	10.94	7.09	308.58	37.09	38.91	0.35	105.27

Means as the same letter are not significant .

Table (6): Means of grain yield , biological yield , straw yield ,number of spike /m^2 , number of kernel / spike, 1000-kernel weight , harvest index , and plant height for planting dates over irrigation treatments and cultivars .

Planting date	Grain yield (t/ha)	Biological yield (t/ha)	Straw yield (t/ha)	Number of spikes /m^2	Number of kernels /spike	1000-k weight (gram)	Harvest index	Plant height (cm)
D 1	3.73 c	11.26 b	7.53 a	308.00 c	36.96 c	39.23 b	0.33 c	104.68 b
D 2	4.11 a	11.62 a	7.51 a	318.26 a	37.71 a	40.24 a	0.35 b	106.90 a
D 3	4.05 b	10.98 c	6.93 b	312.58 b	37.39 b	39.28 b	0.37 a	107.84 a
D 4	3.52 d	9.93 d	6.41 c	295.46 d	36.30 d	36.89 c	0.35 b	101.64 c

D1 : 25/10/1995 and 28/10/1996 D2 : 10/11/1995 and 12/11/1996
D3 : 25/11/1995 and 27/11/1996 D4 : 10/12/1995 and 11/12/1996
Means as the same letter are not significant .

This result may be due to the prevailing of favorable temperature and day length leading to greater vegetative growth . It could be concluded that D2 sowing date governed growth and consequently yield components of wheat plant . Moreover growing wheat at D2 gave best results of most different characters of yield and yield components . Suitable environmental conditions encourage vegetative growth as well as reproductive organs and this in turn can explain our findings . In addition , translocation of organic components from source to sink depends to a large extent on daily changes in solar radiation and minimum temperature of day and night . However , the minimum ones were obtained from sowing wheat in D4 for all the studied traits except harvest index which obtained from the early sowing date (D1) . Similar results were reported by Samre *et al* (1989) , Lauer and Partridge (1990) , Islam (1990) , Islam (1991) , Dahlke *et al* (1993) .

C. Effect of Irrigation Treatments (I) :

Irrigation mean squares for all the studied traits were significant in both seasons as well as the combined analysis (Table 4A , 4B and 4C) . This finding reflected that the components of each of these indices responded to irrigation treatments .

Mean squares for the interaction between irrigation treatments and seasons were found herein to be significant in all characters (Table 4C) . This finding revealed that these traits responded to irrigation treatments differently from season to season . The fluctuation of response detected herein could be due to that both experimental seasons varied in the amount and distribution of rainfall (Table 2) .

Table (7) presents mean values for all the studied traits in the combined analysis . Mean values for all studied traits reported in Table (7) indicated clearly that plants received five irrigations after sowing exhibited significant increase in all the studied traits compared with those received one or two irrigations . However significantly decreased mean values for all the studied traits were detected by using one irrigation .

For number of spikes per m^2 , mean values detected herein indicated that plants received five irrigations expressed a significant increase in number of spikes per plant compared with those received one or two irrigations . This finding hold fairly true . It can be concluded that the increase in number of available water might be due to the increase in number of tillers per m^2 . These results are agree with those obtained by Gebeyehou and Knott (1983), Magdadi (1990) and Shalaby *et al* (1992) . On the other hand Dubtez and Bole (1973) reported that number of spikes per m^2 was not significant affected by varying the number of irrigation .

With regard to number of kernels per spike , the results indicated that increasing number of irrigation led to a significant increase . The decrease in number of kernels per spike detected by lowering the level of available water in the soil reflected the probable effect of deficiency on spike fertility (Torop and Koryakin 1990) .

Table (7): Mean of grain yield , biological yield , straw yield ,number of spike /m^2 , number of kernel / spike, 1000-kernel weight , harvest index and plant height for irrigation treatments over planting dates and cultivars .

Irrigation	Grain yield (t/ha)	Biological yield (t/ha)	Straw yield (t/ha)	Number of spikes (m^2)	Number of kernels (spike)	1000-kernel weight(g)	Harvest Index	Plant height (cm)
I 1	2.72 c	8.26 c	5.53 c	281.35 c	33.60 c	34.46 c	0.33 c	104.03 b
I 2	3.72 b	10.89 b	7.17 b	303.91 b	37.38 b	38.07 b	0.34 b	105.77 a
I 3	5.11 a	13.69 a	8.58 a	340.47 a	40.29 a	44.20 a	0.38 a	105.98 a

I 1 : One irrigation I 2 : two irrigation I 3 : Five irrigation
Means as the same letter are not significant .

1000-kernel weight mean values indicated that there was a significant increase in harvest index by increasing the number of irrigations . Plants received five irrigations exhibited a significant increase in 1000-kernel weight compared with one or two irrigations .The lowest value was detected by one irrigation . The increase in harvest index by increasing the amount of available water in the soil might be attributed to an increase in all the metabolism process in the plant which led to increase in dry matter accumulation in the different plant organs . Similar results were obtained by Mohamed (1976) , Gebeyehou and Knott (1983) , Phiboonwat and Homdok (1987) , Abd-Mishani and Jafari-Shabesteri (1988) , Gharti-Chhetr and Lales (1990) , Okuyama and Riede (1991) and Shalaby *et al* (1992) . On the other hand Sharar *et al* (1989) reported that weight of 1000-kernel of wheat was not significantly affected by varying the number of irrigations .

Grain yield (t/ha) was found to be appreciably influenced by the application of water regime treatments in the combined analysis . Plants received five irrigations significantly outyielded those received one or two irrigations . Such increase in grain yield was logically due to the achieved increase in its components . In addition , increasing number of irrigations (five irrigations) decreased the osmotic pressure of soil solution and consequently increased water and minerals absorption by growing wheat p[l] ants. This finding agrees with those obtained by Jana and Sen (1978) , Kailasnathan (1986) , Abd-Mishani and Jafari-Shabesteri (1988) , Islam (1990) , Islam (1991) ,Iqbal *et al* (1992) , Shalaby *et al* (1992) .

Data indicated that a significant increase in straw yield (t/ha) , biological yield (t/ha) and plant height mean values were exerted by increasing the amount of available water in the soil .Also , there was a progressive and consistent significant increase in straw yield t/ha by increasing irrigation number from one , two and five irrigations respectively . The highest straw yield and biological yield (t/ha) were obtained from plants received five irrigations . The highest straw yield (t/ha) , in fact , is the out product of its main components ,i.e., plant height , stem thickness , and number of tillers . Any increase in one or more of such components without decrease in the others will lead to an increase in straw yield . Therefore , the increase in straw yield (t/ha) under irrigation conditions was the logical result of the increase in both of number of tillers per m^2 and plant height at similar condition . These results are agree with those obtained by Jana and Sen (1978) , Abd-Mishani and Jafari-Shabestari (1988) , Islam (1990) , Islam (1991) , and Shalaby *et al* (1992) . who reported that increasing soil moisture stress by increasing amount of available water of the soil irrigation depressed straw and biological yield of wheat .

Harvest index mean values was found to be increased by increasing the number of irrigations .These findings go parallel with those presented by Fischer and Wood (1979) .

Again , the obtained results clearly reflected the great effect of water deficiency on the mean performances of all the studied traits . This effect , also , varied from year to year .

Generally , plants received five irrigations after sowing expressed the highest mean values . A gradual depression in mean values parallel to the decrease in amount of available water in the soil was detected .

D.Varietal Differences :

Mean squares associated with varietal differences was found herein to reach the level of significant in all studied traits in the combined analysis (Table 4C) . Mean squares for the interaction between varieties and years were found herein to be significant in all studied traits . This finding revealed that the tested varieties ranked differently from season to season in all the studied traits .

Mean performances of the investigated wheat varieties in the combined analysis are presented in Table (8) . With regard to number of spikes per m^2 , data indicated that there was a significant difference between varieties, Table (8) .It is clear that the cultivar Sids 1 had the highest mean values for all the studied traits except harvest index . While , some varieties showed lowest values ,i.e., Giza 167 and Sahel 1 for plant height , straw yield , number of spikes per m^2 , biological yield and grain yields (t/ha) , Giza 164 for number of kernels per spike , Sakha 8 for 1000-kernel weight and Sakha 69 for harvest index . Whereas , the variety Sakha 69 gave the highest values for harvest index . For grain yield , biological yields (t/ha) , straw yield (t/ha) and number of spikes per m^2 , the variety Sids 1 gave the highest values followed by Sakha 8 and then by Sakha 69 . In this connection it could be concluded that these results are quite expected since the tested varieties had some differences in their genetic stracture . Similar results were reported by Fatih (1987) , Musaviun and Ehdaie (1987) and Bhavsar *et al.* (1996a) .

Table (8): Mean of grain yield , biological yield , straw yield ,number of spike /m^2 , number of kernel /spike, 1000-kernel weight , harvest index and plant height for eight genotypes over planting dates and irrigation treatments .

Genotype.	Grain yield (t/ha)	Biological yield (t/ha)	Straw yield (t/ha)	Number of spikes / m^2	Number of kernels /spike	1000-k. weight (gram)	Harvest index	Plant height (cm)
Gemmiza1	3.77 c	10.78 c	7.01 c	310.63 bc	36.70 c	38.77 c	0.348 cd	106.58 bc
Giza 163	3.80 c	10.93 c	7.13 bc	306.85 bc	36.28 d	38.57 c	0.346 cd	108.28 a
Giza 164	3.75 c	10.83 c	7.08 bc	299.46 d	35.76 e	39.60 b	0.345 cd	108.0 ab
Sakha 8	4.05 b	11.33 b	7.28 b	312.24 b	37.79 b	38.53 c	0.354 bc	103.57 d
Sakha 69	3.74 c	10.88 c	7.14 bc	305.83 c	36.26 d	39.30 b	0.342 d	106.15 c
Giza 167	3.53 d	9.68 d	6.16 d	297.88 de	36.93 c	37.82 d	0.364 a	101.08 e
Sahel 1	3.54 d	9.83 d	6.29 d	293.71 e	36.84 c	37.73 d	0.358 ab	100.57 e
Sids 1	4.65 a	13.32 a	8.67 a	342.02 a	40.16 a	40.95 a	0.347 cd	107.87 ab

Means as the same letter are not significant .

E. Effect of Interaction Between Planting Date and Irrigation Treatments (D X I) :

Mean squares associated with interaction effect between planting date and number of irrigation treatments were found herein to reach the level of significance for all studied traits (Table 4A , 4B and 4C), and that was true in both seasons and their combined analysis . This results revealed that the effect of planting dates differed at various irrigation treatments , on the other words , the effect of planting dates differed in their response to available soil moisture .

Table (9) showed the mean values of wheat yields and its components as affected by the interaction between planting date and number of irrigation treatments in the combined analysis .It is clear that the D2 (10/11) and five irrigation's treatment expressed significantly increased of number of spikes per m^2 , 1000-kernel weight , number of kernels per spike and biological yield followed by the effect of interaction between D3 (25/11) and five irrigation's treatment . However , the lowest values of these traits were detected from effect of interaction between D4 (late of planting date 10/12) and one irrigation treatment .

For straw yield (t/ha) the highest value was detected from D1 (first planting date 25/10) and five irrigation's treatment followed by effect between D2 (the second planting oate) and five irrigations treatment . Suitable environmental conditions encourage vegetative growth as well as reproductive organs can explain our finding . For plant height the highest mean values were detected from effect of interaction between D3 and the three irrigations treatment and D2 and one the irrigation treatment .

Meanwhile the highest value of harvest index was recorded from effect of interaction between D3 and five irrigation treatment . However, the lowest ones for straw yield and plant height were recorded from D4 and one irrigation treatment .

For grain yield (t/ha) , the highest value was obtained from effect of interaction between D2 and five irrigation's treatment , but without superiority than effect of interaction between D3 and five irrigation's treatment . Also , the lowest one was detected by effect of interaction between D4 and one irrigation treatment . This result may be attributed to decreased the osmotic pressure of soil solution and consequently increased water and minerals absorption by growing wheat plant when increasing number of irrigation's . This finding agrees with those obtained by Islam (1990) , Islam (1991) , Bouzerzour and Oudina (1990) .

The effect of interaction between planting date , irrigation treatments and seasons was significant for all the studied traits except number of spikes per m^2 (Table 4C) . This result may be due to the unstable effect of the interaction of planting dates and number of irrigation treatments .

Table (9) : Means of grain yield (t/ha) , number of spikes /m^2 , number of kernels / spike , 1000-kernel weight, biological yield (t/ha) , straw yield (t/ha) , harvest index , and plant height (cm) as affected by different irrigation treatment and planting dates over genotypes and seasons .

	Grain yield (t/ha)			Number of spikes / m^2			Number of kernels/ spike			1000-kernel weight (g)		
Planting date	I 1	I 2	I 3	I 1	I 2	I 3	I 1	I 2	I 3	I 1	I 2	I 3
D 1	2.72	3.60	4.88	282.13	308.06	333.83	33.70	37.44	39.73	34.74	38.76	44.18
D 2	2.94	4.02	5.38	293.72	305.75	355.31	34.24	37.97	40.93	35.95	39.16	45.60
D 3	2.88	3.94	5.32	285.25	308.06	344.44	33.84	37.59	40.73	34.71	38.27	44.85
D 4	2.36	3.33	4.87	264.31	293.75	328.31	32.61	36.51	39.78	32.43	36.09	42.16
LSD 0.05		0.09			6.56			0.48			0.48	
LSD 0.01		0.12			8.62			0.63			0.63	

I 1 : One irrigation I 2 : two irrigation I 3 : Five irrigation
D1 : 25/10/1995 and 28/10/1996 D2 : 10/11/1995 and 12/11/1996
D3 : 25/11/1995 and 27/11/1996 D4 : 10/12/1995 and 11/12/1996

Table (9) Cont. :

Planting date	Biological yield (t/ha)			Straw yield (t/ha)			Harvest index			Plant height (cm)		
	I 1	I 2	I 3	I 1	I 2	I 3	I 1	I 2	I 3	I 1	I 2	I 3
D 1	8.48	11.27	14.02	5.76	7.67	9.14	0.323	0.322	0.350	106.09	104.67	103.28
D 2	8.78	11.59	14.49	5.84	7.57	9.11	0.338	0.350	0.373	107.89	108.38	104.42
D 3	8.43	10.87	13.64	5.55	6.93	8.33	0.344	0.364	0.391	108.66	107.23	107.63
D 4	7.34	9.85	12.62	4.98	6.51	7.74	0.323	0.340	0.388	100.45	103.66	100.8
LSD 0.05		0.23			0.24			0.010			1.70	
LSD 0.01		0.30			0.32			0.014			2.24	

I 1 : One irrigation I 2 : two irrigation I 3 : Five irrigation
D1 : 25/10/1995 and 28/10/1996 D2 : 10/11/1995 and 12/11/1996
D3 : 25/11/1995 and 27/11/1996 D4 : 10/12/1995 and 11/12/1996

F. Effect of Interaction Between Cultivars and Planting Date (C X D) :

Mean square associated with interaction between wheat cultivars and planting date was found herein to reach significance level for all the studied traits (Table 4A ,4B and 4C) , and that was true in both seasons as well as the combined analysis . The result reveal that the tested cultivars different rank at various planting dates . Generally , the most cultivars gave the highest values at D2 for all studied traits . However , the lowest ones were detected at the late planting (10/12) . Table (10) indicates the mean values of wheat yields and its components as affected by interaction between cultivars and planting date .

The highest value of number of spikes per m^2 was obtained when Sids 1 cultivar, sown in D2 , However , the lowest value for this trait was obtained from sowing Giza 164 cultivar in 10 / 12 (D4) late planting .The maximum values of number of kernels per spike were 40.70 , 40.27 , and 40.17 obtained by Sids 1 when sowing at 25/10 , 25/11 , and 10/11 (D1 , D3, D2) respectively . Whereas , Giza 163 gave the minimum value for this character at late planting date (D4) .

The highest values of 1000-kernel weight were detected by Sids 1 at the first , second and third planting dates (D1,D2,and D3) . However the lowest one was detected by Gemmiza 1 at late of planting (D4) .

The Sids 1 cultivar had the highest values for grain yield t/ha at the second , third and first planting dates (D2 , D3, and D1) . However the

lowest ones were obtained from Giza 167 and Sahel 1 at late of planting (D4) .

Sids 1 gave the highest values of biological and straw yield t/ha at the first planting date followed by Sids 1 at second sowing date (D2) . This result might be attributed to the long day led to short growth habit in the later sowing date , such condition induces wheat plants to flowering ,maturity and limited the growth attributes . On the other hand , the lowest ones were detected from Giza 167 and Sahel 1 at late of planting (D4) .

For plant height, the highest values were recorded by Giza 164 and Sids 1 at the third planting date , and Giza 163 at the second sowing date. However , the lowest ones were detected by Giza 167 and Sahel 1 at the later sowing date (D4). For harvest index the highest value was recorded by Giza 167 at the third planting date . However the lowest one was detected by Sahel 1 at the first planting date .

Significant mean squares of interaction between cultivars , sowing date and season were detected for all traits except number of spikes per m^2 (Table 4C) . This result may due to the fluctuated of this effect of cultivars and planting dates from season to another .

Table (10) : Means of grain yield (t/ha) , number of spikes /m^2 , number of kernels / spike , 1000-kernel weight (g), biological yield (t/ha) , straw yield , harvest index , and plant height (cm) as affected by planting dates and genotypes over irrigation treatments and seasons .

	Grain yield (t/ha)				Number of spikes / m^2				Number of kernels / spike				1000-kernel weight (g)			
Genotype	D1	D2	D3	D4	D1	D2	D3	D4	D1	D2	D3	D4	D1	D2	D3	D4
Gemmiza 1	3.53	4.13	3.96	3.47	310.67	317.83	316.83	297.17	36.63	36.98	37.20	35.97	38.78	40.92	39.53	35.83
Giza 163	3.69	4.07	3.98	3.42	301.75	325.17	313.50	287.00	35.98	37.22	37.07	34.83	39.02	39.75	39.10	36.42
Giza 164	3.66	3.96	3.92	3.47	306.50	306.67	303.00	281.67	35.35	36.42	35.92	35.37	39.22	41.23	40.32	37.63
Sakha 8	3.90	4.34	4.24	3.72	311.38	326.42	313.83	297.33	38.20	38.33	38.20	36.42	39.15	39.42	38.67	36.90
Sakha 69	3.66	3.94	3.98	3.37	300.67	311.83	313.83	297.00	35.63	36.88	36.78	35.73	39.98	40.87	39.85	36.50
Giza 167	3.37	3.74	3.77	3.24	301.67	303.33	300.17	286.33	36.30	38.13	37.02	36.28	38.50	38.83	37.65	36.30
Sahel 1	3.39	3.77	3.70	3.30	290.66	296.50	296.50	291.17	36.85	37.58	36.63	36.28	37.72	38.95	37.92	36.32
Sids 1	4.66	4.94	4.82	4.18	340.75	358.33	343.00	326.00	40.70	40.17	40.27	39.50	41.45	41.93	41.17	39.23
LSD 0.05		0.15				10.71				0.79				0.78		
LSD 0.01		0.19				14.08				1.04				1.03		

D1 : 25/10/1995 and 28/10/1996 D2 : 10/11/1995 and 12/11/1996
D3 : 25/11/1995 and 27/11/1996 D4 : 10/12/1995 and 11/12/1996

Table (10) Cont. :

Genotype	Biological yield (t/ha)				Straw yield (t/ha)				Harvest index				Plant height (cm)			
	D1	D2	D3	D4	D1	D2	D3	D4	D1	D2	D3	D4	D1	D2	D3	D4
Gemmiza 1	10.95	11.27	10.90	9.99	7.42	7.15	6.93	6.52	0.323	0.363	0.360	0.345	104.75	111.0	108.33	102.25
Giza 163	11.35	11.57	10.95	9.85	7.65	7.47	6.97	6.44	0.324	0.358	0.360	0.341	108.50	111.83	109.5	103.29
Giza 164	10.71	11.79	10.92	9.89	7.05	7.83	7.00	6.42	0.340	0.340	0.357	0.345	108.38	108.92	110.83	103.88
Sakha 8	11.34	12.11	11.51	10.37	7.44	7.78	7.27	6.64	0.341	0.355	0.367	0.352	102.38	105.42	106.21	100.29
Sakha 69	11.33	11.43	10.74	10.03	7.67	7.49	6.76	6.65	0.323	0.344	0.369	0.333	104.71	107.96	109.96	101.96
Giza 167	9.91	10.26	9.78	8.79	6.54	6.52	6.01	5.55	0.342	0.364	0.383	0.366	101.21	102.04	101.92	99.17
Sahel 1	9.95	10.52	9.99	8.87	6.56	6.74	6.28	5.57	0.318	0.356	0.368	0.368	100.58	99.00	104.33	98.38
Sids 1	14.53	13.99	13.07	11.68	9.87	9.05	8.25	7.50	0.363	0.350	0.368	0.354	106.96	109.0	111.63	103.88
LSD 0.05		0.37				0.40				0.017				2.78		
LSD 0.01		0.48				0.52				0.022				3.65		

D1 : 25/10/1995 and 28/10/1996 D2 : 10/11/1995 and 12/11/1996
D3 : 25/11/1995 and 27/11/1996 D4 : 10/12/1995 and 11/12/1996

G. Effect of Interaction Between Cultivars and Irrigation Treatments (C X I) :

Mean squares associated with interaction between cultivars and the number of irrigation were significant for all the studied traits except plant height (Table 4A and B), and was true in both seasons as well as the combined analysis . This result revealed that the tested cultivars differentially ranked at various irrigation treatments . In other words , the tested cultivars differed in their response to the available soil moisture . As mentioned before plants received five irrigations after sowing expressed in all cultivars the highest mean values for all traits (Table 11) .

Concerning number of spikes per m^2 , the combined data over two seasons showed that increasing number of irrigation of all cultivars significantly increased the number of spikes per m^2 . Thus the higher number of spikes per m^2 was obtained from Sids 1 when received five irrigations followed by Sakha 8 at the same irrigation treatment . However the lowest ones were detected by cultivars Giza 164 , Giza 167 and Sahel 1 by five irrigations treatment .

As shown in Table (11) number of kernels per spikes was considerably affected by the interaction effect of wheat cultivars and number of irrigation treatments . The obtained results showed that increasing mean values by increasing number of irrigation treatments in all cultivars . The highest values were recorded by Sids 1 followed by Sakha 8 at five irrigations treatment . However , the lowest ones were

recorded by Giza 163 and Sahel 1 when received one irrigation after sowing .

Concerning 1000-kernel weight the combined data over two seasons showed that highest mean values were recorded by Sids 1 followed by Giza 164 at five irrigations treatment . On the other hand , the three cultivars Gemmiza 1 , Giza 164 , and Sahel 1 expressed the lowest ones for this trait .

Data presented in Table (11) cleared that grain yield t/ha was significantly affected by cultivars X number of irrigation treatments . It is observed that under the tested wheat cultivars , grain yield was noticeably increased by increasing irrigation numbers . Each cultivar , the higher number of irrigation's (five irrigations after sowing) produced higher grain yield comparing one or two irrigation's after sowing . Also the highest value of grain yield was achieved by Sids 1 followed by Sakha 8 and then by Giza 164 at five irrigation's after sowing .The superiority of Sids 1 , Sakha 8 and Giza 164 might be refereed to its maximized yield components . Moreover this findings may be related to genetical differences between cultivars (Jana and Sen 1978 , Kailasnathan 1986 , and Okuyama and Riede 1991) .

Data presented in Table (11) cleared that biological and straw yields t/ha was significantly affected by effect of interaction between cultivars and the number of irrigation treatments . The highest mean values were recorded by Sids 1 followed by Sakha 8 and then by Giza 164 at five irrigation's . However the lowest ones were recorded by Giza 167 and Sahel 1 at one irrigation after sowing . Under each cultivar the higher irrigation numbers produced the higher biological yield t/ha . This result may be due to high number of stems per m^2 and high plant height .

Table (11) : Means of grain yield (t/ha) , number of spikes /m^2 , number of kernels / spike , 1000-kernel weight (g), biological yield (t/ha) , straw yield (t/ha), harvest index, and plant height (cm)as affected by different irrigation treatment and genotypes over planting dates and seasons .

	Grain yield (t/ha)			Number of spikes /m^2			Number of kernels /sp			1000-kernel weight		
Genotype	I 1	I 2	I 3	I 1	I 2	I 3	I 1	I 2	I 3	I 1	I 2	I 3
Gemmiza 1	2.74	3.61	4.97	283.63	309.25	339.00	33.96	36.01	40.11	33.69	37.40	45.21
Giza 163	2.61	3.88	4.90	281.25	299.94	339.38	32.58	37.08	39.18	34.59	37.98	43.15
Giza 164	2.60	3.60	5.05	269.75	295.88	332.75	33.00	34.66	39.63	33.77	39.50	45.54
Sakha 8	2.95	3.74	5.46	280.69	302.63	353.41	34.65	38.00	40.71	34.15	37.53	43.93
Sakha 69	2.73	3.55	4.94	288.25	299.25	330.00	32.74	37.19	38.85	35.01	38.13	44.76
Giza 167	2.63	3.44	4.51	268.63	295.50	329.50	33.34	37.85	39.56	34.59	36.81	42.06
Sahel 1	2.45	3.50	4.67	267.00	292.50	321.63	32.66	37.97	39.88	33.68	36.71	42.79
Sids 1	3.09	4.47	6.40	311.63	336.31	378.13	35.79	40.26	44.43	36.20	40.51	46.13
LSD 0.05		0.13			9.28			0.68			0.68	
LSD 0.01		0.17			12.19			0.90			0.89	

I 1 : One irrigation I 2 : two irrigation I 3 : Five irrigation

Table (11) Cont. :

Genotype	Biological yield (t/ha)			Straw yield (t/ha)			Harvest index			Plant height (cm)		
	I 1	I 2	I 3	I 1	I 2	I 3	I 1	I 2	I 3	I 1	I 2	I 3
Gemmiza 1	8.40	10.43	13.49	5.67	6.83	8.53	0.327	0.346	0.371	105.56	108.41	105.78
Giza 163	8.32	10.99	13.47	5.71	7.11	8.57	0.314	0.356	0.367	108.63	108.49	107.78
Giza 164	7.90	10.98	13.61	5.30	7.38	8.56	0.331	0.332	0.373	109.63	108.53	105.84
Sakha 8	9.13	10.91	13.96	6.18	7.17	8.50	0.324	0.344	0.393	103.47	103.88	103.38
Sakha 69	8.19	11.07	13.39	5.46	7.52	8.45	0.334	0.323	0.370	106.78	108.25	103.41
Giza 167	7.47	9.65	11.93	4.83	6.21	7.42	0.354	0.358	0.379	100.94	102.38	99.94
Sahel 1	7.24	9.73	12.52	4.78	6.24	7.85	0.341	0.359	0.375	102.00	100.38	99.34
Sids 1	9.42	13.40	17.13	6.34	8.93	10.74	0.331	0.336	0.375	109.19	107.63	106.78
LSD 0.05		0.32			0.34			0.015			2.40	
LSD 0.01		0.42			0.45			0.019			3.16	

I 1 : One irrigation I 2 : two irrigation I 3 : Five irrigation

For plant height the highest values were recorded by Giza 163 , Giza 164 and Sids 1 at one or two irrigation treatments and Gemmiza 1 at two irrigation's after sowing . However the lowest ones were recorded by Giza 167 and Sahel 1 at five irrigation's after sowing .

For harvest index , the highest value was recorded by Sakha 8 at five irrigation's after sowing .However the lowest value was detected by Giza 163 at one irrigation treatment .The effect of interaction between cultivar , number of irrigation and seasons was significant for all the studied traits (Table 4B) . This indicated the changeable effect of interaction between cultivar and number of irrigation's for these characters from season to another .

H. Effect of Interaction Between Planting Date, Irrigation Treatments and Cultivars (D X I X C) :

Mean squares associated with interaction between wheat cultivars ,planting date and irrigation treatments were significant for all the studied traits except number of spikes per m^2 , in the combined analysis (Table 4A and B) . The cultivar Sids 1 expressed the highest values of grain yield t/ha at the different planting dates by one irrigation after sowing compared with other cultivars . Also the cultivar Sids 1 gave the highest mean values of grain yield t/ha in different planting dates with five irrigation after sowing . While the highest mean value was recorded by Sids 1 in the second planting date (10/11) with five irrigations after sowing (Table 12) . This was expected since drought stress during grain filling may effect greatly amount of photosynthates in the grain . In addition this is to be expected since average 1000-kernel weight and number of kernels per spike .

However the lowest mean values of grain yield t/ha were recorded by Giza 163 and Sahel 1 at the fourth planting dates (D4 10/12) and one irrigation after sowing but without significant differences of those recorded by Gemmiza 1 , Giza 163 , Sakha 8 , Sakha 69 and Giza 167 in fourth planting date with one irrigation after sowing and Sahel 1 in the third planting date with one irrigation after sowing .

Concerning number of kernels per spike , the combined data over two seasons showed that Sids 1 recorded the highest mean value when plants received five irrigation's (Table 12) under all cultivars at different planting dates .

In different planting dates , increasing number of irrigation's let to a significant increase in number of grains per spike . Again , the decrease in number of kernels per spike detected herein by lowering the level of available water in the soil reflected the probable effect of deficiency on spike fertility (Torop and Koryahin 1990) . The lowest mean values were recorded by cultivars Giza 163 and Gemmiza 1 when plants received one irrigation after sowing at fourth planting date of Sakha 69 in the second planting date (Table 12) . (Islam 1990 , Saini and Gautan 1990 and Islam 1991) .

As shown in Table (12) , biological yield was considerable affected by the interaction effect of wheat cultivars , planting dates and number of irrigation treatments . The obtained results showed that Sids 1 had the highest biological yield at first planting date with five irrigation's but without superiority of Sids 1 at the second planting date with five irrigation's . However lowest values of biological yield were recorded

by Sahel 1 , Giza 164 at fourth planting date with one irrigation after sowing.

For straw yield the highest mean value was detected by Sids 1 at the first planting date with five irrigations after sowing , followed by Sids 1 at the second and third planting dates with five irrigation's treatment . However , the lowest ones were recorded by Giza 167 and Sahel 1 at fourth planting date with one irrigation after sowing .

For plant height, the highest values were recorded by Sids 1, Sakha 69 and Giza 164 at the third planting date with one irrigation after sowing . However , the lowest one was recorded by Sahel 1 at the second planting date with five irrigation's treatment (Table 12) .

Significant effect of interaction between cultivars, planting dates , irrigation regime and seasons was obtained for all the studied traits except the number of spikes per m^2 (Table 4 B) . This result indicated the fluctuated of this effect from year to another .

Concerning 1000-kernel weight , the highest mean values were recorded by Sids 1 at the first , second and third planting dates , Sakha 69 at the first and second planting dates , Sakha 8 at the first planting dates and Giza 164 and Gemmiza 1 at the second and third planting dates when plants received five irrigations after sowing . However the lowest ones were recorded by Gemmiza 1 , Giza 164 , Sakha 8 and Giza 167 at fourth planting date when received five irrigation's (Table 12) .

Table (12) : Means of grain yield (t/ha), number of spikes / m^2 , number of kernels / spike , 1000-kernel weight (g) , biological yield (t/ha), straw yield (t/ha) , harvest index , and plant height (cm)as affected by planting dates , irrigation treatments , and genotypes over two seasons .

		Grain yield (t/ha)				Number of spikes / m^2				Number of kernels / spike				1000-kernel weight (g)			
Genotype	I	D1	D2	D3	D4	D1	D2	D3	D4	D1	D2	D3	D4	D1	D2	D3	D4
Gemmizal	I 1	2.61	2.98	2.88	2.47	279.5	289.5	290.5	275.0	33.7	35.1	34.9	32.2	34.2	35.7	34.5	30.5
	I 2	3.18	4.21	3.75	3.26	320.5	309.0	316.5	291.0	36.6	35.4	35.7	36.3	37.9	40.5	37.9	33.4
	I 3	4.78	5.17	5.24	4.66	332.0	355.0	343.5	325.5	39.6	40.4	41.0	39.5	44.3	46.7	46.3	43.7
Giza 163	I 1	2.58	2.98	2.72	2.13	279.0	303.0	293.0	250.0	32.2	34.0	33.0	31.2	34.5	36.7	34.1	33.2
	I 2	3.71	4.27	4.00	3.53	301.2	312.0	302.5	284.0	36.6	37.9	37.4	36.8	39.5	38.8	38.1	35.6
	I 3	4.77	5.02	5.21	4.59	325.0	360.5	345.0	327.0	39.1	39.9	40.9	36.8	43.1	43.9	45.2	40.5
Giza 164	I 1	2.57	2.88	2.78	2.16	278.0	281.5	272.0	247.5	34.0	34.4	32.8	30.9	33.8	35.0	34.9	31.5
	I 2	3.50	3.69	3.83	3.35	294.5	294.5	305.5	289.0	34.0	34.8	34.9	35.0	39.0	41.9	40.0	37.3
	I 3	4.89	5.29	5.13	4.88	347.0	344.0	331.5	308.5	38.1	40.2	40.1	40.2	44.9	46.9	46.2	44.2
Sakha 8	I 1	2.98	3.17	3.16	2.46	280.0	292.2	285.5	265.0	36.8	34.8	34.1	33.0	34.7	35.9	34.3	31.8
	I 2	3.62	4.01	3.99	3.32	311.5	311.5	300.0	287.5	38.1	38.6	39.3	36.1	38.6	37.2	37.8	36.6
	I 3	5.08	5.81	5 56	5.37	342.6	375.5	356.0	339.5	39.8	41.6	41.3	40.3	44.2	45.2	44.0	42.4
Sakha 69	I 1	2.75	2.91	2.91	2.33	282.0	301.0	300.5	269.5	32.8	31.4	33.2	33.6	35.1	36.8	36.6	31.7
	I 2	3.46	3.77	3.79	3.16	296.5	296.5	308.0	296.0	37.1	38.5	37.8	35.5	39.2	39.8	37.9	35.7
	I 3	4.76	5 13	5.25	4.61	323.5	338.0	333.0	325.5	37.1	40.8	39.5	38.1	45.7	46.1	45.1	42.2
Giza 167	I 1	2.68	2.76	2.71	2.36	282.0	282.5	266.5	243.5	31.9	34.8	33.5	33.4	36.1	36.2	32.8	33.3
	I 2	3.22	3.67	3.76	3.10	297.0	289.5	333.5	295.0	37.6	39.5	37.4	37.1	37.1	36.8	37.2	36.2
	I 3	4.19	4.76	.4.84	4.23	326.0	338.0	333.5	320.5	39.5	40.2	40.2	38.4	42.3	43.6	43.0	39.4
Sahel 1	I 1	2.52	2.62	2.48	2.16	265.5	274.5	267.5	360.5	32.0	33.4	32.9	32.4	34.5	34.4	33.7	32.2
	I 2	3.46	3.77	3.65	3.07	301.5	283.0	297.0	288.5	38.5	39.8	37.6	36.1	36.6	37.8	37.0	35.6
	I 3	4.16	4.90	4.96	4.64	305.0	332.0	325.0	324.5	40.1	39.6	39.5	40.4	42.1	44.7	43.1	41.3
Sids 1	I 1	3.00	3.18	3.40	2.73	311.0	325.5	306.5	303.5	36.3	36.2	36.5	34.3	35.1	37.2	37.0	35.6
	I 2	4.59	4.70	4.73	3.84	341.7	350.0	334.5	319.0	41.2	39.4	40.9	39.6	42.4	40.9	40.4	38.4
	I 3	6.38	6.92	6.31	5.96	369.5	399.5	388.0	355.5	44.7	44.9	43.5	44.7	46.9	47.8	46.1	43.8
LSD0.05			0.25				18.55				1.36				1.30		
LSD0.01			0.33				24.38				1.79				1.78		

I 1 : One irrigation I 2 : two irrigation I 3 : Five irrigation D1 : 25/10/1995 and 28/10/1996 D2 : 10/11/1995 and 12/11/1996 D3 : 25/11/1995 and 27/11/1996 D4 : 10/12/1995 and 11/12/1996

Table (12) Cont.:

Genotype	I	Biological yield (t/ha)				Straw yield (t/ha)				Harvest index				Plant height (cm)			
		D1	D2	D3	D4	D1	D2	D3	D4	D1	D2	D3	D4	D1	D2	D3	D4
Gemmiza1	I 1	8.1	9.1	9.0	7.5	5.47	6.07	6.11	5.02	0.324	0.329	0.321	0.331	103.4	109.1	109.5	100.3
	I 2	10.5	10.9	10.5	9.8	7.30	6.68	6.75	6.57	0.306	0.385	0.358	0.331	105.3	112.4	108.4	107.6
	I 3	14.3	13.9	13.2	12.7	9.48	8.69	7.95	7.98	0.338	0.375	0.399	0.371	105.7	111.5	107.1	98.9
Giza 163	I 1	9.0	8.7	8.3	7.4	6.37	5.68	5.55	5.25	0.288	0.345	0.330	0.289	108.1	113.3	110.6	102.5
	I 2	11.6	11.2	11.3	9.9	7.86	6.92	7.28	6.38	0.325	0.383	0.355	0.357	109.3	110.0	108.6	105.9
	I 3	13.5	14.8	13.3	12.3	8.73	9.81	8.07	7.68	0.356	0.346	0.392	0.374	108.1	112.3	109.3	101.5
Giza 164	I 1	8.0	8.6	8.2	6.9	5.38	5.72	5.38	4.71	0.326	0.341	0.341	0.314	112.1	109.8	112.8	103.9
	I 2	10.5	11.4	11.0	10.0	7.03	8.67	7.19	6.62	0.333	0.307	0.348	0.338	108.4	110.8	108.6	106.4
	I 3	13.6	14.4	13.6	12.8	8.74	9.11	8.44	7.94	0.359	0.369	0.381	0.382	104.6	106.3	111.1	101.4
Sakha 8	I 1	9.5	9.6	9.3	8.1	6.50	6.46	6.13	5.62	0.316	0.331	0.343	0.305	105.8	106.6	103.0	98.5
	I 2	10.6	12.1	10.7	10.2	7.01	8.11	6.70	6.84	0.340	0.333	0.373	0.329	101.8	105.6	109.0	99.1
	I 3	13.9	14.6	14.5	12.8	8.82	8.75	8.97	7.47	0.365	0.401	0.384	0.419	99.6	104.0	106.6	103.3
Sakha 69	I 1	8.4	9.0	8.0	7.3	5.64	6.12	5.09	4.98	0.328	0.322	0.365	0.320	104.8	107.6	113.3	101.5
	I 2	11.6	11.2	11.0	10.4	8.14	7.46	7.19	7.28	0.299	0.343	0.345	0.303	103.5	114.0	110.4	105.1
	I 3	14.0	14.0	13.2	12.3	9.22	8.90	7.99	7.70	0.341	0.366	0.397	0.376	105.9	102.3	106.3	99.3
Giza 167	I 1	7.5	7.8	7.9	6.7	4.82	5.03	5.16	4.33	0.359	0.356	0.346	0.352	104.0	103.9	99.1	96.8
	I 2	10.0	10.3	9.6	8.7	6.81	6.58	5.86	5.58	0.322	0.359	0.393	0.357	103.5	102.9	101.3	101.9
	I 3	12.2	12.7	11.9	11.0	7.99	7.95	7.01	6.74	0.343	0.376	0.408	0.386	96.1	99.4	105.4	98.9
Sahel 1	I 1	7.4	7.8	7.3	6.42	4.92	5.13	4.89	4.25	0.341	0.339	0.340	0.344	100.0	101.6	107.4	99.0
	I 2	10.2	10.4	9.7	8.8	6.66	6.58	6.0	5.72	0.344	0.363	0.378	0.348	98.6	101.4	101.4	100.1
	I 3	12.3	13.4	13.0	11.4	8.12	8.54	8.01	6.75	0.339	0.365	0.385	0.411	103.1	94.0	104.3	96.0
Sids 1	I 1	10.1	9.7	9.5	8.4	7.05	6.51	6.11	5.69	0.300	0.336	0.362	0.325	110.6	111.3	113.6	101.3
	I 2	15.2	14.3	13.2	11.0	10.58	9.55	8.46	7.13	0.302	0.329	0.356	0.354	107.1	110.0	110.3	103.1
	I 3	18.4	18.0	16.5	15.7	12.0	11.09	10.18	9.68	0.351	0.384	0.383	0.382	103.1	105.8	111.0	107.3
LSD0.05			0.64				0.69				0.029				4.81		
LSD0.01			0.84				0.90				0.039				6.32		

I 1 : One irrigation I 2 : two irrigation I 3 : Five irrigation D1 : 25/10/1995 and 28/10/1996 D2 : 10/11/1995 and 12/11/1996 D3 : 25/11/1995 and 27/11/1996
D4 : 10/12/1995 and 11/12/1996

For harvest index the highest values were recorded by Sakha 8 at fourth planting date with received five irrigation's after sowing followed by Sakha 8 at second planting date when plants received five irrigation's . However the lowest one was detected by Sakha 69 at first planting date with five irrigation's after sowing , Sakha 69 at fourth planting date with two irrigation's after sowing and by Sakha 8 at fourth planting date with one irrigation (Table 12) .

I. Stability Analysis :

Mean squares of environments , genotypes and genotypes X environments interaction were significant for all traits (Table 13) . Significant mean squares for environments was detected for all traits , indicating that the performance of these traits differed from environment to another . Significant varieties and varieties X environment interaction were detected , revealing that varieties carried genes with different additive and additive X additive effects which seemed to be inconstant from environment to another . These results emphasize that the environments had stress and non-stress conditions . The significance of varieties X environments interaction is in agreement with Sharma and Nanda (1985) , Sayed (1987) , Fatih (1987) , Gullord and Aastveit (1987), Ghandorah (1989) , Sariah *et al* (1990) , and Bhavsar *et al* (1996) .

Eberhart and Russell Model (1966)

This model provides a mean of partitioning the genotype environmental interaction for each variety into two parts : (1) The variation due to the response of the variety to varying environmental index (sum of squares due to regression) . (2) The unexplainable deviation from the regression on the environmental index . They added that a stable prefered variety would have approximately :

1- bi = 1.0

2- $S^2d = 0.0$

3- A high mean yield

Differences among variety mean values were statistically significant for all the studied traits . This results not only the amount of variability that existed among environments but also the presence of genetic variability among genotypes included in the study .

Data in Table (15) showed that the linear response of environment was significant for all the studied traits , consequently , the regression coefficient (bi) of seed yield on the environmental index and deviation from regression mean squares (s^2d) pooled over the 24 environments were calculated for each variety are presented in Table (15) .

Significant varieties X environments linear was detected for all the studied traits Table (15) . This indicated that the differences among varieties for their regression on the estimate the (bi) values when this interaction is significant . Pooled deviations mean squares were significant suggesting linear regressions also assume importance considering deviation mean squares for individual variety deviation .

Mean square for individual variety was significant except for deviation squares due to cultivar Gemmiza 1 , Sakha 8 , Sakha 69 , Giza 167 and Sahel 1 for number of spikes per m^2 , variety Giza 167 for straw yield and variety Giza 163 and Giza 164 for plant height whereas insignificant ones were detected . This result indicated that the high stability for the previous cultivars .

According to Langer *et al* (1979) , the regression coefficient is a measure of respor .e to varying environments . Backer *et al* (1982) regarded s^2d for deviation from regression to be the most appropriate criterion for measuring phenotypic stability to micro changes in the environment while the regression coefficient would indicate the response to the major feature of the environment . The variation in regression

coefficients indicates that eight cultivars had different response to environmental changes .

Ideally , a cultivar would be adapted to all environments (bi did not differ significantly from unity) , stable (s^2d did not differ significantly from zero) and had above yielding ability particularly for a given production area . The highest yielding cultivars were Sids 1 , followed by Sakha 8 and then Giza 163 , Gemmiza 1 and Sakha 69 . Also , the bi values for the above mentioned cultivars were not significantly from unity (Table 14) .

The minimum deviation from regression mean squares (s^2d) pooled over 24 environments were obtained for Giza 163 , Gemmiza 1 , Giza 164 , and Sakha 69 followed Sids 1 while Sakha 8 had the highest s^2d . These results revealed that the mention cultivars except Sakha 8 were more stable than the others under the environments study . According to Eberhart and Russell (1966) , these cultivars were more stable than others under the environments studied . Also , these cultivars might be considered as a stable and desired cultivars because there performance was outstanding . Therefore , it could be used in breeding programs in this respect . At the same times , the other cultivars had undesired stability parameters .

Results of stability for number of spikes per m^2 presented in Table (14) showed that values of regression coefficient (bi) were not significant all cultivars except Sakha 8 and Sakha 69 . Whereas values of deviation from regression (s^2d) were significant for all cultivars except Giza 163 , Giza 164 and Sids 1 , revealing the importance of s^2d

parameter in measuring the stability of performance of the eight wheat cultivars . Such results suggested that cultivars exhibited general adaptability to the most environments under study for that trait . But we take into account the magnitude of s^2d and the two other stability parameters ($\overline{X}$ and bi) , it is evident that , the cultivar Gemmiza 1 was the almost having the lowest s^2d value it is bering the more stable cultivars for this trait . For the two cultivars Giza 163 and Sids 1 had high values for s^2d , suggesting that both cultivars are being as moderately to low stable ones . On the other hand , the significant bi and low s^2d for Sakha 8 and Sakha 69 show that this type is perform relatively better under favorable environments .

Regarding number of kernels per spike results of stability parameters Table (14) showed that all cultivars had non significant values for bi from unity and variable significant values for s^2d .The highest number of kernels per spike were recorded by Sids 1 and Sakha 8 , while the deviation from regression s^2d were significant , therefore they are considered as adapted but characterized by specific instability .

Considering all stability parameters it is appeared that , the most desirable cultivars are Gemmiza 1 , Giza 163 and Sakha 69 . Such they had as shown , high mean performance and low magnitude of variability as compared with other cultivars .

Regression coefficient values of 1000-kernel weight Table (14) did not significantly from unity for all cultivars except Giza 163 , Giza 164 and Giza 167 . Meanwhile their deviation from linear regression

were significant for Gemmiza 1 and Giza 167 . Therefore the Sakha 8 , Sakha 69 , Sahel 1 and Sids 1 had more stable for most environments used in this investigation .

For biological yield t/ha , the stable performing cultivars were Giza 163 , Giza 164 and Sakha 8 . Also for straw yield t/ha the cultivar Sakha 69 exhibited more stable for this trait . Meanwhile , the Giza 163 expressed more stable over all environments for plant height . Also the three cultivars Giza 164 , Sakha 69 and Giza 167 expressed more stability for harvest index.

Finally , there is a need to test these cultivars in a more diverse and wider range of locations and agricultural treatments to confirm its conclusion .

Table (13) : Mean squares of the combined analysis using the combination between both planting dates and irrigation treatments as different 24 artificial environments .

S.O.V	d.f	Mean Squares							
		Grain yield	Biological yield	Straw yield	Number of spikes /m2	Number of kernels /spike	1000-kernel weight	Harvest index	Plant height
Environment (E)	23	8.89 **	45.04 **	15.20 **	6621.64 **	87.92 **	177.84 **	0.0066 **	447.09 **
Genotype (G)	7	3.12 **	29.70 **	13.89 **	5366.93 **	45.48 **	26.18 **	0.0013 *	233.88 **
E X G	161	0.093 **	0.84 **	0.64 **	171.91 **	3.74 **	1.97 **	0.0007 **	13.76 **
Pooled error	504	0.02	0.103	0.123	85.56	0.46	0.49	0.00022	5.20

* Significant at 0.05 level
** Significant at 0.01 level

Table (14) : Estimates of stability parameters for eight genotypes of wheat based on 24 different artificial environments in 1995/96 and 1996/97 seasons .

Trait and Parameter		Genotype Gemmiza 1	Giza 163	Giza 164	Sakha 8	Sakha 69	Giza 167	Sahel 1	Sids 1	Mean
Grain yield (t/ha)	$\bar{X}$	3.77 c	3.79 c	3.75 c	4.05 b	3.74 c	3.53 d	3.54 d	4.65 a	3.85
	bi	0.94	0.95	0.99	1.06	0.94	0.80*	0.94	1.38**	
	s^2d	0.04	0.03	0.02	0.6	0.02	0.01	0.03	0.1	
Number of spike /(m2)	$\bar{X}$	310.63 bc	306.85bc	299.46 d	312.24 b	305.83 c	297.88 de	293.71 e	342.02 a	308.58
	bi	0.93	1.14	1.12	1.28**	0.69**	1.03	0.86	0.95	
	s^2d	- 15.1	113.8	53.3	- 9.13	13.6	- 18.5	7.9	185.6	
Number of kernel/ spike	$\bar{X}$	36.7 c	36.28 d	35.76 e	37.79 b	36.26 d	36.93 c	36.84 c	40.16 a	37.09
	bi	0.88	0.99	1.13	0.73	0.88	1.07	1.06	1.25	
	s^2d	1.4	1.2	2.8	5.5	1.6	2.3	2.4	3.9	
1000-kernel weight	$\bar{X}$	38.77 c	38.57 c	39.6 b	38.53 c	39.3 b	37.82 d	37.73 d	40.95 a	38.91
	bi	1.15	0.89*	1.08*	1.01	1.01	0.84*	0.98	1.04	
	s^2d	1.3	0.5	2.6	0.5	0.7	1.3	0.9	0.7	

$\bar{X}$: Mean of the genotype in all environments bi : Regression coefficient S^2d : Deviation from regression .

Table (14) Cont. :

Trait and Parameter		Genotype Gemmiza 1	Giza 163	Giza 164	Sakha 8	Sakha 69	Giza 167	Sahel 1	Sids 1	Mean
Biological yield (t/ha)	$\bar{X}$	10.78 c	10.93 c	10.83 c	11.53 b	10.88 c	9.68 d	9.83 d	13.32 a	10.94
	bi	0.90	0.96	1.04	0.91	0.95	0.82*	0.96	1.42**	
	s^2d	0.56	0.22	0.58	0.57	0.07	0.07	0.74	1.17	
Straw yield (t/ha)	$\bar{X}$	7.01 c	7.13 bc	7.08 bc	7.28 b	7.14 bc	6.16 d	6.29 d	8.67 a	7.09
	bi	0.89*	0.98	1.09	0.79**	1.00	0.87*	0.93	1.45**	
	s^2d	0.46	0.30	0.51	0.36	0.13	0.008	0.52	0.81	
Harvest index	$\bar{X}$	0.348 cd	0.346 cd	0.345 cd	0.354 bc	0.342 d	0.364 a	0.358 ab	0.347 cd	0.35
	bi	0.89*	1.14*	1.02	1.26**	1.00	1.02	0.70**	0.97	
	s^2d	0.0004	0.0005	0.0004	0.0002	0.0005	0.0001	0.0003	0.0003	
Plant height (cm)	$\bar{X}$	106.58 bc	108.28 a	108.00 ab	103.57 d	106.15 c	101.08 e	100.57 e	107.87 ab	105.27
	bi	0.99	0.97	0.91*	0.89*	1.04	0.86*	1.12*	1.22**	
	s^2d	7.0	1.0	2.72	12.1	8.54	8.36	10.05	4.1	

$\bar{X}$: Mean of the genotype in all environments bi : Regression coefficient S^2d : Deviation from regression .

Table(15) : Analysis of variance for grain yield , Number of spikes / m^2 , Number of kernels / spike , 1000-kernel weight , biological yield , straw yield , harvest index and plant height under 24 artificial environments (Eberhart & Russell's model 1966) .

S.O.V	d.f	Mean Square Grain yield	Number of spikes / m^2	Number of kernel /spike	1000-kernel weight	Biological yield	Straw yield	Harvest index	Plant height
Total	191								
Genotypes(G)	7	3.12**	5366.93**	45.48**	26.18**	29.7**	13.89**	0.0013*	233.88**
E.+(G X E)	184	1.19**	978.13**	14.26**	23.95**	6.37*	2.46	0.0014	67.93
Environment (E) linear	1	204.47**	152297.72**	2022.16**	4090.32**	1035.92**	349.63**	0.1518**	10783.14**
G X E linear	7	0.72**	628.38**	6.74*	4.98**	4.29**	1.86**	0.00047	16.42
Pooled deviation	176	0.06	132.26	3.15	1.60	0.6	0.51	0.00062	11.94
Gemmiza 1	22	0.059**	75.65	1.95**	1.81**	0.68**	0.59**	0.0007**	12.20**
Giza 163	22	0.049**	204.70**	1.72**	1.05**	0.32**	0.42**	0.0007**	6.20
Giza 164	22	0.041**	144.17*	3.33**	3.16**	0.69**	0.63**	0.0007**	7.92
Sakha 8	22	0.056**	81.67	5.97**	1.01**	0.67**	0.49**	0.0004*	17.31**
Sakha 69	22	0.044**	104.46	2.16**	1.23**	0.17*	1.40**	0.0007**	13.74**
Giza 167	22	0.032*	72.24	2.80**	1.83**	0.174*	0.13	0.0004*	13.57**
Sahel 1	22	0.051*	98.76	2.89**	1.47**	0.84**	0.64**	0.0006**	15.25**
Sids 1	22	0.120**	276.46**	4.42**	1.28**	1.27**	0.93**	0.0009**	9.30*
Pooled error	504	0.02	85.56	0.46	0.49	0.103	0.123	0.00022	5.2

J. Correlation and Path Coefficient Analysis

Table (16) shows that values of simple correlation coefficient between different characters . Highly significant and positive association were obtained between grain yield and each of number of spikes / m2, number of kernels / spike , 1000-kernel weight , straw yield , biological yield and harvest index . Therefore , selection for higher number of spikes , or number of kernels / spike , and / or heavy seed index , biological yield , straw yield and higher harvest index is more effective for obtaining new higher yielding strains . Ahmed (1972), Ibraheim *et al* (1974) and Sornprach (1988) concluded that number of kernels per spike is the one of the main yield components which might improve directly the yielding ability in new varieties .

Highly significant positive correlation coefficient was found between number of spikes / m^2 and each of number of kernels/spike , 1000-kernel weight , biological yield , straw yield and harvest index . Highly significant correlation coefficient was detected between number of kernels/spike and each of 1000-kernel weight , biological yield , straw yield, harvest index and plant height . The same trend was previously reported by Shanahan *et al* 1984 .

Significant positive correlation coefficient between 1000-kernel weight and each of biological yield , straw yield harvest index and plant height . Also significant positive correlation coefficient between biological yield and each of straw yield and harvest index . However significant negative correlation coefficient between straw yield and harvest index (Ahmed and Rashid 1992) .

Partitioning of simple correlation coefficient between grain yield and its components i.e number of spikes /m^2 , number of kernels per spike and 1000-kernel weight are presented in Table (17) .1000-kernel weight proned to high direct effect followed by both number of spikes / m^2 and number of kernels /spike . Also , the results showed that the indirect effect of number of kernels / spike through 1000-kernel weight and number of spikes /m^2 through 1000-kernel weight . These results revealed that the most important sources of variation for plant yield in dedcending order were 1) the direct effect of 1000-kernel weight , number of spikes / plant and number of kernels / spike respectively . 2) the indirect effects of number of kernels / spike through 1000-kernel weight and number of spikes throught 1000-kernel weight .

The coefficient of determination were calculated for the direct and indirect effects of the three yield factors studied and transformed into percentages in order to evaluate these factors as to their importance as sources of variation in plant yield . The components in percent for grain yield variation over all environments are presented in Table (18) . From this table , it could be concluded that the most important sources of variation in plant yield are :

The direct effect of 1000-kernel w' ight followed by indirect effect of number of kernels / spike through 1000-kernel weight and indirect effect of number of spikes /m^2 through 1000-kernel weight . The three previous sources account for approximately 55.62 of grain yield variation . While , the direct effect of number of spikes /m and number

of kernels per spike account for approximatly 18.69 of grain yield variation . In this connection Bhowmik *et al* (1989) found that the most important sources of variation in plant yield were the direct effect of number of spikes / m^2 , 1000-kernel weight and spike length . On the other hand Sayed and Al-Sayad (1983) reported that 1000-kernel weight had the largest direct effect on grain yield .

Table (16) : Correlation coefficients for Yield , its components and some other agronomic characters .

Character	Number of spikes/m^2	Number of e	1000-kernel weight	Biological yield	Straw yield	Harvest index	Plant height
Grain yield	0.71**	0.75**	0.83**	0.89**	0.72**	0.55**	0.07
Number of spikes /m^2		0.48**	0.55**	0.73**	0.67**	0.20**	-0.13
Number of kernels/spike			0.64**	0.69**	0.57**	0.39**	0.26**
1000-kernel weight				0.79**	0.67**	0.37**	0.25**
Biological yield					0.95**	0.12**	0.04
Straw yield						-0.16**	0.02
Harvest index							0.14*

Table (17) : Path coefficient analysis for yield , and yield components .

Character	Number of spikes/m^2	Number of kernels/spike	1000-kernel weight	Correlation coefficients
Number of spikes/m^2	0.3076	0.1458	0.2564	0.71**
Number of kernels/spike	0.1476	0.3038	0.2984	0.75**
1000-kernel weight	0.1692	0.1944	0.4662	0.83**

Table (18) : The components in percent for grain yield variation .

Source of Variation	Coefficient of determination	Percentage contributed
Number of spike /m^2	0.0946	9.46
Number of kernels / spike	0.0922	9.23
1000-kernel weight	0.2173	21.73
Number of spikes /m^2 X Number of kernels / spike	0.0897	8.97
Number of spikes /m^2 X 1000-kernel weight	0.1577	15.77
Number of kernels /spike X 1000-kernel weight	0.1812	18.12
Residual factors	0.1671	16.71
Total	1.00	100