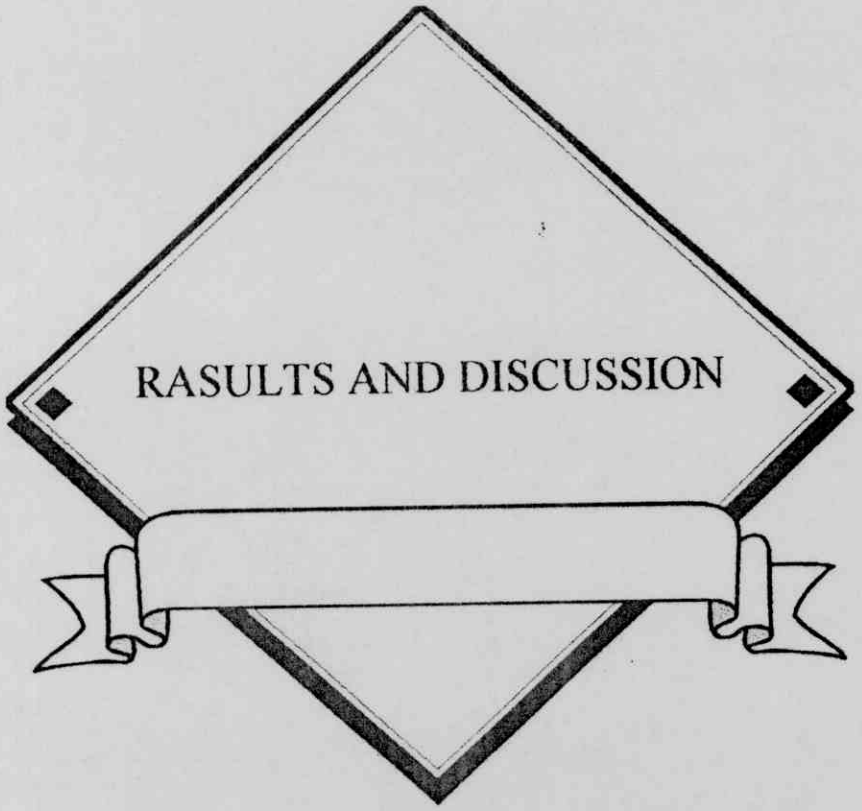
RASULTS AND DISCUSSION

RESULTS AND DISCUSSION

I- Growth characters:

A- Varietal differences :-

Data illustrated in Table 4 show the effect of wheat cultivars on some growth characters in 1999 / 2000 and 2000 / 2001 seasons at 130 days from sowing.

1- Plant height and peduncle length :

Results in Table 4 noticed marked differences in plant height among the wheat cultivars under study in both seasons but it was significant in the first season. The tallest cultivar was Sids 1 recording 115.31 and 115.86 cm, in the first and second seasons, respectively and the shortest one was Gemmeiza 7 with an average of 112.58 and 113.53 cm, respectively. Such results are mainly due to the differences in the genetic make up of the evaluated cultivars and meteorlogical factors between the two seasons. These results are in harmony with those obtained by **Shams El-Din and El-Habbak (1992), El- Kalla *et al.* (1994), Abd El- Fatah, Nagwa (1995), El- Sawi (1996), Galal, Anaam and Allam (1996), Hassanein *et al.* (1997), Abu El-Nagah (1998) El-Karamity (1998), Mostafa (1998), Abd El- All, Azza (1999), Abd Alla *et al.* (1999), El- Bana (1999),Sharaan and Abd El-Samie (1999), Al-Awani (2000) and Hassan and Gaballah (2000).** On the other hand, **Moursy (1999) and Salah (2000)** found that wheat varieties under study did not differ in plant height.

The differences among wheat cultivars were significant for peduncle length in the first season Table 4. It was clear that Sids 1 cultivar had the lowest values of peduncle length which equaled 21.13 and 20.38 cm in the first and second seasons, respectively. Whereas, peduncle length was not significantly different in wheat cultivars in the second season. Also, Sakha 69 and Gemmeiza 7 cultivars recorded

higher values of peduncle length, without significant difference between Sakha 69 and Gemmeiza 7.

It was evident, that Sids 1 gave the shortest values of peduncle length and this may be due to that new varieties were more earlier in heading as compared to the other varieties. This result was expected since the studied varieties are different in their genetical structure. Similar results were obtained by **Abd El- Fatah, Nagwa (1995)** who found that peduncle length was varied significantly among wheat cultivars.

2- Flag leaf area :-

Results in Table 4 indicated that wheat cultivars under study were different in flag leaf area. Differences in flag leaf area were significant in the two growing seasons. In the first season, Sids 1 surpassed significantly the other studied cultivars in flag leaf area with an average of 69.0 cm^2 in the first season, whereas no significant difference was obtained between Sids 1 and Gemmeiza 7 cultivars. While, Gemmeiza 7 recorded higher values of flag leaf area than Sids 1 and Sakha 69 cultivars in the second season. The lowest values of flag leaf area were 57.22 and 45.85 cm^2 , produced from Sakha 69 cultivar in the first and second seasons, respectively. This result agrees with those obtained by **Abd El-Fatah, Nagwa (1995), El-Sawi (1996), Hassanein *et al.* (1997), Abu –El-Nagah (1998), Mostafa (1998), Mwafy (1999), Sharaan and Abd El-Samie (1999) and Salah (2000).**

3- Fresh and dry weight of different plant organs:-

The results showed that wheat cultivars varied in fresh and dry weight of the different plant organs with significant differences in the two growing seasons, except dry weight of spike / tiller in the second seasons. Gemmeiza 7 cultivar surpassed significantly Sids 1 and Sakha 69

Table 4 : Effect of wheat cultivars on some growth characters in 1999 / 2000 and 2000 / 2001 seasons at 130 days from sowing.

Characters / Treatments	Plant height cm	Peduncle length Cm	Flag leaf area cm^2	Fresh weight (gm)			Dry weight (gm)		
				Stem	Leaves	Spike	Stem	Leaves	Spike
Wheat cultivars	**1999 / 2000 season**								
Sakha 69	114.72 a	23.18 a	57.22 b	5.94 c	1.26 b	3.36 b	2.23 b	0.67 c	1.56 b
Sids 1	115.32 b	21.13 b	69.00 a	7.01 b	1.51 a	3.62 b	2.46 b	0.77 b	1.68 b
Gemmeiza 7	112.58 c	23.00 a	67.15 a	8.46 a	1.62 a	5.06 a	3.40 a	0.87 a	2.28 a
F – test	*	*	**	**	*	**	**	*	**
Wheat cultivars	**2000 / 2001 season**								
Sakha 69	115.22 a	21.46 a	45.86 c	6.35 b	1.67 b	3.94 b	2.39 c	0.91 c	1.73 a
Sids 1	115.86 a	20.38 a	50.41 b	6.88 b	1.94 b	4.32 ab	2.47 b	1.00 b	1.77 a
Gemmeiza 7	113.53 a	21.09 a	52.67 a	8.89 a	2.44 a	5.30 a	2.88 a	1.24 a	2.01 a
F – test	N.S	N.S	*	**	**	**	*	**	N.s

Symboles
* and ** denotes significant and highly significant in this Table and the succeeding ones.

cultivars in fresh weight of stem (8.5 and 8.9 g), fresh weight of leaves (1.6 and 2.4 g), fresh weight of spike (5.1 and 5.3 g) , dry weight of stem (3.4 and 2.9 g), dry weight of leaves (0.9 and 2.0 g) and dry weight of spike (2.3 and 2.0 g) in the first and second seasons, respectively. Whereas, Sakha 69 cultivar gave the lowest values of fresh and dry weight of stem, leaves and spike / tiller in both seasons. No significant differences were found between Sakha 69 and Sids 1 cultivars in fresh and dry weight of spike / plant in both seasons, fresh weight of stem and leaves / plant in the second season.

The Varietal differences between wheat cultivars may be due to genetical differences between cultivars (**Abd El-Gawad *et al.* , 1987).**

The results of varietal differences in fresh and dry weight of the different plant organs obtained in this study are in agreement with those obtained by **Hassanin *et al.* (1997) and Mwafy (1999).**

B- Effect of seeding rates:-

The average values of plant height , peduncle length, flag leaf area ,fresh and dry weight of the different plant organs at 130 days as affected by seeding rates in 1999 / 2000 and 2000 / 2001 growing seasons are shown in Table 5.

1- Plant height and peduncle length :-

Data presented in Table 5 indicate that plant height and peduncle length were not significantly affected by seeding rates in both seasons.

In 1999 / 2000 , increasing seeding rate from 45 to 60 and 75 kg seeds / feddan increased plant height by 0.8 and 1.8 % , respectively. Whereas, in 2000 / 2001 season, increasing the same rate of seeding increased plant height by 0.9 and 1.5 %, respectively. The increase in plant height in dense sowing may be attributed to the reduction in light intensity within plant canopy which enhances IAA synthesis and hense increased cell division and elongation would be expected. Similar

results were obtained by **Abo – Warda (1993) and Sharaan and Abd El-Samie (1999)** who found that the differences in plant height due to seeding rates (40 , 60 and 80 kg seeds / fed.) did not reach the significant level.

Also, peduncle length was insignificantly increased by increasing seeding rates from 45 to 75 kg seeds / feddan in the two growing seasons. The tallest peduncle length was 22.78 and 21.19 cm, produced from sowing at 75 kg seeds / feddan in the first and second seasons, respectively. The present results are mainly due to the increase in the competition between the plants grown in dense population. The results reported by several investigators showed different trend where an increase in plant height and peduncle length due to increasing seeding rate was reported **(Ellen, 1990; El-Bana and Basha, 1994 ; Behera, 1995; El-Sawi, 1996; El-Bana, 1999; Sharaan and Abd El-Samie, 1999 and El-Habbasha, 2001).**

2- Flag leaf area :-

The mean values of flag leaf area was significantly decreased by increasing seeding rate up to 75 kg seeds / feddan in the first season only (Table 5). In 1999 / 2000 season, increasing seeding rate from 45 to 60 and 75 kg seeds / feddan significantly decreased flag leaf area by 3.21 and 7.55 %, respectively. Whereas, no significant difference was obtained between the three rates of seeding on flag leaf area in the second season. It could be concluded that flag leaf area was decreased by increasing seeding rates due to dense sowing which leads to a severe competition among plants for nutrient, water supply and light, so, plants grown crowded become less vigor than those of thin sowing. Hence a reduction in photosynthesis and metabolic process for dense plants could be expected which would be reflected on flag leaf area.

These results are in accordance with those obtained by **El-Sawi (1996), Abu-El-Nagah (1998), El-Bana (1999)and Saleh (2000)** who found that increasing seed rate caused a significant decrease flag leaf area. On the other hand, **Abo-Warda (1993)** showed that seeding rate did not exhibit significant influence on flag leaf area.

3- Fresh and dry weight of the different plant organs:-

The results in Table 5 showed that seeding rate significantly influenced fresh and dry weight of the different plant organs in both seasons except fresh and dry weight / tiller and dry weight of leaves / tiller in the second season. In general fresh and dry weight of stem , leaves and spike were decreased by increasing seeding rate from 45 kg to 75 kg seeds / feddan. Sowing wheat plant at 45 kg seeds / feddan gave the highest values of fresh and dry weight of stem (7.8 and 3.0 g, resp.) in the first season, as well as (7.9 and 2.8 g, resp.) in the second season. Also, the highest values of fresh and dry of leaves / tiller were 1.6 and 0.8 g, resp.) in the first season as well as 2.2 and 1.2 g, resp. in the second season, produced from seeding rate at 45 kg seeds / feddan. Also, sowing wheat plants at 45 kg seeds / feddan gave the maximum values of fresh and dry weight of spike / tiller (4.2 and 2.0 g, resp., in the first season). On the other hand, the lowest values of the different plant organs were obtained from seeding rate at 75 kg / feddan. This result may be due to the increase in the competition among the plants grown in dense population. These results are in line with those obtained by **El-Bana (1999)** found that total dry weight / plant was decreased due to increasing planting density from 250 to 450 kg grain / m^2.

Table 5 : Effect of seeding rate on some growth characters in 1999 / 2000 and 2000 / 2001 seasons at 130 days from sowing.

Characters / Treatments	Plant height cm	Peduncle length cm	Flag leaf area cm^2	Fresh weight (gm)			Dry weight (gm)		
				Stem	Leaves	Spike	Stem	Leaves	Spike
Seed rate (kg/fed)	**1999 / 2000 season**								
45	113.21 a	21.98 a	66.85 a	7.78 a	1.63 c	4.19 a	2.97 a	0.86 a	2.00 a
60	114.13 a	22.56 a	64.70 b	7.05 b	1.46 b	4.03 a	2.65 b	0.75 b	1.82 b
75	115.27 a	2278 a	61.81 c	6.57 c	2.30 a	3.82 b	2.46 c	0.71 c	1.71 c
F – test	N.S	N.S	*	*	**	*	**	**	**
Seed rate (kg/fed)	**2000 / 2001 season**								
45	113.93 a	20.95 a	49.99 a	7.79 a	2.21 a	4.80 a	2.79 a	1.16 a	1.94 a
60	114.99 a	20.79 a	49.78 a	7.37 ab	2.00 ab	4.46 a	2.56 ab	1.02 a	1.83 a
75	115.68 a	21.19 a	49.16 a	6.98 b	1.84 b	4.30 a	2.40 b	0.97 a	1.74 a
F – test	N.S	N.S	N.S	*	*	N.S	*	N.S	N.S

Symboles

* and ** denotes significant and highly significant in this Table and the succeeding ones.

C- Effect of N- level :-

The results of plant height , peduncle length , flag leaf area, fresh and dry weight of the different plant organs as affected by nitrogen fertilizer level in 1999 / 2000 and 2000 / 2001 seasons are presented in Table 6.

1- Plant height and peduncle length :-

Mean values of plant height were significantly and consistently increased by increasing N – level up to 100 kg N / feddan in the two growing seasons Table 6. The tallest plants recorded 116.14 and 116.69 cm, by adding 100 kg N / feddan in the first and second season, respectively. On the other hand, the shortest one recorded 111.54 and 112.72 cm, by adding 50 kg N / feddan, respectively. The increase in plant height may be due to the increase in meristematic activity in wheat plant and cell elongation. Nitrogen encourages both meristematic activity and auxin production in plants. These results are in accordance with those obtained **by Salem *et al.* (1990), Abd El-Maaboud (1991), Basilious (1992), Shama EL-Din and El-Habbak (1992), Abd El-Gawad *et al.* (1993), Abo-Warda (1993), El-Gazzar *et al.* (1993), Shalaby *et al* .(1993), Sultan *et al.* (1993), Hegab (1994), Salwau (1994), Abo- Shetaia and Abd El-Gawad (1995a), Abou – Salama *et al.*(1995), Shams El-Din and Abdrabou (1995), Atta (1997), El-Moursy (1997), Mostafa (1998), Abd El-All, Azza (1999), El-Bana (1999)Hassanein (1999), Moursy (1999), Salem (1999), Hassan and Gaballah (2000), Toaima *et al.* (2000), El-Habbasha (2001) and Saleh (2001).**

Table 6 indicates that the mean values of peduncle length were not significantly affected by increasing N level up to 100 kg N / feddan in both seasons. Increasing N level from 50 to 100 kg N / feddan caused insignificant increase in penduncle length in the first season,

Table 6: Effect of nitrogen fertilizer levels on some growth characters in 1999/2000 and 2000 / 2001 seasons at 130 days from sowing..

Characters / Treatments	Plant height cm	Peduncle length cm	Flag leaf area cm^2	Fresh weight (gm)			Dry weight (gm)		
				Stem	Leaves	Spike	Stem	Leaves	Spike
N- levels (kg/fed)	**1999 / 2000 season**								
50	111.54 c	22.14 a	61.85 c	6.60 c	1.28 c	3.76 b	2.27 c	0.70 c	1.55 c
75	114.92 b	22.38 a	65.04 b	7.17 b	1.47 b	4.03 a	2.72 b	0.78 b	1.85 b
100	116.14 a	22.79 a	66.48 a	7.63 a	1.63 a	4.29 a	3.10 a	0.84 a	2.02 a
F – test	**	N.S	*	**	**	*	**	**	**
N- levels (kg/fed)	**2000 / 2001 season**								
50	112.72 c	21.18 a	48.55 a	6.93 c	1.76 b	4.17 b	2.31 c	0.92 b	1.66 b
75	115.20 b	21.01 a	49.79 a	7.35 b	2.01 ab	4.44 ab	2.60 b	1.03 ab	1.81 ab
100	116.69 a	20.74 a	50.59 a	7.84 a	2.28 a	4.95 a	2.85 a	1.20 a	2.04 a
F – test	**	N.S	N.S	**	**	**	**	*	**

Symboles
* and ** denotes significant and highly significant in this Table and the succeeding ones.

RESULTS AND DISCUSSION

and dry weight of stem, leaves and spike per plant in both seasons. This means that each factor acted independently on those characters consequently , the data were excluded.

D-d- Interaction effect between varieties, seeding rates and N – levels.

The interaction between the three factors did not affect significantly plant height, peduncle length, flag leaf area, fresh and dry weight of the different plant organs in 1999 / 2000 and 2000 / 2001 seasons, consequently the data were excluded.

II- Yield and yield components :

A-Varietal differences :-

Data presented in Table 7 show the effect of wheat cultivars on the mean values of yield and yield components at harvest in the growing seasons (1999 / 2000 and 2000 / 2001 seasons)

1- Number of tillers / m^2

Results in Table 7 revealed that the differences between wheat cultivars under study were significant for number of tillers / m^2 in both seasons. It was clear that Sakha 69 cultivar had the highest number of tillers (368.78 and 396.78) in the first and second seasons, respectively. While, the lowest one was 325.97 and 303.00 tillers / m^2, produced from Gemmeiza 7 cultivar in both seasons, respectively. This result is to be expected since the studied wheat cultivars are different in their genetical structure. Similar results were obtained by **Ibrahim and Abdel-Aal (1991), Tomer *et al.* (1993), El – Kalla *et al.* (1994), Hassan *et al* (1997), Mostafa (1998), El- Bana (1999), Mwafy (1999), Al-Awami (2000) and El-Sawi (2001).**

2- Number of spikes / m^2 :-

Results in Table 7 showed significant differences among the tested wheat cultivars regarding number of spikes / m^2 in both seasons. Sakha 69 cultivar gave the maximum number of spikes / m^2 (365.78 and 375.78) followed by Sids 1 cultivar (334.67 and 348.44), whereas, Gemmeiza 7 cultivar gave the lowest values of spike number / m^2 (317.56 and 297.56) in the first and second seasons, respectively. It could be concluded that wheat cultivars differed in their potentially to produce fertile tillers and the old cultivars superior in the this respect compared with the new ones. These results are in harmony with those obtained by **Abd El-Gawad *et al.* (1990), Ibrahim and Abdel – Aal (1991), Shams El-Din and El-Habbak (1992), El-Bana and Aly (1993), Kheiralla *et al.* (1993b), El-Kalla *et al.*(1994), Abd-El-Fatah, Nagwa (1995), El-Sawi (1996), Galal, Anaam and Allam (1996), Abu El-Nagah (1998), El-Karamity (1998), Abd- Alla *et al.* (1999), El-Bana (1999),Moursy (1999), Salem (1999), Al-Awami (2000), El-Sayed *et al.* (2000), Toaima *et al.*(2000) and El-Sawi (2001).**

3-Spike length :-

Spike length was significantly affected by wheat cultivars in both seasons as shown in Table 7. It was clear that Gemmeiza 7 cultivar gave the tallest spike length (14.65 and 15.02 cm) in the first and second seasons, respectively. On the other hand, Sakha 69 cultivar was significantly inferior to all other cultivars under study in spike length for both seasons. Such results is due to the differences in the genetical structure among the studied cultivars. Similar conclusion was obtained by **Shams El-Din and El-Habbak (1992), Bana and Aly (1993), El-Kalla et al.(1994),), Galal, Anaam and Allam (1996), Abu El-Nagah (1998), El-Karamity (1998), Mostafa (1998), El-**

Bana (1999), Sharaan and Abd El-Samie (1999), Al-Awami (2000), Hassan and Gaballah (2000), Saleh (2000) and El-Habbasha (2001).

4-Number of spikelets per spike:-

Results in Table 7 indicated that number of spikelets per spike was significantly affected by the grown wheat cultivars in both seasons. Gemmeiza 7 cultivar surpassed the other two wheat cultivars in number of spikelets / spike with averages of 23.4 and 26.36 in the first and second seasons, respectively. Whereas, Sakha 69 cultivar gave the lowest mean values of spikelets number / spike (21.94 and 23.72) in the first and second seasons, respectively. On the other hand, no significant difference was obtained between Sakha 69 and Sids 1 cultivars in number of spikelets / spike in both seasons.

The present results were mainly due to the genetical constitution of the tested cultivars which are quite different in this concern. These results are in accordance with those obtained by **El-Bana and Aly (1993), Kheiralla et al. (1993b) and Abd El-Fatah, Nagwa (1995).**

5-Spike weight :-

Data in Table 7 showed significant difference among the tested wheat cultivars regarding spike weight in the two growing seasons. Gemmeiza 7 cultivar was the best cultivar in spike weight with average values of 5.41 and 5.49 g in the first and second seasons, respectively. While, Sakha 69 cultivar gave the lowest spike weight which equaled 3.78 and 3.74 g, respectively. The weight of spike of the tested cultivars could be arranged in descending order as follows: Gemmeiza 7 , Sids 1 and Sakha 69 cultivars in the first season. On the other hand, no significant difference was obtained between Sakha 69 and Sids 1 cultivars in spike weight in second season. Difference in spike weight is to be expected since the new cultivars were superior to the old ones in spike length, number of spikeletes per spike and number of grains /

equaled 64.34 and 65.11 grains in the first and second seasons, respectively. These results are expected since the new cultivars were superior to the old ones in spike length and number of spikelets per spike. These results agree with those obtained by **El-Bana and Aly (1993), Tomar *et al.* (1993), El-Kalla *et al.* (1994), El-Sawi (1996), El-Karamity (1998), Mostafa (1998), Moursy (1999), Mwafy (1999), Al-Awami (2000), El-Sayed *et al.* (2000), Hassan and Gaballah (2000), Toaima *et al.* (2000) and El – Habbasha (2001).**

8-1000- grain weight :-

Results in Table 7 showed that wheat cultivars under study were significantly different for weight of 1000 grains. Gemmeiza 7 cultivar surpassed significantly the other studied cultivars in 1000- grain weight recording 49.94 and 47.56 g in the first and second seasons, respectively. On the other hand, no significant difference was found between Sakha 69 and Sids 1 cultivars in 1000 – grain weight in the two growing seasons. Whereas, the lowest one was 39.32 and 39.94 g, produced from Sids 1 cultivar in the first and second seasons, respectively. It could be concluded that the wheat cultivars under study differed markedly in 1000 – grain weight due to the great difference in their genetic make up and grain development behavior.

These results are in accordance with those recorded by **Abd El- Gawad *et al.* (1990), Ellen (1990), Ibrahim and Abdel-Aal (1991), Shams El-Din and El-Habbak (1992), Tomar *et al.* (1993) , El-Kalla *et al.* (1994), El-Sawi (1996), Galal, Anaam and Allam (1996), Abu El-Nagah(1998), El-Karamity (1998), El-Bana (1999), Moursy (1999), Al-Awami (2000), El-Sayed *et al.* (2000), Hassan and Gaballah (2000) and El-Habbasha (2001).**

spike. The superiority of the new cultivars is due to the inclusion of dwarf lines in their genetical constitution which are characterized with high spike weight compared with the old cultivars. Similar conclusion was obtained by **Mostafa (1998), Abd El-All, Azza (1999), Abd- Alla *et al.* (1999), Moursy (1999), Al-Awami (2000) and Toaima *et al.* (2000).**

6-Weight of grains per spike :-

The differences between wheat cultivars under study were significant for weight of grains per spike in the two growing seasons as shown in Table 7. Gemmeiza 7 surpassed the other wheat cultivars in weight of grains / spike, whereas, no significant differences were found between Sids 1 and Sakha 69 cultivars in the above character. These results may be due to the differences in genetic structure. These results are expected since the Gemmeiza 7 was superior to the Sakha 69 and Sids 1 cultivars in spike length, number of spikelets per spike and number of grains / spike.

These results coincide with those obtained by **Ibrahim and Abdel-Aal (1991), Shams El-Din and El-Habbak (1992), El-Bana and Aly (1993), El-Kalla et al. (1994), Allam and Teama (1995), El-Sawi (1996), Hassaein *et al.* (1997), Mostafa (1999), Abd all *et al.* (1999)El-Bana (1999), Al-Awami (2000), El-Sayed *et al.* (2000), and El-Habbasha (2001).**

7-Number of grains / spike:-

Data in Table 7 indicated that number of grains per spike was significantly affected by the grown wheat cultivars in both seasons. Gemmeiza 7 cultivar was the first cultivar with the greatest number of grains per spike which amounted to 73.74 and 79.23 grains in the first and second seasons, respectively, followed by Sids 1 cultivar. Whereas, Sakha 69 cultivar had the lowest number of grains / spike which

9- Straw yield kg/ feddan:-

The average values of straw yield per feddan was not significantly affected by wheat cultivars under study in 1999 / 2000 and 2000 / 2001 seasons as shown in Table 7.

It was clear that Sakha 69 cultivar gave the maximum values of straw yield / feddan (7006.92 and 6788.11 kg / fed.) in the first and second seasons, respectively. Whereas, the minimum straw yield of Gemmeiza 7 cultivar being 6790.33 and 6555.94 kg / fed. in the first season and second season. It could be concluded that the commercial cultivar Sakha 69 was the first in straw yield compared to the long spike varietiy (Gemmeiza 7).

The marked differences in straw yield were also reported by **El-Sawi (1996), Abd El-All, Azza (1999), Abd Alla *et al.*(1999), El-Habbasha (2001) and El-Sawi (2001).**

10- Grain yield kg/ feddan:-

Table 7 indicated that the differences between the three cultivars on the mean values of grain yield / feddan were significant in the first season only. In 1999 / 2000 season, Gemmeiza 7 outyielded Sakha 69 and Sids 1 cultivars by 6.92 and 8.57 % respectively. Also, in the second season, Gemmeiza 7 cultivar outyielded Sakha 69 and Sids 1 cultivars by 5.04 and 5.01 %, respectively, without significant difference. This result may be due to the increase in spike weight, grain weight/ spike, number of grains / spike and 1000- grain weight of the Gemmeiza 7 cultivar.

The present results indicate clearly the superiority of the new wheat cultivars particularly Gemmeiza 7 over the old one i.e. Sakha 69 cultivar. Such results are due to the genetical constitution of the evaluated cultivars and their interaction with the prevailing

Table 7: Effect of wheat cultivars on yield and its components of wheat in 1999/2000 and 2000 / 2001 seasons at harvest.

Characters / Treatments	No. of Tiller / m^2	No. of Spike / m^2	Spike Length cm	No. of Spikelets /spike	Spike Weight gm	Weight of grain/ spike gm	No. of Grains / spike	1000 - Grain weight gm	Straw Yield kg / fed.	Grain Yield Kg / fed.
Wheat cultivars	**1999 / 2000 season**									
Sakha 69	368.78 a	365.78 a	12.52 c	21.94 b	3.78 c	2.53 b	64.34 c	40.42 b	7006.92a	2648.64b
Sids 1	346.58b	334.67b	13.81 b	22.04 b	4.26 b	2.73 b	70.32 b	39.32 b	6958.33a	2608.33c
Gemmeiza 7	325.97 c	317.56 c	14.65 a	23.40 a	5.41 a	3.69 a	73.74 a	49.94 a	6790.33a	2831.89a
F – test	*	**	*	*	**	**	*	**	N.S	**
Wheat cultivars	**2000 / 2001 season**									
Sakha 69	396.78 a	375.78 a	12.26 c	23.72 b	3.74 b	2.70 b	65.11 c	40.56 b	6788.11a	2675.78a
Sids 1	355.78b	348.44b	13.30 b	23.90 b	3.96 b	2.69 b	69.65 b	39.94 b	6737.25a	2676.64a
Gemmeiza 7	303.00 c	297.56 c	15.12 a	26.36 a	5.49 a	3.88 a	79.23 a	47.56 a	6555.94a	2810.72a
F – test	**	*	*	*	*	*	*	**	N.S	N.S

Symboles

* and ** denotes significant and highly significant in this Table and the succeeding ones.

environmental condition. Similar results were obtained by **Basilious (1992), El-Bana and Aly (1993), El-Kalla *et al.* (1994), El-Sawi (1996), Mostafa (1998), Abd-Alla *et al.* (1999), Moursy (1999), EL-Sayed *et al.* (2000) and Toaima *et al.*(2000).** On the other hand, **El-Sawi (2001)** found that no significant differences were detected in grain yield / feddan among the three genotypes (Sids 1, Sids 8 and Sids 10 cultivars).

B- Effect of seeding rates:-

The average values of number of tillers and spikes / m^2, spike length, number of spikelets / spike, spike weight, weight of grains / spike, number of grains / spike, 1000 grain weight, straw yield and grain yield per feddan as affected by seeding rates in 1999 / 2000 and 2000 / 2001 growing seasons are shown in Table 8.

1- Number of tiller / m^2:-

Results in Table 8 indicated that the mean values of number of tillers / m^2 were not significantly affected by increasing seeding rates up to 75 kg seed / feddan in the two growing seasons. Increasing seeding rates from 45 to 75 kg / feddan caused insignificant increase in number of tillers / m^2. The maximum mean values of tillers number / m^2 was 357.75 and 355.33 tillers / m^2, produced from sowing with 75 kg seeds / feddan in the first and second seasons, respectively. Whereas, the minimum one was 336.25 and 338.22 tillers / m^2, obtained from sowing with 45 kg seeds / feddan, respectively. These results are mainly due to the increase in seeding rates at sowing that leads to increase number of tillers / m^2. The same trend was obtained by **El-Sawi (1996) and El-Sawi (2001)** who found no considerable differences in number of tillers due to increasing seeding rates. It is worth noting that the increase in seeding results in fewer surviving tillers / plant due to increased tiller mortality.

2- Number of spikes / m^2:-

Data presented in Table 8 show that number of spikes / m^2 was significantly increased by increasing seeding rates up to 75 kg seeds / feddan in the second season.

In 2000 / 2001 season, the results showed that raising seeding rate from 45 to 60 and 75 kg seeds / feddan significantly increased spikes number /m^2 by 1.85 and 3.54 %, respectively. Whereas, no significant difference was found between the three seeding rates on number of spikes / m^2 in 1999 / 2000 season.

It was found that a marked increase in the number of spikes / m^2 due to the increase in seeding rate. This result is mainly due to the limited number of tillers / plant in the long genotypes. Consequently, at the lower seeding rates, the increase in tillering capacity could not compensate for the reduced population density.

Similar results were obtained by **Blue *et al.* (1990), Abo-Warda (1993), El-Bana and Basha (1994), Behera (1995), Parihar and Singh (1995), Abu-El-Nagah (1998), El-Karamity (1998), El-Bana (1999), El-Bana (2000), Saleh (2000), Toaima *et al.*(2000) and El-Sawi (2001),** who found that number of spikes / m^2 was significantly increased with increasing seeding rates. On the other hand, **Salem *et al.* (1994) and Al-Sawi (1996),** found that increasing seeding rates had no significant effects on number of spikes /m^2.

3- Spike length :-

The mean values of spike length was significantly decreased by increasing seeding rates up to 75 kg seeds / feddan in the second season only as shown in Table 8. In 2000 / 2001 season, increasing seeding rate from 45 to 60 and 75 kg seeds / feddan significantly decreased spike length by 3.18 and 3.83 %, respectively. While, the

corresponding decrease in spike length was 2.57 and 4.85, respectively without significant difference among the three rates of seeding in the first season.

It could be concluded that spike length was decreased by increasing seeding rates due to dense sowing which leads to a severe competition among plant for nutrients, water supply and light. So , plants grown crowded become less vigour than those of light sowing. Hence a reduction in photosynthesis and metabolic process for dense plants could be expected which would be reflected on spike length.

These results are in line with those obtained by **Abu- El-Nagah (1998), El-Karamity (1998), El-Bana (2000), Saleh (2000), Toaima et al. (2000), and El-Habbasha (2001),** who found that spike length was significantly decreased with increasing seeding rate. Whereas, **El-Bana and Basha (1994), Behera (1995), El-Bana (1999),Sharaan and Abd El-Samie (1999) and El-Sawi (2001)** reported that increasing seeding rates had no significant effect on spike length.

4- **Number of spikelets / spike:-**

The results in Table 8 showed that number of spikelets / spike were not significantly affected by seeding rates in the two growing seasons.

In the first season, increasing seeding rate from 45 to 60 and 75 kg seeds / feddan decreased number of spikelets / spike by 1.54 and 2.37 % , respectively. Whereas, increasing the same rates of seeding decreased this trait by 1.20 and 2.40 %, respectively. The decrease in number of spikelets / spike by increasing dense sowing may be due to the reduction in light intensity within plant canopy, nutrient and water supply. The results reported by **Castagna *et al.* (1996) and El-Sawi (2001)** showed that seeding rate had no significant effect on number of spikelets / spike.

5- Spike weight :-

The effect of seeding rate on the mean values of spike weight was significant in both seasons. In 1999 season, increasing seeding rate from 45 to 60 and 75 kg seeds / feddan significantly reduced spike weight by 6.33 and 10.13 %, respectively. Whereas, no significant difference was obtained between 45 and 60 kg seeds / feddan on the mean values of spike weight. Also, in 2000 / 2001 season, raising the same rates of seeding significantly decreased spike weight by 4.35 and 8.91 %, respectively.

It could be concluded that weight of spike was decreased by increasing seeding rates due to reduced spike length, number of spikelets / spike and number of grains/ spike as a result of the increase in the competition among the growing plants.

These results are in accordance with those obtained by **Sharaan and Abd El-Samie (1999), Salah (2000), Toaima *et al.* (2000) El-Habbasha (2001)** who found that spike weight was significantly decreased by increasing seeding rate. On the other hand, **Abo- Warda (1993)** showed that seeding rate didn't exhibit significant influence on weight of spike.

6- Weight of grains / spike :-

The mean values of grain weight / spike was significantly decreased by increasing seeding rates up to 75 kg seeds / feddan in the second season only as shown in Table 8. Also, no significant difference in weight of grains / spike was obtained between 45 and 60 kg seeds / feddan in the same season (2000 / 2001). On the other hand, the difference in the mean values of grain weight / spike was not significant as affected by seeding rate in 1999 / 2000 season. The highest weight of grains / spike was 3.16 and 3.20 g , produced from sowing with 45 kg seeds/ feddan in the first and second seasons,

respectively. Whereas, the lowest one was 2.85 and 2.97 g , obtained from sowing at 75 kg seeds / feddan, respectively.

The reduction in grain weight / spike due to increasing seeding rate is mainly due to the increase in competition among growing plants for nutrients, water supply and light under dense population. Hence a reduction in photosynthesis and metabolic process for dense plants is expected.

Similar results were obtained by **Ellen (1990), El-Bana (1999), Sharaan and Abd El-Sami (1999), Saleh (2000), Toaima *et al.* (2000), El-Habbasha (2001) and El-Sawi (2001)** who showed that grain weight / spike decreased significantly with increasing seeding rates. But, **Behera (1995) and El-Sawi (1996)** indicated that weight of spike was not influenced by seeding rates.

7- Number of grains / spike:-

Results in Table 8 showed no significant response of number of grains / spike to seeding rates in both seasons.

In 1999 / 2000 season, increasing seeding rate from 45 to 60 and 75 kg seeds / feddan decreased number of grains / spike by 3.31 and 5.17 %, respectively. While, in 2000 / 2001 season, increasing the same rates of seeding decreased number of grains / spike by 2.80 and 3.31 %, respectively. The present results are mainly due to the increase in the competition among the plants grown in dense population.**Abu – El-Nagah (1998), El-Bana (2000), Saleh (2000), Toaima *et al.* (2000) and El-Habbasha (2001)** found that increasing seeding rates caused a significant decrease in number of grains / spike. Whereas,the results reported by **Abo-Warda (1993), El-Bana and Bashâ (1994), El-Sawi (1996) and El-Bana (1999)** showed that seeding rate had no significantly effected on number of grains / spike.

8- 1000 – grain weight (g):-

The results in Table 8 revealed that 1000 – grain weight was decreased significantly by increasing seeding rate from 45 to 75 kg seeds / feddan in the two growing seasons. Sowing wheat plants at 45 kg seeds / feddan gave the highest mean values of 1000 – grain weight (44.23 and 43.95 g) in the first and second seasons, respectively. Whereas, the lowest one was 42.14 and 41.55 g , obtained from seeding rate at 75 kg seeds / feddan in the first and second seasons, respectively.

It could be concluded that increasing seeding rate reduced 1000 – grain weight due to the increase in tillers number / m^2 and to the increase in the competition among growing plants. Similar results were obtained by **Ellen (1990), Abu – El- Nagah (1998), El-Karamity (1998), El-Bana (1999), Sharaan and Abd El-Samie (1999), Toaima *et al.* (2000), El-Habbasha (2001) and El-Sawi (2001).**

9- Straw yield kg / feddan:-

Results in Table 8 indicated that straw yield of wheat per feddan was significantly increased by increasing seeding rates up to 75 kg / feddan in the two seasons.

In 1999 / 2000 season, increasing seeding rate from 45 to 60 and 75 kg seeds / feddan significantly increased straw yield by 3.40 and 6.4 %, respectively. Whereas, in 2000 / 2001 season, increasing the same rates of seeding increased straw yield / feddan by 3.5 and 7.1 %, respectively.

The present results are mainly due to the positive effects of the higher seeding rate on plant height, number of tillers / m^2 and dry weight . Also, the higher seeding rates prolonged flowering and maturity dates and extended the vegetative growth periods, leading in turn to greater photosynthetic activity and dry matter accumulation.

Similar conclusion was obtained by Abo – Warda (1993), Salem (1993), El-Bana and Basha (1994), Salem *et al.* (1994), Behera (1995), El-Karamity (1998), Kumpawat (1998), El-Bana (2000), Toaima *et al.* (2000) and El-Habbasha (2001).

10-Grain yield kg / feddan:-

The effect of seeding rates on grain yield was significant in the second season Table 8. Whereas, in the first season, the differences in grain yield did not reach the level of significance.

In 1999 / 2000 season, increasing seed rate from 45 to 60 and 75 kg / feddan significantly increased grain yield by 4.50 and 7.76 %, respectively. Also, in 2000 / 2001 season, raising the same rates increased grain yield by 2.65 and 5.77 %, respectively. This result may be due to the increase in number of tillers and spikes / m^2 and grain weight.

These results are in good agreement with those obtained by **Abo – Warda (1993), Salem (1993), El-Bana and Basha (1994), Salem *et al.* (1994), Behera (1995), Abu El-Nagah (1998), El-Karamity (1998), Kumpawat (1998), El-Bana (2000), Toaima *et al.* (2000), El-Habbasha (2001) and El-Sawi (2001)** who found that grain yield was significantly increased with increase in seeding rate. Whereas, **Sharaan and Abd El-Samie (1999) and Saleh (2000)** indicated that increasing seeding rate had no significant effect on grain yield / feddan.

Table 8: Effect of seeding rates on yield and its components of wheat in 1999/2000 and 2000 / 2001 seasons at harvest at harvest.

Characters / Treatments	No. of Tiller / m^2	No. of Spike / m^2	Spike Length cm	No. of Spikelets /spike	Spike Weight g	Weight Of grain/ spike g	No. of Grains / spike	1000 - Grain weight g	Straw Yield kg / fed.	Grain Yield kg / fed.
Seed rate (kg/fed)	**1999 / 2000 season**									
45	336.25 a	229.56 a	14.01 a	22.76 a	4.74 a	3.16 a	71.49 a	44.23 a	6698.47c	2590.42a
60	347.33 a	340.22 a	13.65 a	22.41 a	4.44 a	2.94 a	69.12 a	43.30 b	6926.44b	2706.33a
75	357.75 a	348.56 a	13.33 a	22.22 a	4.26 b	2.85 a	67.79 a	42.14 c	7130.67a	2791.56a
F – test	N.S	N.S	N.S	N.S	*	N.S	N.S	*	*	N.S
Seed rate (kg/fed)	**2000 / 2001 season**									
45	338.22 a	336.00 c	13.85 a	24.96 a	4.60 a	3.20 a	72.81 a	43.95 a	6464.39c	2646.72c
60	348.44 a	342.22b	13.41 b	24.66 a	4.40 b	3.09 a	70.77 a	42.56 b	6694.11b	2717.00b
75	355.33 a	347.89 a	13.32 b	24.36 a	4.19 c	2.97 b	70.40 a	41.55 c	6922.81a	2799.42a
F – test	N.S	*	*	N.S	*	*	N.S	*	*	*

Symboles

* and ** denotes significant and highly significant in this Table and the succeeding ones.

C- Effect of N levels:-

The average values of number of tillers and spikes per m^2, spike length , number of spikelets / spike , spike weight , weight of grains / spike, number of grains / spike, 1000- grain weight , straw yield and grain yield / feddan as affected by nitrogen fertilizer levels in 1999 / 2000 and 2000 / 2001 seasons are presented in Table 9.

1- Number of tillers / m^2:-

The data reported in Table 9 show that the mean values of tillers number / m^2 were significantly increased by increasing level of nitrogen fertilizer in both seasons.

Number of tillers / m^2 was 364.58 and 376.56 tillers / m^2, produced by adding 100 kg N / feddan in the first and second seasons, respectively. The lowest one was 325.0 and 331.11 tillers / m^2, respectively. obtained by adding 50 kg N / feddan. This increase clearly indicated the prominent role of nitrogen on encourageing both meristematic activity and auxin production in plants.

These results are in accordance with those obtained by **Abd El-Maaboud (1991), El-Salhy (1991), Abd El-Gawad *et al.* (1993) El-Gazzar *et al.* (1993), Hegab (1994), Abo-Shetaia and Abd El-Gawad (1995a), Mostafa (1998), El-Bana (1999), Zaghloul (1999), Sawires , Eman (2000) and El-Habbasha (2001)** who found that number of tillers / m^2 increased with increasing nitrogen fertilizer.

2- Number of spikes / m^2:-

Results in Table 9 showed clearly that number of spikes / m^2 was significantly increased by increasing N level up to 100 kg N / feddan. The increase in N level from 50 to 75 and 100 kg N / feddan significantly increased number of spike by 6.38 and 9.73 %, respectively in the first season. The corresponding increases in the

second season were 4.91 and 9.25 %, respectively. Here it should be noted that there were significant differences in number of spikes / m^2 between all nitrogen levels in both seasons. This increase clearly indicated that prominent role of N on vegetative growth , tillering and fertility in wheat.

Similar results were reported by **Rady and Abo El-Zahab (1990), Abd El-Maaboud (1991), El-Salhy (1991), El-Ganbeehy and Shalaby (1992), Fayed (1992), Miceli *et al.* (1992), Abd El-Gawad *et al.* (1993), Abo-Warda (1993), Hegab (1994), Salwau (1994), Abd El-Fatah , Nagwa (1995), Abo-Shetaia and Abd El-Gawad (1995b), Abou – Salama *et al.* (1995), Shams El-Din and Abdrabou (1995), El-Moursy (1997), Abd El-All, Azza (1999), El-Bana (1999), Moursy (1999), Sabry *et al.* (1999), Salem (1999), Sharaan and Abd El-Samie (1999), El-Sayed *et al.* (2000), Hassan and Gaballah (2000), Sawires, Eman (2000), Toaima *et al.* (2000), El-Habbasha (2001) and Saleh (2001).**

3- **Spike length :-**

Data presented in Table 9 reveal that nitrogen levels had a significant effect on spike length in 1999 / 2000 and 2000 / 2001 seasons. The application of 75 and 100 kg N / feddan increased spike length over adding 50 kg N / feddan by 6.81 and 10.37 %, respectively, in the first season. While, in the second season, applying the same subsequent N levels increased spike length by 3.90 and 6.27 %, respectively.

The increase in spike length due to N application is an indication for the role of N in plant growth , development and production. These results are in harmony with those obtained by **Abd El-Maboud (1991), El-Salhy (1991), El-Ganbeehy and Shalaby (1992), Fayed (1992), Abo-Warda (1993), Salwau (1994), Abou-Salama et al.(1995),**

Shams El-Din and Abdrabou (1995), El-Moursy (1997), Mostafa (1998), Abd El-All, Azza (1999), Moursy (1997), Zaghloul (1999), Hassan and Gaballah (2000), Toaima *et al.* (2000), El-Habbasha (2001) and Saleh (2001).

4- **Number of spikelets / spike :-**

Table 9 showed that the mean values of spikelets number / spike was significantly increased by increasing N level up to 100 kg N / feddan in the two growing seasons. Whereas, no significant difference was obtained between adding 75 and 100 kg N / feddan in number of spikelets / spike in the second season. The application of nitrogen fertilizer at the rate of 100 kg N / feddan produced the maximum number of spikelets / spike (23.05 and 25.11 spikelets / spike) in the first and second seasons, respectively. On the other hand, the minimum one was 21.79 and 24.03 spikelets / spike in the first and second seasons, respectively.

The favorable effect of N on the number of spikelets / spike may be due to its effect on photosynthesis and the other essential metabolic activities which affect the plant growth and development. Similar results were obtained by **Rady and Abo El-Zahab (1990)** who found that the increase of nitrogen from 30 to 90 kg N feddan increased number of spikelets / spike by 8.56 % as an average of both seasons.

5-Spike weight :-

The data presented in Table 9 indicated that the mean values of spike weight were significantly increased by increasing N level up to 100 kg N / feddan.with no significant difference between adding 50 and 75 kg N / feddan in the first season and between 75 and 100 kg N / feddan in the second one.

The maximum weight of spike was 4.80 and 4.58 g , produced from application of 100 kg N / feddan in the first and second seasons, respectively. Whereas, the minimum one was 4.11 and 4.19 g, obtained from adding 50 kg N / feddan in both seasons. It seems that under the conditions of the experiments the highest N level (100 kg N / feddan) was satisfactory to supply wheat plants with their N requirements. This trait showed the same pattern of response to N – level as that observed with spike length and number of spikelets / spike. These results are line with those obtained by **El-Salhy (1991), Shams El-Din and El-Habbak (1992), Salwau (1994), Mostafa (1998), Moursy (1999), Zaghloul (1999), Toaima *et al.* (2000), and El-Habbasha (2001).**

6-Weight of grains / spike:-

Results in Table 9 showed clearly that N application had significant effect on weight of grains / spike in both seasons. However, no significant difference were obtained between adding 75 and 100 kg N / feddan in weight of grains / spike in the two growing seasons. The application of 75 and 100 kg N / feddan increased weight of grains / spike by 14.72 and 23.02 % over adding 50 kg N / feddan, respectively, in the first season and by 8.65 and 12.11 %, respectively, in the second season.

The increase in weight of grain / spike may be due to the effect of N in increasing the source sink relation which stimulated the accumulation of the photosynthetic and metabolic products in grain weight / spike. Similar results were reported by **Abd El-Maaboud (1991), Fayed (1992), Shams El-Din and El-Habbak (1992), Abo-Shetaia and Abd El-Gawad (1995b), El-Moursy (1997), Mostafa (1998), Moursy (1999), Sabry *et al.* (1999), Sharaan and Abd El-Samie (1999), El-Sayed *et al.* (2000) and El-Habbasha (2001).**

7-Number of grains / spike :-

The data reported in Table 9 show that the mean values of number of grains / spike were significantly increased by increasing N level up to 100 kg N / feddan in 1999 / 2000 and 2000 / 2001 seasons. While, no significant difference was obtained between application 75 and 100 kg N / feddan in number of grains / spike in second season. The increase in N level from 50 to 75 and 100 kg N / feddan significantly increased number of grain / spike by 10.89 and 16.81 %, respectively in the first season , corresponding to 5.91 and 7.26 %, respectively in the second season. The increase in number of grains / spike may be due to the increase in spike length and number of spikelets / spike by increasing N level up to 100 kg N / feddan.

These results are in harmony with those obtained by **Rady and Abo El-Zahab (1990), Shams El-Din and El-Habbak (1992), Abo-Shetaia and Abd El-Gawad (1995b), El-Moursy (1997), Mostafa (1998), Sabry *et al.* (1999), El-Sayed *et al.* (2000) and El-Habbasha (2001).**

8-1000- grain weight :-

Results in Table 9 showed clearly that 1000- grain weight was significantly increased by increasing N level up to 100 kg N / feddan in the second season. The application of 75 and 100 kg N / feddan increased 1000 – grain weight by 3.43 and 6.14 % over adding 50 kg N / feddan , respectively in the second season. Whereas, raising N level from 50 to 75 and 100 kg N / feddan insignificantly increased 1000-grain weight by 2.99 and 5.03 %, respectively in the first season. Nitrogen application level showed a similar effect as that obtained on grain weight / spike.

Similar results were also reported by **Fayed (1992), Abo-Warda (1993), Hegab (1994), Salwau (1994), Abd El-Fatah, Nagwa (1995), Abo-Shetaia and Abd El-Gawad (1995b), Abou-Salama *et al.* (1995), Mostafa (1998), Sharaan and Abd El-Samie (1999), Zaghloul (1999), Hassan and Gballah (2000), Sawires, Eman (2000), Toaima *et al.* (2000)** and **Saleh (2001)** who found that 1000-grain weight was significantly increased by increasing N levels. On the other hand, **Abd El-Maaboud (1991), El-Salhy (1991), El-Ganbeehy and Shalaby (1992), Shalaby *et al.* (1993), Sultan *et al.* (1993), Zahran and Mosalem (1993), Abd -All, Azza (1999) and El-Sawi (2001)** found that 1000-grain weight was not affected by nitrogen application.

9-Straw yield kg / feddan:-

The effect of nitrogen fertilizer level on straw yield / feddan was significant in both seasons Table 9. The increase in N level from 50 to 75 and 100 kg N / feddan significantly increased straw yield by 2.54 and 6.45 %, respectively in 1999 / 2000 season, corresponding to 3.84 and 7.43 %, respectively in 2000 / 2001 season.

It could be concluded that the application of nitrogen fertilizer at the rate of 100 kg N / feddan produced the maximum straw yield / feddan which was 7134.39 and 6930.72 kg / feddan in the first and second seasons, respectively. The response of straw yield to N levels reflects the effect of nitrogen fertilizer on stimulating the vegetative growth of wheat i.e. plant height, number of tillers / m^2, flag leaf area and dry weight of the different plant organs. These results are accordance with those obtained by **Rady and Abo El-Zahab (1990), Abd El-Gawad *et al.* (1993) , Salwau (1994), Mostafa (1998) , Abd El-All , Azza (1999) , Sharaan and Abd El-Samie (1999), Zaghloul (1999) and El-Habbasha (2001)** who indicated that straw yield

increased significantly with increasing N levels up to 90 , 80 , 75 , 75 , 150 , 70 , 90 and 100 kg N / feddan respectively.

10-Grain yield kg / feddan :-

The mean values of grain yield / feddan was significantly increased consistently by increasing N level from 50 to 100 kg N / feddan in the two growing seasons as shown in Table 9. The highest mean values of grain yield / feddan were 2810.06 and 2835.94 kg / feddan produced from adding 100 kg N / feddan in the first and second seasons, respectively. Whereas, the lowest one was 2574.81 and 2595.89 kg / feddan , obtained from adding 50 kg N / feddan, respectively.

The present result is a quite clear manifestation for the prominent role of N on wheat grain yield in the soil under study. The increase in grain yield due to the increase in N level is a result of the effect of N in increasing all yield components such as number of spikes / m^2 , weight and length of spike , number of spikelets and grains / spike and 1000 –grain weight. The present results are in agreement with those obtained by **Rady and Abo El-Zahab (1990), El-Ganbeehy and Shalaby (1992), Fayed (1992), Miceli *et al.* (1992), Shams El-Din and El-Habbak (1992), Abd El-Gawad *et al.* (1993), El-Gazzar *et al.* (1993), Fayed *et al.* (1993), Hegab (1994), Salwau (1994), Abo-Shetaia and Abd El-Gawad (1995b), Shama El-Din and Abdrabou (1995), El-Moursy (1997), El-Karamity (1998), Mostafa (1998), Hassanein (1999), Moursy (1999), Sabry *et al.* (1999), Zaghloul (1999), El-Sayed *et al.* (2000), Hassan and Gaballah (2000), Toaima *et al.* (2000), El-Habbasha (2001) and Saleh (2001).**

Table 9: Effect of nitrogen fertilizer levels on yield and its components of wheat in 1999/2000 and 2000 / 2001 seasons at harvest.

Characters / Treatments	No. of Tiller / m^2	No. of Spike / m^2	Spike Length cm	No. of Spikelets /spike	Spike Weight g	Weight Of grain/ Spike g	No. of Grains / spike	1000 - Grain weight g	Biological Straw Yield kg / fed.	Grain Yield kg / fed.
N- levels (kg/fed)	**1999 / 2000 season**									
50	325.00 c	322.22c	12.92c	21.79c	4.11b	2.65b	63.59c	42.10a	6725.19c	2574.81c
75	354.75b	342.78b	13.80b	22.54b	4.53b	3.04a	70.52b	43.36a	6896.00b	2704.00b
100	364.58 a	353.56a	14.26a	23.05a	4.80a	3.26a	74.28a	44.22a	7134.39a	2810.06a
F – test	**	**	**	**	*	*	*	N.S	*	*
N- levels (kg/fed)	**2000 / 2001 season**									
50	331.11c	325.56c	13.08b	24.03b	4.19b	2.89b	68.30b	41.37c	6451.33c	2595.89c
75	348.22b	341.56b	13.59a	24.85a	4.41a	3.14a	72.34a	42.79b	6699.25b	2731.31b
100	376.56a	355.67a	13.90a	25.11a	4.58a	3.24a	73.26a	43.91a	6930.72a	2835.94a
F – test	*	*	*	*	*	*	*	*	*	*

Symboles

* and ** denotes significant and highly significant in this Table.

D-Interaction effect:-

D-a- Interaction effect between varieties and seeding rates:-

There was no significant difference of the mean values of number of tillers and spikes / m^2, spike characters, 1000-grain weight, straw yield and grain yield as affected by the interaction between varieties and N levels in both seasons, consequently the data were excluded. Similar results were obtained by **El-Sawi (1996) and Saleh (2000)** who found that no significant interaction was detected between seeding rates and genotypes on number of spikes / m^2 , number of kernels / spike, 1000-grain weight, straw yield and grain yield / feddan.

D-b- Interaction effect between varieties and N – level

The effect of the interaction between varieties and N – levels was not significant on all studied characters of yield and its components of wheat in the two growing. This means that each of this factors acted independently on these characters, consequently, the data were excluded. The present results are not in agreement with those obtained by **Basilious (1992), Shama El-Din and El-Habbak (1992), El-Banna and Aly (1993), Keiralla (1993b)Abd El-Fatah, Nagwa (1995), El-Karamity (1998), Abd El-All, Azza (1999), El-Bana (1999), Sharaan and Abd El-Samie (1999) and El-Sawi (2001).**

D-c- Interaction effect between seeding rates and N – levels:-

The interaction between seeding rates and N– levels insignificantly affected number of tillers and spikes / m^2, spike characters , 1000-grain weight, straw yield and grain yield per feddan in 1999 / 2000 and 2000 / 2001 growing seasons, consequently the data were excluded.

Similar results were obtained by **El-Habbasha (2001)** who found that all interactions between seeding rates and N –level on yield and yield components did not reach the 5 % level of significance .

D-d- Interaction effect between varieties, seeding rates and N- levels:-

The interaction between the three factors did not affect significantly all studied character of yield and yield components of wheat in both seasons. This means that each of these factors acted independently on these characters consequently, the data were excluded.

Similar results were reported by **El-Habbasha (2001)** who showed that all the interactions between seeding rates and N levels for Sakha 69, Sids 1 and Sids 7 cultivars on yield and yield attributes did not reach the 5 % level of significance. On the other hand, **El-Karamity (1998) and El-Sawi (2001)** found that seeding rates x N fertilizer rates x cultivars interaction exhibited significant effect on all studied traits except straw yield / feddan in both seasons.