RESULTS AND DISCUSSION

The present investigation aimed at evaluating 7 wheat varieties, 6 of which are newly introduced as promising long spike types characterized with some merits and possessing a high yielding ability as believed by wheat breeders. These varieties were tested under 6 N levels. The interaction between these two experimental factors is also considered.

1- Heading Date :

This character denotes the date of flowering which was recorded for each sub plot as the number of days from sowing to the stage at which spikes had partly emerged on half or more of the plants in the sub- plot.

The results of the effects of variety and N fertilizer levels as well as their interaction on flowering dates in the three successive seasons and their combined average are shown in Tables 3 and 4.

1.1 Effect of variety :

The results in Tables 3 and 4 showed that the evaluated varieties significantly varied in heading date in the three successive seasons as well as their combined average.

In 1995/ 96 season, the earliest heading was recorded with Sids 4 which was significantly earlier than the rest 6 varieties. This variety was followed by Sids 8, Sids 6, and Sids 9 as one group without significant differences among them. Then Sids 7 is followed with a

Table (3): Effect of nitrogen levels on heading date of seven wheat varieties in the three successive seasons (1995/ 96/ 1996/ 97 and 1997/ 98).

N level kg / fed / Varieties	1995/ 96							1996/ 97							1997/ 98						
	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean
Sids 1	106.00	104.50	109.00	109.50	109.75	110.25	108.17	104.75	106.50	107.75	107.00	108.25	109.25	107.25	90.50	92.00	92.75	99.00	99.50	101.75	95.92
Sids 4	86.00	87.75	88.50	87.75	88.00	87.00	87.50	81.50	82.50	83.50	84.25	84.25	85.75	83.63	75.00	76.50	77.25	77.50	79.00	88.50	78.96
Sids 5	95.50	94.00	98.75	96.75	98.25	98.00	96.88	96.75	97.25	98.00	100.00	103.25	104.50	99.96	85.75	87.00	89.00	91.00	91.25	93.00	89.50
Sids 6	92.75	91.25	95.50	94.50	95.00	95.75	94.13	95.00	95.75	96.50	99.50	101.25	104.75	98.79	85.00	86.50	87.00	89.00	90.50	94.25	88.71
Sids 7	92.75	95.00	96.25	96.75	97.00	95.00	95.46	96.00	96.50	99.50	100.00	102.25	104.00	99.71	90.25	84.00	84.25	85.75	87.75	87.75	86.63
Sids 8	92.75	94.00	93.75	93.25	95.50	94.25	93.92	94.00	94.25	94.75	96.50	97.25	101.50	96.38	95.00	84.25	85.00	85.50	86.00	84.75	86.75
Sids 9	93.25	94.75	93.75	94.50	95.75	94.25	94.38	96.50	95.75	95.50	95.75	96.00	96.00	95.92	87.50	84.25	85.75	85.75	89.00	86.00	86.38
Mean	94.14	94.46	9650	96.14	97.04	96.36	95.77	94.93	95.50	96.50	97.57	98.93	100.82	97.38	87.00	84.93	85.86	87.64	89.00	90.86	87.55
L.S.D 5%																					
Varieties (V)				0.98							0.78							0.77			
Nitrogen (N)				1.78							0.68							0.87			
V x N				2.41							1.90							1.88			

Table (4): Effect of N levels on heading date of seven wheat varieties (combined analysis of 1995/ 96, 1996/ 97 and 1997/ 98 seasons).

N level kg / fed / Varieties	0	30	60	90	120	150	Mean
Sids 1	100.42	101.00	103.17	105.17	105.83	107.08	103.78
Sids 4	80.83	82.25	83.08	83.17	83.75	87.08	83.36
Sids 5	92.67	92.75	95.25	95.92	97.58	98.50	95.44
Sids 6	90.92	91.17	93.00	94.33	95.58	98.25	93.88
Sids 7	93.00	91.83	93.33	94.17	95.67	95.58	93.93
Sids 8	93.92	90.83	91.17	91.75	92.92	93.50	92.35
Sids 9	92.42	91.58	91.67	92.00	93.58	92.08	92.22
Mean	92.02	91.63	92.95	93.79	94.99	96.01	93.57
L.S.D 5%							
Varieties (V)				0.489			
Nitrogen (N)				0.663			
V x N				1.199			

heading date of 95.46 days which was significantly earlier than Sids 5 with a heading date of 96.88 days. The latest variety was the commercial cultivar Sids 1 with the latest heading date being 108.17 days which was significantly higher compared with all other varieties .

In 1996/ 97 season, the tested varieties showed about the same variation in heading date. Similarly, Sids 4 was the earliest variety with a heading date of 83.63 days with significant differences when compared with all varieties. This variety was followed by Sids 9 and Sids 8 without significant difference between both varieties, then Sids 6 is followed which was significantly earlier than Sids 7 and Sids 5 which were nearly similar in their heading date. The latest heading was also recorded with Sids 1, being 107.25 days.

In 1997/ 98 season, the evaluated varieties showed nearly a similar trend with very slight deviations compared with the first and second seasons. The results indicated that Sids 4 was also the earliest variety in heading (78.96 days) and Sids 1 with the latest variety (95.92 days), with significant differences when compared with the other varieties. Sids 7, Sids 8 and Sids 9 were included as one groups with heading dates of 86.63, 86.75 and 86.38 days, respectively, showing no significant differences among them but were earlier than Sids 5 and Sids 6 which are included as one group (89.50 and 88.71 days).

The three seasons average indicates a more accurate illustration for heading date. The combined analysis indicated the superiority of Sids 4 showing the earliest heading date of 83.36 days, followed by Sids 8 and Sids 9 as one group with 92.35 and 92.22 heading date

respectively. Then another group with Sids 6 and Sids 7 with 93.88 and 93.93 heading date which were earlier than Sids 5 (95.44 days). The latest heading was recorded with the check variety Sids 1 with 103.78 days, which significantly differed compared with the 6 varieties. From the pervious results it could be concluded that the tested varieties markedly varied in heading date and the newly introduced long spike varieties possessed the character of early heading over the commercial cultivar Sids 1.

The variation in heading date is mainly due to the differences in the genetic make up of the tested varieties .

Many investigators showed that wheat varieties markedly varied in their heading date **(Eissa, 1979; Hussein *et al.* 1981a; Massoud, 1986; Abo Warda, 1989; Hifnawi, 1993; Ibrahim *et al.*, 1995; Massoud, 1995; El- Sawi, 1996; Abd El- Ghany, 1997 and Ali, 1997).**

1.2. Effect of N Level :

The results presented in Tables 3 and 4 showed that the increase in N level significantly increased days to 50% heading in the three successive seasons. The earliest heading occured under the check treatment in 1995/ 96 and 1996/ 97 seasons and under 30 kg N/ fad in 1997/ 98 season. The highest heading date was recorded at 120 kg N/ fad in the first season, and at 150 kg N/ fad in the second and third seasons. The differences in heading date among the 6 N levels were significant. The results showed that raising the N level from zero to

150 kg/ fad delayed heading by 2.22, 5.89 and 3.86 days in the three successive seasons, respectively.

The combined data of the three seasons indicated that the earliest heading was that of the 30 kg N/ fad level and the latest heading date was of the highest N level (150 kg N/ fad), the difference being 4.38 days.

The effect of a high rate of N on heading date is mainly due to prolonging the vegetative growth period and extending the photosynthetic activity of the growing plants. This in turn may be reflected on the grain yield of wheat.

The present results are in general agreement with those reported by **Eissa (1979), Emam Sadek (1985), Gheith *et al.* (1989), Eissa (1990), Shehab El- Din and Eissa (1992), Abo- Warda (1993) and Eissa (1996).**

1.3. Interaction Effect :

The results presented in Tables 3 and 4 showed that the interaction between varieties and N level significantly affected heading date in the three successive seasons as well as the combined average.

The results indicated that the highest value of heading date was recorded with Sids 1 supplied with 150 kg N/ fad being 110.25, 109.25 and 101.75 days in the first, second and third season, respectively. The combined data indicated an average heading date of 107.08 days for Sids 1 at 150 kg N/ fad. On the other hand, the earliest heading was

recorded with Sids 4 under the check treatment with an average date of 86.00, 81.50 and 75.00 days in the three successive seasons, respectively.

The combined analysis indicated that the three seasons average for the earliest heading was recorded after 80.83 days by the unfertilized plants of Sids 4 variety .

The results of the interaction indicated also a different response of heading dates of the tested varieties to N levels. For example, Sids 9 variety showed an opposite response to N level when compared with the other varieties where a delayed heading was observed at the check level in the second and third seasons compared with the highest N level. Such result indicates that this variety showed earlier heading at the highest N level. This trend is quite different when compared with Sids 4 which showed a progressive increase in heading date with each increment in N level.

It could be concluded that the tested varieties responded differently to N levels concerning heading date in the three successive seasons.

Similar results were also reported by **Eissa (1979) and Abd- El-Ghany (1997)** who found a significant interaction effect between variety and N level on heading date.

2. Maturity Date :

Results of the effect of varieties and N levels and their interaction on maturity date in the three seasons as well as their combined average are presented in Tables 5 and 6.

Table (5): Effect of nitrogen levels on maturity date of seven wheat varieties in the three successive seasons (1995/ 96/ 1996/ 97 and 1997/ 98).

	1995/ 96							1996/ 97							1997/ 98						
N level kg / fed / Varieties	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean
Sids 1	146.50	146.25	151.75	152.25	151.50	151.75	150.00	143.00	148.25	150.75	152.00	154.50	156.25	150.79	140.75	144.00	147.25	148.50	152.50	154.00	147.83
Sids 4	139.75	143.00	142.75	146.00	148.00	145.50	144.17	132.75	136.25	141.00	143.00	146.50	148.50	141.33	127.75	131.50	133.25	141.25	144.25	145.50	137.25
Sids 5	136.25	143.50	144.50	146.25	147.25	152.50	145.04	144.00	147.00	149.25	151.75	154.50	156.25	150.46	135.75	141.00	143.00	146.75	148.25	149.25	144.00
Sids 6	139.00	147.75	144.75	151.75	149.75	155.00	148.00	142.75	143.75	145.25	147.75	149.25	151.50	146.71	132.50	139.75	142.50	144.75	147.00	148.75	142.54
Sids 7	142.00	139.75	146.50	147.50	147.50	153.25	146.08	143.50	145.25	147.00	148.25	152.25	153.75	148.33	142.50	132.50	136.00	143.00	147.75	146.75	141.42
Sids 8	140.25	143.75	145.75	149.75	145.25	150.50	145.88	143.50	145.75	147.50	149.50	151.00	153.75	148.50	139.25	135.25	140.00	148.50	145.75	147.00	142.63
Sids 9	144.50	146.75	146.50	149.25	152.00	148.25	147.88	143.50	145.25	146.25	149.00	151.00	154.25	148.21	142.75	133.75	141.75	142.75	146.25	148.25	142.58
Mean	141.18	144.39	146.07	148.96	148.75	150.96	146.72	141.86	144.50	146.71	148.75	151.29	153.46	147.76	137.32	136.82	140.54	145.07	148.30	148.50	142.61
L.S.D 5%																					
Varieties (V)	3.11							1.45							1.25						
Nitrogen (N)	1.59							0.96							1.05						
V x N	N.S							N.S							3.06						

Table (6): Effect of N levels on maturity date of seven wheat varieties (combined analysis of 1995/ 96, 1996/ 97 and 1997/ 98 seasons).

N level kg / fed / Varieties	0	30	60	90	120	150	Mean
Sids 1	143.42	146.17	149.92	150.92	152.83	154.00	149.54
Sids 4	133.42	136.92	139.00	143.42	146.25	146.50	140.92
Sids 5	138.67	143.83	145.58	148.25	150.00	152.67	146.50
Sids 6	138.08	143.75	144.17	148.08	148.67	151.75	145.75
Sids 7	142.67	139.17	143.17	146.25	149.17	151.25	145.28
Sids 8	141.00	141.58	144.42	149.25	147.33	150.42	145.67
Sids 9	143.58	141.92	144.83	147.00	149.75	150.25	146.22
Mean	140.12	141.91	144.44	147.60	149.14	150.98	145.70
L.S.D 5%							
Varieties (V)	1.216						
Nitrogen (N)	0.676						
V x N	2.980						

2.1. Effect of Variety :

The evaluated varieties showed significant differences in maturity date in the three seasons of experimentation and the combined average. In 1995/ 96 season, Sids 4 was the earliest variety and surpassed the other 6 varieties with significant differences when compared with Sdis 1, Sids 6 and Sids 9. Sids 4 was followed by Sids 5, Sids 8, Sids 7 and Sids 9 as one group in maturity after 145.04- 147.88 days without significant differences among them. The latest maturing variety was Sids 1 recording a maturity date of 150 days with significant differences compared with Sids 4, Sids 5 , Sids 7 and Sids 8.

In 1996/ 97 season, also Sids 4 was the earliest maturing variety which was significantly earlier than all the other varieties. Sids 4 was followed by Sids 6 which was significantly earlier than the rest five varieties, i.e., Sids 1, Sids 5, Sids 7, Sids 8 and Sids 9. A group of 3 varieties including Sids 9, Sids 7 and Sids 8 followed Sids 6 recording maturity date of 148.21- 148.33- 148.50 days without significant differences among them. The latest maturity was recorded by the commercial cultivar Sids 1 (150.79 days) and Sids 5 (150.46 days).

In 1997/ 98 season, similarly Sids 4 was the earliest maturing variety with significant differences compared with all other varieties and Sids 1 was the latest maturing variety with significant differences when compared with the rest 6 varieties . The other 5 varieties could be arranged in a descending order in their maturity date as follows : Sids 5 (144.00 days), Sids 8 (142.63 days), Sids 9 (142.58 days), Sids 6 (142.54 days), and Sids 7 (141.42 days), with some significant

differences as a group in between the earliest and latest maturing varieties .

The combined analysis indicated also marked differences among the tested varieties and the varieties could be clearly classified into three distinct categories as follows :

a- The earliest variety Sids 4 with an average maturity date of 140.92 days which significantly surpassed all other varieties .

b- The latest maturing variety Sids 1 with a maturity date of 149.54 days which showed significant differences compared with all other varieties .

c- The moderate group which was in between the early and late varieties including Sids 5, Sids 6, Sids 7, Sids 8 and Sids 9 with an average maturity date between 145.28 and 146.50 days showing no marked differences among them.

The present results are expected since the tested varieties showed marked differences in heading date. The earliest maturing variety Sids 4 was also the earliest in heading date and Sids 1 was the latest variety reaching heading and consequently the latest maturing one. These results are mainly due to the differences in the genetical constitution of the evaluated varieties .

Similar results were also reported by **Hussein *et al.* (1981a), Abo- Warda (1989), and Ali (1997)** who found marked differences in maturity date of the different wheat varieties .

2.2. Effect of N level :

The results in Tables 5 and 6 showed that N significantly affected maturity date of wheat in the three successive seasons as well as in their combined average. The increase in N level from zero to 30, 60, 90, 120 and 150 kg / fad significantly increased maturity date in the three seasons.

In 1995/ 96, raising N level delayed maturity date from 141.18 days under the check treatment to 150.96 days at the highest N level (150 kg/ fad). Most of the differences in maturity dates were significant .

In 1996/ 97, similar results were also observed where an increase of 11.60 days was recorded in maturity date due to raising N level from zero to 150 kg/ fad. All differences in date of maturity due to the increase in N level were significant .

In 1997/ 98 season, an increase of 11.18 days in maturity was recorded as a result of applying N at 150 kg/ fad when compared with the control treatment .

The combined data indicated clearly that a progressive and consistent increase in maturity date followed any increase in N level. The application of 30, 60, 90, 120 and 150 kg N/ fad delayed maturity by 1.79, 4.32, 7.48, 9.02 and 10.86 days, respectively.

This result indicates clearly that a good supply of N increased the vegetative growth as well as the grain filling period markedly and this in

turn should increase grain yield of wheat due to an increase in photosynthetic activity of the growing plants.

The effect of N in delaying wheat maturity was also reported by several investigators (**Abo- Warda, 1993 and Eissa, 1996**).

2.3. Interaction Effect :

The results in Tables 5 and 6 showed that varieties x N levels interaction significantly affected maturity date in 1997/ 98 season, whereas no significant effect of the interaction was detected in the first and second seasons. Also, the combined average of the three seasons indicated a significant effect of the interaction on this trait.

The results indicated that in 1997/ 98 season, the response of the tested varieties to N levels markedly varied. The results showed that 5 varieties recorded the highest maturity date at the highest N level (150 kg/ fad), but two varieties, i.e., Sids 7 and Sids 8 recorded the highest maturity date under 120 and 90 kg N/ fad, respectively. Similarly, the earliest maturity was reached under the check treatment with 4 varieties, i.e., Sids 1, Sids 4, Sids 5 and Sids 6, while the other 3 varieties (Sids 7, Sids 8 and Sids 9) recorded the earliest maturity date under 30 kg N/ fad.

This clear variation in the response of wheat varieties to N level indicated the interaction effect.

The three seasons average showed a significant interaction effect of variety x N on maturity date. The earliest maturity was recorded with Sids 4 under the unfertilized treatment, being 133.42 days and the

highest date of maturity was 154 days which was recorded with the commercial cultivar Sids 1 supplied with 150 kg N/ fad.

The significant effect of the interaction between variety and N level on maturity date was also reported by **Abd- El- Aleem (1980), and Abd El- Ghany (1997).**

3. Plant Height :

The effects of N fertilizer levels on plant height of the 7 wheat varieties as well as variety x N level interaction in the three successive seasons and their combined average are shown in Tables 7 and 8.

3.1. Effect of Variety :

Varieties varied markedly in their plant height in the three seasons of experimentation as well as their combined average.

In 1995/ 96 season, the tested varieties could be classified into three distinct groups as far as plant height is concerned. Sids 1 was the tallest variety and significantly surpassed the other 6 varieties .

Sids 4, Sids 5, Sids 6 and Sids 7 are included in one group with a plant height ranging from 113.96 cm for Sids 4 and 110.63 cm for Sids 7 without significant differences among them.

The third group includes the shortest varieties Sids 8 (107.08 cm) and Sids 9 (106.46 cm) which were inferior in plant height than the other 5 varieties .

In 1996/ 97 season, the same trend was observed and also the three distinct groups are observed more evidently. The commercial cultivar Sids 1 was at the top with an average plant height of 120.83 cm

Table (7): Effect of nitrogen levels on plant height (cm) of seven wheat varieties in the three successive seasons (1995/ 96/ 1996/ 97 and 1997/ 98).

	1995/ 96							1996/ 97							1997/ 98						
N level kg / fed / Varieties	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean
Sids 1	105.00	120.00	122.50	121.25	132.50	131.25	122.08	151.00	123.75	121.25	122.50	121.25	121.25	120.83	73.75	115.00	122.50	116.25	120.00	117.50	110.83
Sids 4	111.25	112.50	112.50	117.50	113.75	116.25	113.96	93.75	102.50	102.50	101.25	101.25	102.50	100.63	62.50	87.50	103.75	103.75	102.50	103.75	93.96
Sids 5	105.00	111.25	112.50	111.25	113.75	111.25	110.83	96.25	102.50	105.00	101.25	102.50	101.25	101.46	61.25	100.00	105.00	106.25	111.25	106.25	98.33
Sids 6	102.50	112.50	112.50	112.50	112.50	113.75	111.04	97.50	101.25	98.75	103.75	105.00	106.25	102.08	65.00	100.00	105.00	107.50	106.25	108.75	98.75
Sids 7	103.75	115.00	110.00	110.00	113.75	111.25	110.63	90.00	101.25	103.75	101.25	107.50	101.25	100.83	65.00	103.75	100.00	106.25	107.50	105.00	97.92
Sids 8	97.50	110.00	103.75	111.25	110.00	110.00	107.08	91.25	96.25	97.50	97.50	98.75	95.00	96.04	58.75	95.00	103.75	103.75	103.25	103.75	94.79
Sids 9	95.00	113.75	103.75	108.75	108.75	108.75	106.46	96.25	95.00	95.00	92.50	96.25	93.75	94.79	57.50	95.00	102.50	101.25	102.50	102.50	93.54
Mean	102.86	113.57	111.07	113.21	115.00	114.64	111.73	97.14	103.21	103.39	102.86	104.64	103.04	102.38	63.39	99.46	106.07	106.43	107.68	106.79	98.30
L.S.D 5%																					
Varieties (V)	3.78							3.04							3.25						
Nitrogen (N)	4.94							3.17							4.18						
V x N	N.S							N.S							N.S						

Table (8): Effect of N levels on plant height of seven wheat varieties (combined analysis of 1995/ 96, 1996/ 97 and 1997/ 98 seasons).

N level kg / fed / Varieties	0	30	60	90	120	150	Mean
Sids 1	97.92	119.58	122.08	120.00	124.58	123.33	117.92
Sids 4	89.17	100.83	106.25	107.50	105.83	107.50	102.85
Sids 5	87.50	104.58	107.50	106.25	109.17	106.25	103.54
Sids 6	88.33	104.58	105.42	107.92	107.92	109.58	103.96
Sids 7	86.25	106.67	104.58	105.83	109.58	105.83	103.13
Sids 8	82.50	100.42	101.67	104.17	104.17	102.92	99.31
Sids 9	82.92	101.25	100.42	100.83	102.50	101.67	98.26
Mean	87.80	105.42	106.85	107.50	109.11	108.16	104.14
L.S.D 5%							
Varieties (V)	1.946						
Nitrogen (N)	2.280						
V x N	4.768						

and Sids 9 at the base with 94.79 cm height. The significant differences were only observed between the three groups.

In 1997/ 98 season, the same trend was also observed with one exception for Sids 4 variety which is included in the short plants group. The varieties could be arranged in a descending order in regard to plant height as follows : Sids 1 (110.83 cm), Sids 6 (98.75 cm), Sids 5 (98.33 cm), Sids 7 (97.92), Sids 8 (94.79 cm), Sids 4 (93.96 cm) and Sids 9 (93.54 cm).

The significant differences were observed between the three groups of plant height. The first group included only Sids 1, the second included Sids 5, Sids 6 and Sids 7, and the third included Sids 4, Sids 8 and Sids 9.

The combined analysis of the three seasons average shwoed also that the evaluated varieties could be classified into three groups: the first group includes Sids 1, with an average of 117.92 cm as the tallest variety , the second group includes Sids 4, Sids 5, Sids 6 and Sids 7 with an average height between 102.85 and 103.96 cm and the third group including Sids 8 and Sids 9 with 99.31 and 98.26 cm plant height, respectively.

It could be concluded that marked differences were found among the tested varieties in plant height due to the differences in the genetical make up of the evaluated varieties .

It is worth noting that each variety showed about the same trend of plant height in the three successive seasons and their combined average as well.

The results reported by **El- Helay (1984), Abd El- Gawad *et al.* (1985 a), Massoud (1986), Reiad *et al.* (1987), Abo- Warda (1989), Shams El- Din and El- Habbak (1992), Ibrahim *et al.* (1995), Mady (1996) and Ali (1997),** showed that wheat varieties widely varied in plant height.

3.2. Effect of N level :

The results presented in Tables 7 and 8 indicated a significant effect of N level on plant height in the 3 seasons as well as in the combined average.

In 1995/ 96 seasons, applying N at 30 kg N/ fad significantly increased plant height over the check treatment by 10.41%. Further increase in N level to 60, 90, 120 and 150 kg N/ fad did not induce any further increase in plant height over that obtained by 30 kg N/ fad.

Applying 30, 60, 90, 120 and 150 kg N/ fad significantly increased plant height by 10.41, 7.98, 10.06, 11.80 and 11.54 %, compared with the untreated plants, respectively.

In 1996/ 97 season, a similar trend for the effect of N level on plant height was detected where a significant increase of 6.25 % in plant height was observed due to applying 30 kg N/ fad. No further significant increases were obtained due to raising N level from 30 to 60, 90, 120 or 150 kg N/ fad. The results in that season are identical with those of the first season.

In 1997/ 98 season, the significant increase in plant height was obtained by all N levels over the check treatment and a further increase in plant height was observed by raising N level over 30 kg/ fad.

Applying 30, 60, 90, 120 and 150 kg N/ fad significantly increased plant height by 56.90, 67.33, 67.90, 69.87 and 68.47 % respectively.

It is worth mentioning that the response of plant height to N levels in the third season was more evident than in the first and second seasons.

The three seasons average indicated that applying N at 30, 60, 90, 120 and 150 kg N/ fad significantly increased plant height over the control by 20.07, 21.70, 22.44, 24.27 and 23.19%, respectively.

The significant differences were those between the untreated plants and the five N levels (30- 150 kg), and between 30 and each of 120 and 150 kg N/ fad.

It could be concluded that N is an essential element for wheat growth and a good supply of N is necessary for the vegetative growth and photosynthetic activity of the growing plants.

The present results are in general agreement with those obtained by **Eissa (1979), El- Helaly (1984), Eman Sadek (1985), Saleh *et al.* (1985), Ellen (1987), Basilious and Mosaad (1988), Gheith *et al.* (1989), Eissa (1990), Hayam Mahgoub (1990), Shams El- Din and El- Habbak (1992), Shenab El- Din and Eissa (1992), Abd El-Gawad *et al.* (1993b), Abo- Warda (1993), Fayed *et al.* (1993),**

Shalaby *et al.* (1993), Sulttan *et al.* (1993), El- Zein (1994), Abo-Shetaia and Abd El- Gawad (1995), and Mady (1996) who found that N application significantly increased plant height of wheat.

3.3 Interaction Effect :

The results in Tables 7 and 8 showed that the interaction between variety and N levels had no significant effect on plant height in the three successive seasons whereas the combined average indicated a significant interaction effect.

In general, the combined average showed a different response of the tested varieties to N, and the highest plants were those of Sids 1 supplied with 120 kg N/ fad, recording an average of 124.58 cm.

On the other hand, the shortest plants were those of untreated Sids 8, with and average height of 82.50 cm. The results reported by **Abd El- Aleem (1980),** showed a significant interaction between variety and N level on plant height.

4. Number of Spikelets per Spike :

The effects of variety , N level and their interaction on number of spikelets per spike in the three successive seasons and their combined average are presented in Tables 9 and 10.

4.1. Effect of Variety :

The seven varieties evaluated in the present study showed significant differences in number of spikelets/ spike in the three seasons and their combined average.

Table (9): Effect of nitrogen levels on number of spikelets/ spike of seven wheat varieties in the three successive seasons (1995/ 96/ 1996/ 97 and 1997/ 98).

	1995/ 96							1996/ 97							1997/ 98						
N level kg / fed / Varieties	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean
Sids 1	22.30	21.80	22.33	22.45	23.60	22.05	22.42	21.75	22.13	22.00	21.40	21.80	22.20	21.88	19.00	19.10	20.48	22.25	22.20	22.90	20.99
Sids 4	20.20	22.85	22.40	22.70	23.90	23.60	22.61	19.10	24.30	18.50	20.70	19.80	21.33	20.62	18.80	17.35	18.55	18.43	19.65	20.23	18.83
Sids 5	24.50	24.50	24.00	23.50	24.20	24.20	24.15	24.35	20.65	24.10	25.30	24.20	23.70	23.72	23.80	20.30	22.70	21.80	23.20	22.15	22.33
Sids 6	21.95	23.00	24.00	23.20	23.40	24.15	23.28	21.68	22.85	23.10	22.05	23.85	21.10	22.44	20.40	19.70	21.65	23.10	22.70	22.70	21.71
Sids 7	22.10	21.00	22.90	22.95	23.55	23.80	22.72	19.70	22.40	22.00	22.50	21.50	22.40	21.75	20.70	21.50	20.80	22.33	22.30	23.65	21.88
Sids 8	22.80	23.40	23.20	25.45	23.20	24.60	23.78	20.95	20.39	24.10	23.70	23.60	22.50	22.54	19.68	20.60	22.30	21.33	21.60	21.75	21.21
Sids 9	23.70	23.80	24.65	24.40	21.60	23.70	23.64	23.50	22.60	22.95	20.98	23.70	22.45	22.70	19.50	20.20	22.33	19.10	22.70	23.40	21.20
Mean	22.51	22.91	23.35	23.52	23.35	23.73	23.23	21.58	22.19	22.39	22.38	22.64	22.24	22.23	20.27	19.82	21.26	21.19	22.05	22.40	21.16
L.S.D 5%																					
Varieties (V)	1.03							1.16							1.09						
Nitrogen (N)	N.S							N.S							0.85						
V x N	N.S							2.84							N.S						

Table (10): Effect of N levels on number of spikelets/ spike of seven wheat varieties (combined analysis of 1995/ 96, 1996/ 97 and 1997/ 98 seasons).

N level kg / fed / Varieties	0	30	60	90	120	150	Mean
Sids 1	21.02	21.01	21.60	22.03	22.53	22.38	21.76
Sids 4	19.37	21.50	19.82	20.61	21.12	21.72	20.69
Sids 5	24.22	21.82	23.60	23.53	23.87	23.35	23.40
Sids 6	21.34	21.85	22.92	22.78	23.32	22.65	22.48
Sids 7	20.83	21.63	21.90	22.59	22.45	23.28	22.12
Sids 8	21.14	21.46	23.20	23.49	22.80	22.95	22.51
Sids 9	22.23	22.20	23.31	21.49	22.67	23.18	22.51
Mean	21.45	21.64	22.34	22.36	22.68	22.79	22.21
L.S.D 5%							
Varieties (V)	0.631						
Nitrogen (N)	0.532						
V x N	N.S.						

In 1995/ 96 season, Sids 5 showed the highest number of spikelets, bearing 24.15 spikelets followed by Sids 8 (23.78), Sids 9 (23.64) and Sids 6 (23.28) without significant differences among these four varieties .

Sids 5 significantly surpassed the remaining varieties, i.e., Sids1, Sids 4 and Sids 7, with significant differences. Also, Sids 8 significantly surpassed Sids 1, Sids 4 and Sids 7 in number of spikelets/ spike..

In 1996/ 97 season, about the same trend was observed, where Sids 5 beared the highest number of spikelets/ spike (23.72) with significant differences when compared with Sids 1, Sids 4, Sids 6, Sids 7 and Sids 8.

The lowest number of spikelets per spike was observed with Sids 4 which was significantly lower than Sids 1, Sids 5, Sids 6, Sids 8 and Sids 9.

A group of 3 varieties, i.e., Sids 6, Sids 8 and Sids 9 bearing a moderate number of spikelets (22.44- 22.70) followed the first variety Sids 5 and was inbetween the highest and lowest groups.

In 1997/ 98 season, similarly Sids 5 recorded the highest number of spikelets/ spike (22.33) which surpassed significantly Sids 1, Sids 4, Sids 8 and Sids 9. Also, Sids 4 showed the lowest value of this trait (18.83) which was significantly inferior compared with the other 6 varieties. The other 5 varieties Sids 1, Sids 6, Sids 7, Sids 8 and Sids 9

could be grouped into one group inbetween the two extremes without significant differences among them.

The combined data indicated that the tested varieties could be grouped into 3 groups with marked differences between these groups. The first group with Sids 5 at the top bearing and average of 23.40 spikelets, followed by a group of five varieties including Sids 1, Sids 6, Sids 7, Sids 8 and Sids 9 with a range of 21.76 – 22. 51, spikelets, then Sids 4 is followed with an average of 20.69 spikelets which is considered as significantly inferior in this character compared with the other 6 varieties .

Many investigators reported also considerable variations in the number of spikelets/ spike of the different wheat varieties (**Eissa, 1979; El- Helaly, 1984; Abd El- Gawad *et al.* , 1985b; Mahmoud, 1988; Abo- Warda, 1989; El- Ashmoony, 1990; Hyam Mahgoub, 1990; Rady and Abo El- Zahab, 1990; Ibrahim and Abdel- Aal, 1991; Hifnawi, 1993; Ibrahim *et al.* , 1995; Abdin *et al.* , 1996; Mady, 1996 and Ali, 1997).**

4.2. Effect of N level :

The results in Tables 9 and 10 showed that the increase in N level increased number of spikelets/ spike in the three seasons and their combined average. However, this increase reached the level of significance in the third season as well as in the combined average.

In 1995/ 96 and 1996/ 97 seasons, all N rates slightly increased number of spikelets/ spike, but these increases were far below the significant level.

In 1997/ 98 season, the increases due to raising N level were significant. Applying N at 60, 90, 120 and 150 kg/ fad increased spikelets number by 4.88, 4.54 , 8.78 and 10.5 %, respectively compared with the check treatment. All these increases were significant. It was observed that the 30 kg N/ fad level did not induce a significant increase in this trait.

The three seasons average indicated significant increases in spikelets number/ spike when N was applied at 60, 90, 120 and 150 kg/ fad where increases of 4.15, 4.24, 5.73 and 6.25 % were observed over the check treatment, respectively.

It could be concluded that N favourably affected number of spikelets/ spike and this effect was significant in one season out of three. This encouraging effect of N may be due to the effect of N on vegetative growth of the growing plants.

Many investigators reported that the increase in N fertilization significantly increased number of spikelets/ spike **(Eissa, 1979; El-Helaly, 1984; El- Sayed *et al.*, 1984; Eman Sadek, 1985; Saleh *et al.*, 1985; Shalaby *et al.*, 1993; El- Zein, 1994; Abo- Shetaia and Abd El- Gawad, 1995; Eissa, 1996; and Abd El- Ghany, 1997).**

4.3. Interaction Effect :

The interaction between variety and N level on number of spikelets/ spike was significant in 1996/ 97 season only, whereas in 1995/ 96 and 1997/ 98 seasons, this effect was not significant (Tables 9 and 10).

The combined analysis indicated also no significant effect of the interaction on this trait. The significant interaction in 1996/ 97 season presented in Table 9 indicated that the tested varieties responded differently to the applied N levels. The highest number of spikelets/ spike was recorded at 150 kg N/ fad by Sids 1, at 120 kg N/ fad by Sids 6 and Sids 9, at 90 kg N/ fad by Sids 5, and Sids 7, at 60 kg N/ fad by Sids 8 and at 30 kg N/ fad by Sids 4.

This quite variation in the response of the varieties to N is a clear indication for V x N interaction.

It could be generally concluded that in 1996/ 97 season, the highest number of spikelets/ spike was 25.30 which was recorded by Sids 5 supplied with 90 kg N/ fad., and the lowest value was 18.50 which was obtained by Sids 4 supplied with 60 kg N/ fad.

The results obtained by **Eissa (1979) and Abd El- Ghany (1997)** indicated a significant interaction effect between variety and N level on number of spikelets/ spike.

5. Number of Spikes per One Square Meter :

The effects of variety, N level and their interaction on number of spikes/ m^2 in the three successive seasons as well as their combined average are given in Tables 11 and 12 .

5.1. Effect of Variety :

The seven varieties possessed marked differences in number of spikes/ m^2. These differences reached the level of significance in the second and third seasons as well as in the three seasons average.

Table (11): Effect of nitrogen levels on number of spikes/ m^2 of seven wheat varieties in the three successive seasons (1995/ 96/ 1996/ 97 and 1997/ 98).

	1995/ 96							1996/ 97							1997/ 98						
N level kg / fed / Varieties	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean
Sids 1	236.25	281.25	270.00	277.50	303.75	257.50	271.04	268.75	282.50	240.00	282.50	270.00	310.00	275.63	215.00	315.00	361.25	365.00	365.00	343.75	327.50
Sids 4	275.00	278.75	235.00	297.50	302.50	292.50	280.21	235.00	233.75	246.25	231.25	236.25	228.75	235.21	191.25	251.25	276.25	275.00	283.75	266.25	257.29
Sids 5	234.00	248.75	272.50	276.25	292.50	271.25	265.88	265.00	236.25	216.25	232.50	213.75	233.75	232.92	202.50	278.75	267.50	300.00	295.00	272.50	269.38
Sids 6	231.25	237.50	301.25	268.75	255.00	281.25	262.50	228.75	240.00	232.50	235.00	261.25	237.50	239.17	197.50	285.00	272.50	298.75	331.25	285.00	278.33
Sids 7	258.75	286.25	312.50	317.50	286.25	290.00	291.88	232.50	265.00	216.25	232.50	222.50	251.25	236.67	208.75	320.00	296.25	268.75	325.00	262.50	280.21
Sids 8	268.75	266.25	252.50	270.00	268.75	267.75	265.67	272.50	266.25	268.75	300.00	253.75	257.50	269.79	222.50	296.25	303.75	308.75	348.75	237.50	286.25
Sids 9	298.75	275.00	286.25	282.50	262.50	287.50	282.08	233.75	261.25	250.00	220.00	278.75	241.25	247.50	170.00	248.75	292.50	243.75	325.00	301.25	263.54
Mean	257.54	267.68	275.71	284.29	281.61	278.25	274.18	248.04	255.00	238.57	247.68	248.04	251.43	248.13	201.07	285.00	295.71	294.29	324.82	281.25	280.36
L.S.D 5%																					
Varieties (V)	N.S							19.41							27.51						
Nitrogen (N)	N.S							N.S							43.06						
V x N	N.S							N.S							N.S						

Table (12): Effect of N levels on number of spikes / m^2 of seven wheat varieties (combined analysis of 1995/ 96, 1996/ 97 and 1997/ 98 seasons).

N level kg / fed / Varieties	0	30	60	90	120	150	Mean
Sids 1	240.00	292.92	290.42	308.33	312.92	303.75	291.39
Sids 4	233.75	254.58	252.50	267.92	274.17	262.50	257.57
Sids 5	233.83	254.58	252.08	269.58	267.08	259.17	256.06
Sids 6	219.17	254.17	268.75	267.50	282.50	267.92	260.00
Sids 7	233.33	290.42	275.00	272.92	277.92	267.92	269.58
Sids 8	254.58	276.25	275.00	292.92	290.42	254.25	273.90
Sids 9	234.17	261.67	276.25	248.75	288.75	276.67	264.38
Mean	235.55	269.23	270.00	275.42	284.82	270.31	267.55
L.S.D 5%							
Varieties (V)	13.801						
Nitrogen (N)	18.340						
V x N	33.808						

In 1995/ 96 season, varieties could be arranged in regard to spikes/ m^2 in a descending order as follows :

Sids 7 (291.88 spikes), Sids 9 (282.08 spikes), Sids 4 (280.21 spikes), Sids 1 (271.04 spikes), Sids 5 (265.88 spikes), Sids 8 (265.67 spikes), and Sids 6 (262.50 spikes). These differences, however, were below the significant level.

In 1996/ 97 season, Sids 1 produced the greatest spikes / m^2 (275.63), followed by Sids 8 (269.79) without significant difference. Sids 9 (247.50), Sids 6 (239.17), Sids 7 (236.67), and Sids 4 (235.21) are followed as one group without significant differences.

It is evident that Sids 1, outnumbered the long spike varieties in spikes / m^2 with significant differences compared with Sids 4, Sids 5, Sids 6, Sids 7 and Sids 9.

In 1997/ 98 season, a similar trend was observed as in the former season, where Sids 1 significantly surpassed the long spike varieties Sids 4, Sids 5, Sids 6, Sids 7, Sids 8 and Sids 9 by 27.29, 21.58, 17.67, 16.89, 14.41 and 24.27 %, respectively. It is worth noting that the 6 long spike varieties could be considered as one group in spikes / m^2 where no significant differences were detected among them in that season.

The combined analysis of the three seasons average indicated a similar trend as that observed in the second and third seasons. The results indicated that Sids 1 significantly surpassed the long spike varieties Sids 4, Sids 5, Sids 6, Sids 7, Sids 8 and Sids 9 in spikes / m^2 by 13.13, 13.80, 12.07, 8.09, 6.39 and 10.22 %, respectively. Some

significant differences are found among the long spike varieties where Sids 9 outnumbered the three varieties Sids 4, Sids 5 and Sids 6 significantly.

It could be concluded that the results of the three seasons of experimentation and their combined average indicated that the new long spike varieties are characterized by a fewer number of spikes / m^2 due to the very limited number of tillers.

Many investigators reported also marked differences among wheat varieties in number of spikes / m^2 **(El- Helaly, 1984; Mahmoud, 1988; Hayam Mahgoub, 1990; Rady and Abo El- Zahab, 1990; Shams El- Din and El- Habbak, 1992; Hifnawi, 1993; Abdin *et al.*, 1996; Khattab *et al.*, 1996; Abd El- Ghany, 1997; Abo- Warda, 1997, Ali. 1997 and Abd El- Majeed *et al.*, 1998).**

5.2. Effect of N level :

The results in Tables 11 and 12 showed that N application significantly affected spikes / m^2 in one season out of three as well as in the combined average of the 3 seasons.

In 1995/ 96 season, applying N at 30, 60, 90, 120 and 150 kg N/ fad insignificantly increased spikes/ m^2 over the check treatment by 3.94, 7.06, 10.39, 9.35 and 8.04 %, respectively. These increases, however, were below the level of significance.

In 1996/ 97 season, also some increases were observed due to applying N at 30 and 150 kg N/ fad over the check treatment, but the increases (2.81 and 1.37 %) were far below the level of significance.

In 1997/ 98 season, the increase in N application level induced marked and significant increases in spikes / m^2 . The application of 30, 60, 90, 120 and 150 kg N/fad significantly increased spikes / m^2 over the check treatment by 41.74, 47.07, 46.36, 61.55 and 39.88 %, respectively.

It is worth noting that the highest response to N was that of 120 kg N/ fad level. This marked response may be due to favourable environmental conditions in that season compared with the first and second seasons.

The combined analysis of the 3 seasons average indicated also a significant response of spikes / m^2 to N application.

Applying N at 30, 60, 90, 120 and 150 kg/ fad significantly increased spikes / m^2 over the check treatment by 14.30, 14.63, 16.93, 20.92 and 14.76 %, respectively. The 5 N application levels induced significant increases over the control without significant differences among them.

It could be concluded that, in general, N encouraged tillerage in wheat and this result was evident by combining the three seasons of experimentation.

Many investigators reported also that the increase in N level markedly increased spikes / m^2 of wheat (**El- Helaly, 1984; Hussein *et al.*, 1981b; Eman Sadek, 1985; Hayam Mahgoub, 1990; Peltonen, 1992; Shams El- Din and El- Habbak, 1992; shehab El- Din and Eissa, 1992; Shehab El- Din, 1993; Sulttan *et al.*, 1993; Eissa, 1996; Mady, 1996 and Abd El- Ghany, 1997**).

5.3. Interaction Effect :

The results presented in Tables 11 and 12 indicated that no significant effect was detected for variety x N level on spikes / m^2 in the three successive seasons. On the other hand, the combined data of the three seasons indicated a significant effect for variety x N level on spikes/ m^2. The significant interaction is evident where marked differences are observed among the tested varieties in their response to N.

It is clear that the highest value of spikes / m^2 was recorded at 30 kg N/ fad by Sids 7 (290.42); at 90 kg N/ fad by Sids 5 (269.58 and Sids 8 (292.92); and at 120 kg N/ fad by Sids 1 (312.92), Sids 4 (274.17), Sids 6 (282.50) and Sids 9 (288.75).

In general, the highest number of spikes / m^2 averaged over the 3 seasons was 312.92 which was recorded by Sids 1 supplied with 120 kg N/ fad., and the lowest number was recorded with untreated Sids 6, being 219.17.

The significant interaction between variety and N level on spikes/ m^2 was also reported by **El- Helaly (1984), Abd El- Ghany (1997) and Abo- Warda and Eman Sadek (1998).**

6. Spike length :

The results of the effect of variety and N level and their

Table (14): Effect of N levels on spike length of seven wheat varieties (combined analysis of 1995/ 96, 1996/ 97 and 1997/ 98 seasons).

N level kg / fed / Varieties	0	30	60	90	120	150	Mean
Sids 1	11.34	11.76	11.73	12.03	12.33	12.40	11.93
Sids 4	13.42	14.68	12.86	14.45	14.76	15.72	14.31
Sids 5	14.82	13.22	14.45	14.48	14.17	14.72	14.31
Sids 6	13.35	13.71	15.38	14.70	15.27	14.91	14.55
Sids 7	13.16	14.00	14.53	14.47	14.70	16.05	14.49
Sids 8	12.43	13.33	14.24	14.66	14.37	14.28	13.89
Sids 9	13.72	13.27	14.22	13.45	14.35	14.27	13.88
Mean	13.18	13.42	13.92	14.03	14.28	14.62	13.91
L.S.D 5%							
Varieties (V)	0.500						
Nitrogen (N)	0.503						
V x N	1.225						

6.1. Effect of Variety :

The tested varieties showed significant differences in the length of their spikes in the three successive seasons as well as their combined average.

In 1995/ 96 season, Sids 4 recorded the longest spikes followed by Sids 6, Sids 8 and Sids 7 without significant differences as one group. The shortest spikes were those of the commercial cultivar Sids 1 which was significantly inferior compared with the rest 6 varieties. Inbetween these two extremes, Sids 5 and Sids 9 are shown as a middle group. Significant differences were found between Sids 4 (16.33 cm) and Sids 1, Sids 5 and Sids 9.

In 1996/ 97 season, Sids 5 recorded the longest spikes followed by Sids 7, Sids 6, Sids 4, Sids 9 and Sids 8 without significant differences. On the other hand, Sids 1 produced the shortest spikes (12.04 cm) which were significantly inferior to the other 6 long spike varieties .

In 1997/ 98 season, Sids 7, Sids 6 and Sids 5 as one group recorded the longest spikes followed by Sids 4, Sids 9 and Sids 8 as a second group with significant differences between both groups . Sids 1 was also inferior in this trait with a spike length of 11.08 cm which was significantly shorter than the other 6 varieties .

The combined average showed a more clear illustration of the results. The longest spikes were those of Sids 6 (14.55 cm), followed

6.1. Effect of Variety :

The tested varieties showed significant differences in the length of their spikes in the three successive seasons as well as their combined average.

In 1995/ 96 season, Sids 4 recorded the longest spikes followed by Sids 6, Sids 8 and Sids 7 without significant differences as one group. The shortest spikes were those of the commercial cultivar Sids 1 which was significantly inferior compared with the rest 6 varieties. Inbetween these two extremes, Sids 5 and Sids 9 are shown as a middle group. Significant differences were found between Sids 4 (16.33 cm) and Sids 1, Sids 5 and Sids 9.

In 1996/ 97 season, Sids 5 recorded the longest spikes followed by Sids 7, Sids 6, Sids 4, Sids 9 and Sids 8 without significant differences. On the other hand, Sids 1 produced the shortest spikes (12.04 cm) which were significantly inferior to the other 6 long spike varieties .

In 1997/ 98 season, Sids 7, Sids 6 and Sids 5 as one group recorded the longest spikes followed by Sids 4, Sids 9 and Sids 8 as a second group with significant differences between both groups . Sids 1 was also inferior in this trait with a spike length of 11.08 cm which was significantly shorter than the other 6 varieties .

The combined average showed a more clear illustration of the results. The longest spikes were those of Sids 6 (14.55 cm), followed

by Sids 7 (14.49 cm), Sids 4 (14.31 cm) and Sids 5 (14.31 cm) as one group.

The shortest spikes were those of the commercial cultivar Sids 1 (11.93 cm) which was significantly inferior than the 6 long spike varieties. Sids 8 (13.89 cm) and Sids 9 (13.88 cm), are inbetween these two extremes as one group. The differences between the 3 groups were almost significant .

It could be concluded that the long spike varieties surpassed Sids 1 variety in this character. The differences in spike length are mainly due to genetical differences in the tested varieties .

The results reported by **Eissa (1979), Saleh (1981), Massoud (1986), Abo- Warda (1989), Hayam Mahgoub (1990), Shams El-Din and El- Habbak (1992), Hifnawi (1993), Omar (1993), Ibrahim *et al.* (1995), Mady (1996), Abd El- Ghany (1997) and Ali (1997),** indicated great variations in spike length of the different wheat varieties .

6.2. Effect of N level :

The results in Tables 13 and 14 showed that the increase in N level induced increases in spike length, these increases were evident in the third season, i.e., 1997/ 98, as well as in the three seasons average, where significant differences were observed.

Applying N at 30, 60, 90, 120 and 150 kg N/ fad increased spike length over the check treatment by: 1.15, 1.55, 4.51, 4.78 and 7.82 %, respectively in 1995/ 96 season, being 1.81, 1.66, 3.17, 3.78 and

2.57 %, respectively in 1996/ 97 season. All these increases were not significant.

In 1997/ 98 season, the application of 30, 60, 90, 120 and 150 kg N/fad induced increases in spike length over the control level by 2.88, 15.36, 12.83, 18.24 and 24.61%, respectively. The significant increases were induced by applying 60 kg N/ fad upwards.

The combined analysis of the three seasons average indicated a significant effect of N on spike length when it was applied at 60 kg/ fad or more. The results showed that applying 30, 60, 90, 120 and 150 kg N/ fad increased spike length over the control by 1.82, 5.61, 6.45, 8.35 and 10.93%, respectively.

It could be concluded that N is an essential element for cereals and a good supply of N is necessary for building longer spikes. This result is mainly due to the effect of N on the vegetative growth of wheat plans and photosynthetic activity.

The results obtained **by El- Helaly (1984), El- Sayed *et al.* (1984), Saleh *et al.* (1985), Eissa (1990), Hayam Mahgoub (1990), Basillious and Abd El- Aleem (1992), Shams El- Din and El-Habbak (1992), Abd El- Gawad *et al.* (1993b), Fayed *et al.* (1993), Abo- Shetaia and Abd El- Gawad (1995), Eissa (1996) and Abd El-Ghany (1997)** indicated that N application significantly increased spike length.

6.3. Interaction Effect :

The effect of the interaction between varieties and N levels on spike length was significant in 1995/ 96 and 1996/ 97 seasons as well as the three seasons average (Tables 13 and 14).

In 1995/ 96 season, wheat varieties markedly varied in their response to N. It was observed that the highest response value of this trait was recorded at 150 kg N/ fad by Sids 1 (13.55 cm), Sids 4 (17.75 cm), Sids 5 (15.85 cm), Sids 6 (16.88 cm) and Sids 7 (17.40 cm), while the highest value was recorded at 90 kg N/ fad by Sids 8 (16.55 cm) and at 120 kg N/ fad by Sids 9 (15.85 cm).

Also, in 1996/ 97 season, the interaction between varieties and N levels significantly affected spike length. The highest value was recorded at 150 kg N/ fad by Sids 7 (15.05 cm) at 120 kg N/ fad by Sids 8 (14.05 cm), at 90 kg N/ fad by Sids 5 (15.55 cm) and Sids 8 (14.05 cm), at 60 kg N/ fad by Sids 6 (15.50 cm) and Sids 8 (14.05 cm), and at 30 kg N/ fad by Sids 1 (13.86 cm) and Sids 4 (16.00 cm).

This quite different response of the tested varieties to N indicates clearly the significant interaction effect.

The combined analysis of the three seasons average indicated a significant variety x N level interaction . The highest value was recorded at the highest N level (150 kg N/ fad) by four varieties, i.e., Sids 1 (12.40 cm), Sids 4 (15.72 cm), Sids 7 (16.05 cm) and Sids 9 (14.27 cm); at 90 kg N/ fad by Sids 8 (14.66 cm); at 60 kg N/ fad by Sids 6 ; and at the check treatment by Sids 5 (14.82 cm).

In general, the highest value of spike length was 16.05 cm which was recorded by Sids 7 supplied with 150 kg N/ fad, and the lowest value was recorded with unfertilized Sids 1 plants (11.34 cm).

The significant effect of the interaction between varieties and N levels was also reported by **Abd El- Aleem (1980).**

7. Number of Grains per Spike :

The results in Tables 15 and 16 showed the effect of variety, N level and their interaction on number of kernels/ spike in the three successive seasons as well as their combined average.

7.1. Effect of Variety :

The results indicated significant differences among the tested varieties in number of kernels/ spike in two seasons out of three as well as in their combined average.

In 1995/ 96 season, Sids 8, Sids 6, Sids 9 and Sids 5 showed higher number of kernels/ spike which was significantly higher than that of Sids 1 and Sids 7, while Sids 4 was inbetween these two groups.

Sids 8 recorded the highest number of kernels/ spike, and significantly surpassed that of Sids 4, Sids 7 and Sids 1. On the other hand, Sids 1 recorded the lowest number which was significantly lower than Sids 5, Sids 6, Sids 8 and Sids 9.

The 7 varieties could be arranged in a descending order in number of kernels/ spike as follows: Sids 8 (80.84), Sids 6 (80.68), Sids 9 (79.64), Sids 5 (76.77), Sids 4 (72.32), Sids 7 (68.88) and Sids 1 (66.32).

In 1996/ 97 season, no significant differences were detected among the tested varieties and the arrangement of the 7 varieties was as follows : Sids 5 (79.39), Sids 8 (76.89), Sids 9 (75.85), Sids 7 (74.24), Sids 4 (71.99), Sids 6 (71.82) and Sids 1 (68.88). The results

Table (15): Effect of nitrogen levels on number of grains/ spike of seven wheat varieties in the three successive seasons (1995/ 96/ 1996/ 97 and 1997/ 98).

	1995/ 96							1996/ 97							1997/ 98						
N level Kg / fed / Varieties	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean
Sids 1	53.80	64.55	69.38	69.55	63.30	77.35	66.32	78.50	78.30	66.65	67.10	59.70	63.00	68.88	48.55	48.60	54.90	73.25	70.15	71.80	61.21
Sids 4	70.80	75.18	65.93	57.80	73.85	90.35	72.32	55.15	92.10	98.72	54.70	58.55	72.71	71.99	53.30	49.88	52.45	52.65	53.23	58.90	53.40
Sids 5	86.80	80.20	71.15	75.70	76.08	70.70	76.77	83.50	61.10	79.15	94.35	74.95	83.30	79.39	88.20	64.55	80.45	76.83	84.90	79.53	79.08
Sids 6	69.85	76.95	86.10	82.10	84.90	84.15	80.68	71.93	68.66	74.00	73.95	84.50	57.85	71.82	67.55	55.00	68.75	77.35	78.40	75.25	70.38
Sids 7	76.50	69.70	79.00	60.05	65.65	62.40	68.88	56.06	80.90	72.35	73.55	78.00	84.55	74.24	62.50	63.90	67.40	69.25	78.80	91.28	72.19
Sids 8	77.80	84.68	86.50	81.08	77.90	77.10	80.84	75.75	70.46	81.30	80.30	81.00	72.55	76.89	60.18	62.35	83.28	70.20	84.50	74.53	72.50
Sids 9	72.05	88.55	87.58	83.60	86.30	59.75	79.64	89.95	68.95	75.45	63.83	87.15	69.80	75.85	61.25	63.15	91.68	69.40	80.20	91.00	76.11
Mean	72.51	77.11	77.95	72.84	75.43	74.54	75.06	72.98	74.35	78.23	72.54	74.84	71.97	74.15	63.08	58.20	71.27	69.85	75.74	77.47	69.27
L.S.D 5%																					
Varieties (V)	7.44							N.S							8.87						
Nitrogen (N)	N.S							N.S							6.55						
V x N	18.22							25.56							N.S						

Table (16): Effect of N levels on number of grains/ spike of seven wheat varieties (combined analysis of 1995/ 96, 1996/ 97 and 1997/ 98 seasons).

N level kg / fed. / Varieties	0	30	60	90	120	150	Mean
Sids 1	60.28	63.82	63.64	69.97	64.38	70.72	65.47
Sids 4	59.75	72.38	72.36	55.05	61.88	73.99	65.90
Sids 5	86.17	68.62	76.92	82.29	78.64	77.84	78.41
Sids 6	69.78	66.87	76.28	77.80	82.60	72.42	74.29
Sids 7	65.02	71.50	72.92	67.62	74.15	79.41	71.77
Sids 8	71.24	72.50	83.69	77.19	81.13	74.73	76.75
Sids 9	74.42	73.55	84.90	72.28	84.55	73.52	77.20
Mean	69.52	69.89	75.82	71.74	75.33	74.66	72.83
L.S.D 5%							
Varieties (V)	5.191						
Nitrogen (N)	5.049						
V x N	N.S.						

indicated the superiority of Sids 5 (79.39) as against Sids 1 (68.88), but this difference was not significant .

In 1997/ 98 season, Sids 5 was at the top with 79.08 kernels/ spike, followed by Sids 9 (76.11), Sids 8 (72.50), Sids 7 (72.19) and Sids 6 (70.38) without significant differences. Sids 1 is followed with 61.21 kernels which was significantly inferior compared with the former 5 varieties .

The lowest number of kernels was that recorded by Sids 4, being 53.40 which was inferior compared with all varieties, probably due to unfertility of some flowers.

Combining the three seasons showed that the 7 varieties could be classified into 3 groups :

- The first includes Sids 5 (78.41), Sids 9 (77.20) and Sids 8 (76.75).
- The second group includes Sids 6 (74.29) and Sids 7 (71.77)
- The third group includes Sids 4 (65.90) and Sids 1 (65.47) which were significantly inferior compared with the other 5 varieties .

It could be concluded that Sids 5, Sids 9, Sids 8 and Sids 6 are superior varieties in number of kernels/ spike and this character is considered as an important yield component character among those governing grain yield of wheat.

Similar results were also obtained by **Eissa (1979), El- Sayed *et al.* (1984), Massoud (1986), Mahmoud (1988), Rady and Abo- El-Zahab (1990), Ibrahim and Abd El- Aal (1991), Shams El- Din and El- Habbak (1992), Awasthi and Surajbhan (1993), Hifnawi (1993),**

Omar (1993), Tomar *et al.* (1993), Shah *et al.* (1994), Sulttan *et al.* (1994), Mady (1996), Abd El- Ghany (1997), Abo- Warda (1997), Ali (1997) and Abd El- Majeed *et al.* (1998) who found that wheat varieties markedly varied in number of grains per ear.

7.2. Effect of N level :

The results presented in Tables 15 and 16 showed that N application significantly affected number of grains/ spike in one season out of three. Also, the effect of N on number of grains/ spike in the combined average was significant .

In 1995/ 96 season, applying N at 30, 60, 90, 120 and 150 kg/ fad , insignificantly increased number of kernels/ spike by 6.34, 7.50, 0.46, 4.03, and 2.80%, respectively over the control. However, these increases were below the level of significance.

In 1996/ 97 season, applying 30, 60, and 150 kg N/ fad, insignificantly increased number of kernels/ ear by 1.88, 7.19, and 2.55 % , respectively over the check treatment. The other N levels, i.e., 90 and 150 kg N/ fad did not induce any apparent difference in kernels number when compared with the check treatment .

In 1997/ 98 season, the effect of N on this trait reached the level of significance. Applying N at 60, 90, 120 and 150 kg/ fad increased kernels number by 12.99, 10.73, 20.01 and 22.81 % , respectively, compared with the check treatment. The significant increases were observed when N was applied at 120 and 150 kg/ fad levels.

Combining the three seasons showed a more clear effect for N on this trait, where the effect of N was significant . Applying N at 30, 60, 90, 120 and 150 kg/ fad increased kernels number by 0.53, 9.06, 3.19, 8.36 and 7.39%, respectively over the control.

The effect of N was more evident when it was applied at 60 kg/ fad upwards. The N levels 60, 120 and 150 kg/ fad induced significant increases in this trait. The encourageing effect of N on kernels number is mainly due to its effect on the vegetative growth of wheat and photosynthetic activity as well as extending the grain filling period.

The effect of N on this trait was not so clear in some seasons probably due to high percentage of infertile spikelets in long spike wheat varieties .

The positive effects of N on number of kernels/ spike were reported by **Eissa (1979), El- Sayed *et al.* (1984), Hussein *et al.* (1984b), Eman Sadek (1985), Saleh *et al.* (1985), Ellen (1990), Basillious and Abdel- Aleem (1992), Peltonen (1992), Shams El-Din and El- Habbak (1992), Shehab El- Din and Eissa (1992), Fayed *et al.* (1993), El- Zein (1994), Sharshar *et al.* (1995), Eissa (1996) and Mady (1996).**

7.3. Interaction Effect :

The results in Tables 13 and 14 indicated that the effect of the interaction variety x N level significantly affected number of kernels/ spike in 1995/ 96 and 1996/ 97 seasons.

In 1995/ 96 season, the interaction between varieties and N levels significantly affected this trait. The results in Table 11 showed that the response of the 7 varieties to N level varied markedly. It was observed that the maximum number of kernels was recorded under 150 kg N/ fad level by Sids 1 and Sids 4; and under 60 kg N/ fad by Sids 6, Sids 7 and Sids 8. On the other hand, Sids 5 recorded the highest number of kernels at the check treatment while Sids 9 recorded the highest number at 30 kg N/ fad.

In 1996/ 97 season, the interaction variety x N level significantly affected this trait. The tested varieties showed great differences in their response to N. The highest number of kernels/ ear was recorded at 150 kg N/ fad by Sids 7, at 120 kg N/ fad by Sids 6, at 90 kg N/ fad by Sids 5, at 60 kg N/ fad by Sids 4 and Sids 8 and at the control treatment by Sids 9.

The combined average of the three seasons indicated no significant effect of the interaction on this trait.

In general, the highest value of kernels/ ear was recorded by Sids 5 plants under the check treatment, being 86.17 kernels/ ear, and the minimum number was 59.75 which was recorded by untreated Sids 4 plants.

The results reported by **Eissa (1979), Abd El- Gawad *et al.* (1986), Abd El- Ghany (1997)** indicated a significant effect between variety and N level on number of kernels/ spike. On the other hand, **Abo Warda and Eman Sadek (1998)** found no significant effect for variety x N level on this trait.

8- Weight of 1000 kernels (g) :

The results of the effect of variety, N level and their interaction on 1000- kernel weight in the three successive seasons and their combined average are given in Tables 17 and 18.

8.1. Effect of Variety :

The results indicated significant differences in 1000- kernel weight in the three successive seasons as well as in their combined average.

In 1995/ 96 season, the highest grain index was 60.06 g which was recorded by Sids 6, followed by Sids 7 (59.34 g) and Sids 4 (59.12 g). The lowest grain index was 54.24 g recorded with Sids 1, which was significantly inferior compared with Sids 4, Sids 6 and Sids 7. Significant differences were observed between Sids 6 and each of Sids 1, Sids 5 and Sids 8.

In 1996/ 97 season, Sids 4 was at the top with an average grain index of 65.71 g which significantly surpassed the other six varieties. Sids 1 recorded the lowest grain index (51.18 g) which was significantly inferior compared with Sids 4, Sids 6, Sids 7, Sids 8 and Sids 9.

A group including Sids 5, Sids 7, Sids 8 and Sids 9 is formed showing no significant differences among them, with a grain index between 54.90 and 58.53 g. Sids 6, with an average of 60.34 g, is considered inbetween Sids 4 and the former group, was significantly higher than Sids 5.

Table (17): Effect of nitrogen levels on 1000-grain weight (g) of seven wheat varieties in the three successive seasons (1995/ 96/ 1996/ 97 and 1997/ 98).

	1995/ 96							1996/ 97							1997/ 98						
N level kg / fed / Varieties	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean
Sids 1	53.46	55.00	51.81	55.41	58.25	51.52	54.24	46.25	57.87	57.30	44.81	49.27	51.59	51.18	50.39	51.50	49.80	47.08	48.85	51.98	49.93
Sids 4	59.91	59.76	56.75	58.94	56.79	62.58	59.12	80.25	61.09	52.70	70.27	64.89	65.09	65.71	53.25	57.08	57.90	58.18	58.35	58.23	57.16
Sids 5	57.50	56.79	54.02	64.02	53.12	55.42	56.81	53.83	59.73	55.34	51.67	55.27	53.59	54.90	53.98	53.60	53.36	55.65	52.83	52.65	53.68
Sids 6	58.92	61.04	60.66	60.56	63.73	55.44	60.06	62.07	62.11	60.14	58.76	58.31	60.65	60.34	56.03	56.25	57.78	56.10	59.55	59.65	57.56
Sids 7	59.63	56.83	58.28	60.73	58.92	61.66	59.34	58.53	57.94	55.24	60.63	58.88	59.98	58.53	59.38	57.33	53.73	55.98	56.60	59.63	57.11
Sids 8	55.75	57.70	54.60	53.91	55.30	50.57	54.64	55.49	57.83	59.34	55.25	57.71	58.54	57.36	52.68	60.10	55.93	54.48	56.55	56.75	56.08
Sids 9	52.67	55.79	57.56	59.60	57.05	61.21	57.31	57.96	49.69	57.86	62.12	56.31	57.63	56.93	52.83	53.55	55.65	58.50	56.15	54.10	55.13
Mean	56.83	57.56	56.24	59.02	57.59	56.91	57.36	59.20	58.04	56.84	57.64	57.23	58.15	57.85	54.07	55.63	54.88	55.14	55.55	56.14	55.24
L.S.D 5%																					
Varieties (V)	3.10							4.40							2.57						
Nitrogen (N)	N.S.							N.S.							N.S.						
V x N	N.S.							10.79							N.S.						

In 1997/ 98 season, the highest 1000- kernel weight was recorded with Sids 6, being 57.56 g which was followed by Sids 4 (57.16 g), Sids 7 (57.11 g), Sids 8 (56.08 g) and Sids 9 (55.13 g) without significant differences . The lowest grain index was 49.93 g which was recorded by the commercial variety Sids 1 being significantly inferior compared with the six long spike varieties . Between these two extremes, Sids 5 is situated with an average of 59.68 g which was inferior compared with Sids 4, Sids 6, Sids 7 and Sids 8.

The combined average of the three seasons is a good indication of grain index of the tested varieties. The results showed that Sids 4, with an average of 60.67 g was at the top in grain index and is followed by Sids 6 (59.32 g) without significant difference between them.

The lowest grain index was 51.78 g which was recorded with Sids 1, being significantly inferior compared with the other 6 varieties. Sids 7, Sids 9, Sids 8 and Sids 5 are arranged in a descending order between the two extremes, with a grain index of 58.33, 56.46, 56.03 and 55.13 g, respectively with some significant differences among them.

It could be concluded that the long spike wheat varieties, in general, and Sids 4 and Sids 6, in particular, were superior ingrain index compared with the commercial cultivar Sids 1.

The differences among wheat varieties in grain index were also reported by **Dawood (1979), Eissa (1979), El- Sayed *et al.* (1984), Saleh *et al.* (1985), Abd- El- Aleem (1987), Abo- Warda (1989), Ibrahim and Abdel- Aal (1991), Shams El- Din and El- Habbak**

(1992), Ibrahim *et al.* (1995), Mady (1996), Abd El- Ghany (1997) and Abd El- Majeed *et al.* (1998).

8.2. Effect of N level :

The results in Tables 17 and 18 showed that the increase in N level had no significant effect on 1000- kernel weight in the three successive seasons as well as in their combined average.

The results indicated no any clear trend for the effect of N level on this trait. It was observed that the highest grain index was 59.02, 59.20 and 56.14 and 57.79 g in 1995/ 96, 1996/ 97 , 1997/ 98 and the combined average, respectively which was recorded by applying 90, zero, 150 and 90 kg N/ fad, respectively. These results indicate no any specific trend for N on this trait.

The combined average indicated that the application of 30, 90, 120 and 150 kg N/ fad increased grain index by 0.65, 1.01, 0.16 and 0.65 %, respectively. These very slight increases indicate clearly that this character did not show any response to N application. Similar results were also obtained by **Gheith *et al.* (1989) Basillious and Abd- El- Aleem (1992), Shehab El- Din and Eissa (1992), Shalaby *et al.* (1993) and Shehab El- Din (1993).** On the other hand, **Eissa (1979), El Helaly (1984), El- Sayed *et al.* (1984), Hussein *et al.* (1984b), Eman Sadek (1985), Abd- El- Gawad *et al.* (1993b), Fayed *et al.* (1993), Abo- Shetaia and Abd El- Gawad (1995), and Abd El- Ghany (1997)** reported that the increase in N level significantly increased 1000- kernel weight.

However, an opposite trend was reported by **Eissa (1990), Ellen (1990), Al-Abdulsalam *et al.* (1993) and Mady (1996)** who found that the increase in N level reduced 1000- kernel weight.

8.3. Interaction Effect :

The results in Tables 17 and 18 showed that in one season only out of three, a significant interaction between variety and N level was detected on grain index. The three seasons averaged indicated no significant effect of the interaction on this trait .

The results of 1996/ 97 season showed that 1000- kernel weight was significantly influenced by variety x N level. In that season, the tested varieties showed a quite different response to N level. The highest grain index was recorded at the check treatment by Sids 4; at 30 kg N/ fad by Sids 1, Sids 5 and Sids 6; at 60 kg N/ fad by Sids 8 and at 90 kg N/ fad by Sids 7 and Sids 9.

In 1996/ 97 season, the highest 1000- kernel weight was 80.25 g which was recorded by untreated Sids 4 plants, and the lowest grain index was obtained by Sids 1 supplied with 90 kg N/ fad, being 44.81 g.

The three seasons average showed a similar trend where the highest grain index was also recorded by unfertilized Sids 4 plants, being 64.47 g and the lowest 1000- kernel weight was 49.10 g which was recorded by Sids 1 supplied with 90 kg N/ fad .

The results reported by **Eissa (1979) and El- Helaly (1984)** indicated a significant effect of the interaction between variety and N

level on 1000- kernel weight. On the other hand, **Abo- Warda and Eman Sadek (1998)** showed that 1000- kernel weight was not significantly affected by variety x N level.

9. Biological Yield (t/ fad):

The results of the effects of variety and N level as well as their interaction on biological yield in the three successive seasons and their combined average are shown in Tables 19 and 20.

9.1. Effect of Variety :

The results in Tables 19 and 20 showed that varieties markedly varied in their biological yield in 1995/ 96, 1996/ 97 and 1997/ 98 as well as in the combined average.

In 1995/ 96 season, Sids 4, Sids 5, Sids 6 and Sids 1 recorded higher values of biological yield without significant differences among them. On the other hand, Sids7, Sids 8 and Sids 9 recorded lower biological yield as one group without significant differences.

In 1996/ 97 season, Sids 1 was at the top with the highest biological yield which was followed by Sids 8, Sids 5 without significant differences. Sids 4 was the lowest variety in biological yield which was significantly inferior compared with the other 6 varieties . The rest varieties, i.e., Sids 6, Sids 8 and Sids 9 did not significantly differ in biological yield as one group which was inbetween the two extremes.

In 1997/ 98 season, Sids 1 was the highest variety in biological yield which significantly surpassed the 6 long spike varieties. Also,

Table (19): Effect of nitrogen levels on biological yield (ton/ fad) of seven wheat varieties in the three successive seasons (1995/ 96/ 1996/ 97 and 1997/ 98).

	1995/ 96							1996/ 97							1997/ 98						
N level kg / fad / Varieties	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean
Sids 1	6.777	7.453	9.649	11.116	10.095	11.097	9.364	7.172	7.470	8.945	9.177	8.164	9.241	8.361	3.375	6.250	8.250	9.625	9.375	10.125	7.833
Sids 4	6.512	8.736	12.406	11.875	10.299	11.408	10.206	2.606	6.736	6.239	8.707	6.040	7.650	6.329	1.750	4.375	6.250	7.250	7.125	7.250	5.667
Sids 5	7.563	9.577	10.313	11.250	8.108	10.645	9.576	5.353	8.330	8.379	9.647	7.708	8.688	8.017	1.750	6.625	7.000	9.375	7.500	8.625	6.813
Sids 6	6.339	8.938	10.073	11.904	8.989	10.125	9.394	3.524	7.630	8.625	10.115	7.322	8.892	7.684	2.000	6.000	7.125	8.875	7.750	8.125	6.646
Sids 7	5.464	8.565	8.614	9.746	8.500	9.311	8.366	3.166	8.812	7.841	8.850	7.879	8.258	7.468	1.750	6.125	6.500	7.375	8.125	7.625	6.250
Sids 8	6.672	9.609	8.320	8.664	9.809	9.096	8.695	5.403	7.759	7.723	9.492	8.758	9.629	8.127	1.350	6.125	6.250	7.875	8.000	8.125	6.288
Sids 9	7.555	8.004	8.729	10.063	10.398	9.064	8.969	5.773	7.250	7.153	8.705	7.743	9.516	7.690	2.950	5.500	6.875	7.750	7.625	8.750	6.575
Mean	6.697	8.697	9.729	10.660	9.456	10.106	9.224	4.714	7.712	7.844	9.242	7.659	8.839	7.668	2.132	5.857	6.893	8.304	7.929	8.375	6.582
L.S.D 5%																					
Varieties (V)				0.757							0.673							0.446			
Nitrogen (N)				1.639							0.668							0.903			
V x N				1.854							1.650							1.094			

Table (20): Effect of N levels on biological yield (ton/ fad) of seven wheat varieties (combined analysis of 1995/ 96, 1996/ 97 and 1997/ 98 seasons).

N level kg / fad / Varieties	0	30	60	90	120	150	Mean
Sids 1	5.775	7.058	8.948	9.973	9.211	10.154	8.520
Sids 4	3.622	6.615	8.298	9.277	7.821	8.769	7.401
Sids 5	4.889	8.177	8.564	10.090	7.772	9.319	8.135
Sids 6	3.954	7.522	8.608	10.298	8.020	9.047	7.908
Sids 7	3.460	7.834	7.652	8.657	8.168	8.398	7.361
Sids 8	4.475	7.831	7.431	8.677	8.856	8.950	7.703
Sids 9	5.426	6.918	7.586	8.839	8.588	9.110	7.744
Mean	4.514	7.422	8.155	9.402	8.348	9.107	7.825
L.S.D 5%							
Varieties (V)	0.369						
Nitrogen (N)	0.628						
V x N	0.904						

Sids 4 was the worst variety which was significantly inferior compared with the other 6 varieties . The other 5 varieties are arranged in a descending order as follows : Sids 5, Sids 6, Sids 9, Sids 8 and Sids 7 with some significant differences among them.

The three seasons average indicates a better illustration for the evaluation of the tested varieties. The results showed that Sids 1 was the highest yielder which was significantly superior compared with the 6 long spike varieties. Sids 1 and Sids 5 were followed by Sids 6 which surpassed significantly Sids 4 and Sids 7. The lowest biological yield was recorded by Sids 7 which was significantly lower compared with Sids 1, Sids 5 and Sids 6.

It could be concluded that the commercial cultivar Sids 1 is the highest yielder in biological yield compared with the long spike varieties which possessed some differences in this character .

The present results are mainly due to the genetical constitution of the tested varieties. Results reported by **Ibrahim and Abdel- Aal (1991), Massoud (1995), Abd- El- Ghany (1997), and Ali (1997)** showed marked differences in the biological yield of the evaluated wheat varieties.

9.2. Effect of N level :

The results presented in Tables 19 and 20 showed that N application significantly increased biological yield throughout the three experimental seasons as well as in the combined three seasons average.

In 1995/ 96 season, applying N at 30, 60, 90, 120 and 150 kg/ fad significantly increased biological yield by 29.86, 45.27, 59.18, 41.20 and 50.90%, respectively. Also, in 1996/ 97 season, the same N levels significantly increased biological yield by 63.60, 66.40, 96.05, 62.47 and 87.50%, respectively. Similarly, in 1997/ 98 season, significant increases of 174.72, 223.31, 289.49, 271.90 and 292.82 %, were obtained over the control treatment as a result of applying 30, 60, 90, 120 and 150 kg N/ fad, respectively.

It was generally observed that the highest biological yield in the three seasons was obtained by applying 90 kg N/ fad., and a reduction in the biological yield resulted from applying the higher N levels, i.e., 120 and 150 kg N/ fad. This result indicates the negative effects of the excessive N levels on the biological yield.

The three seasons average in Table 20 showed that the application of 30, 60, 90, 120 and 150 kg N/ fad significantly increased biological yield by 64.42, 80.66, 100.29, 84.94 and 101.75 %, respectively over the check treatment .

The highest biological yield was obtained by applying 90 kg N/ fad, and the further increase of 120 and 150 kg N reduced the yield showing that the optimum level was 90 kg N/ fad.

It could be concluded that excessive N levels over 90 kg N/ fad negatively affected biological yield.

The increase in biological yield resulting from N application is mainly due to the positive effects of N on vegetative growth and grain

formation, and consequently, the role of N as the most essential nutritive element for cereals is clearly demonstrated.

Similar results were also obtained by **Basillious and Mosaad (1988), Abd El- Gawad *et al.* (1993b), and Abdel- Ghany (1997).**

9.3. Interaction Effects :

The results in Tables 19 and 20 showed that the effect of the interaction between varieties and N levels significantly affected biological yield in the three successive seasons and their combined average as well.

In 1995/ 96 season, the results indicated that the highest biological yield was recorded by applying 60 kg N/ fad with Sids 4, by applying 90 kg N/ fad with Sids 1, Sids 5, Sids 6 and Sids 7, whereas by Sids 8 and Sids 9 the highest biological yield was obtained at 120 kg N /fad.

In 1996/ 97 season, similarly, the highest biological yield was recorded at 90 kg N/ fad by Sids 4, Sids 5, Sids 6 and Sids 7, whereas the maximum yield was obtained at 150 kg / fad N level by Sids 1, Sids 8 and Sids 9.

In 1997/ 98 season, also the tested varieties responded differently to N level, and the highest biological yield was obtained at 90 kg N level by Sids 4, Sids 5, Sids 6 at 120 kg N level by Sids 7 and by 150 kg N level with Sids 1, Sids 8 and Sids 9.

Also, the combined average of the three experimental seasons indicated that the highest response to N was at 90 kg/ fad level by Sids

4, Sids 5, Sids 6 and Sids 7. Whereas by Sids 1, Sids 8 and Sids 9 the highest response was recorded at 150 kg N/ fad where the maximum biological yields were recorded.

The present results indicate the different response of the examined varieties to N application.

10. Grain Yield (kg/ fad) :

The results of the effect of variety , N level and their interaction on grain yield in the three successive seasons and their combined average are presented in Tables 21 and 22 .

10.1. Effect of Variety :

The results showed that significant differences were found in the grain yield/ fad of the evaluated varieties in the three seasons of experimentation as well as their combined average. In 1995/ 96 season, 5 varieties could be considered as one group showing no significant differences . Sids 5 was at the top with 3002 kg/ fad (20.02 ardab/ fad), followed by Sids 9 with 2978 kg/ fad (19.86 ardab/ fad), Sids 8 with 2825 kg/ fad (18.84 ardab/ fad), Sids 6 with 2810 kg/ fad (18.74 ardab/ fad), and Sids 1 with 2775 kg/ fad (18.50 ardab/ fad).

The lowest grain yield was obtained by Sids 4, being 2627 kg/ fad (17.52 ardab/ fad), and Sids 7 with 2655 kg/ fad (17.71 ardab/ fad).

The significant differences in grain yield were found only between Sids 5 and each of Sids 4 and Sids 7; and between Sids 9 and each of Sids 4 and Sids 7.

Table (21): Effect of nitrogen levels on grain yield (kg/ fad) of seven wheat varieties in the three successive seasons (1995/ 96/ 1996/ 97 and 1997/ 98).

	1995/ 96							1996/ 97							1997/ 98						
N level Kg / fad / Varieties	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean
Sids 1	2236.3	2385.0	2991.3	3112.5	2927.5	2996.3	2774.8	2462.5	2465.0	2706.3	2775.0	2367.5	2587.5	2560.6	1150.0	2032.5	2548.8	2737.5	2605.0	2787.5	2310.2
Sids 4	2083.8	2358.8	2853.3	2612.5	2883.8	2966.3	2626.4	860.0	1751.3	1372.5	2000.5	1691.3	1912.5	1598.3	568.8	1180.0	1365.0	1763.8	2016.3	1825.0	1453.1
Sids 5	2268.8	2968.8	3300.0	3150.0	2918.8	3406.3	3002.1	1552.5	2582.5	2765.0	2797.5	2928.8	2780.0	2567.7	530.0	2106.3	2296.3	2795.0	2790.0	2543.8	2176.0
Sids 6	1965.0	2681.3	2921.3	3095.0	3056.3	3138.8	2809.6	1092.5	2212.5	2415.0	2630.0	2567.5	2667.5	2264.2	650.0	1710.0	2272.5	2435.0	2618.8	2433.8	2020.0
Sids 7	1803.3	2483.8	2928.8	2923.8	2720.0	3072.5	2655.3	1045.0	2467.5	2587.5	2655.0	2600.0	2725.0	2346.7	586.3	1745.0	2177.5	2210.0	2545.0	2478.8	1957.1
Sids 8	2135.0	2978.8	2828.8	2772.5	3138.8	3092.5	2824.4	1675.0	2250.0	2548.8	2942.5	2802.5	3177.5	2566.0	430.0	1937.5	2161.3	2500.0	2593.8	2740.0	2060.4
Sids 9	2568.8	2801.3	3055.0	3018.8	3431.3	2991.3	2977.7	1905.0	2465.0	2575.0	2872.5	2632.5	3045.0	2582.5	931.0	1915.0	2461.3	2560.0	2677.5	2888.8	2238.9
Mean	2151.5	2665.4	2982.6	2955.0	3010.9	3094.8	2810.0	1513.2	2313.4	2424.3	2667.9	2512.9	2699.3	2355.1	692.3	1803.8	2183.2	2428.8	2549.5	2528.2	2030.9
L.S.D 5%																					
Varieties (V)	236.31							207.27							137.87						
Nitrogen (N)	474.37							186.15							274.28						
V x N	N.S.							507.71							337.70						

Table (22): Effect of N levels on grain yield (kg/ fad) of seven wheat varieties (combined analysis of 1995/ 96, 1996/ 97 and 1997/ 98 seasons.

N level kg / fad / Varieties	0	30	60	90	120	150	Mean
Sids 1	1949.6	2294.2	2748.8	2875.0	2633.3	2790.4	2548.5
Sids 4	1170.8	1763.3	1863.6	2126.3	2197.1	2234.6	1892.6
Sids 5	1450.4	2552.5	2787.1	2914.2	2879.2	2910.0	2582.2
Sids 6	1235.8	2201.3	2536.3	2720.0	2747.5	2746.7	2364.6
Sids 7	1144.8	2232.1	2564.6	2596.3	2621.7	2758.8	2319.7
Sids 8	1413.3	2388.8	2512.9	2738.3	2845.0	3003.3	2483.6
Sids 9	1801.6	2393.8	2697.1	2817.1	2913.8	2975.0	2599.7
Mean	1452.3	2260.8	2530.0	2683.9	2691.1	2774.1	2398.7
L.S.D 5%							
Varieties (V)	114.410						
Nitrogen (N)	182.950						
V x N	280.250						

In 1996/ 97 season, the tested varieties could be arranged into 3 distinct groups as follows:

- Four higher yielding varieties, i.e., Sids 9, Sids 5, Sids 8 and Sids 1 with a grain yield of 2583, 2568, 2566 and 2561 kg/ fad (17.23, 17.13, 17.12 and 17.08 ardab/ fad).
- Two moderate yielding varieties, i.e., Sids 7 and Sids 6 with 2347 kg/ fad (15.13 ardab/ fad) and 2265 kg/ fad (15.65 ardab/ fad).
- The worst variety Sids 4 with an inferior yield of 1598 kg/ fad (10.66 ardab/ fad.).

Significant differences were found between these three distinct groups.

In 1997/ 98 season, a different arrangement was observed where the commercial cultivar Sids 1 produced the highest grain yield, being 2310 kg/ fad (15.41 ardab/ fad) followed by Sids 9 with 2239 kg/ fad (14.93 ardab/ fad), and Sids 5 with 2177 kg/ fad (14.52 ardab/ fad) without significant differences among these 3 varieties.

The worst variety was also Sids 4 with the lowest grain yield of 1454 kg/ fad (9.69 ardab/ fad) which was significantly inferior than the other 6 varieties .

The remaining 3 varieties Sids 8, Sids 6 and Sids 7 are included in one group as middle yielding varieties with a grain yield of 2061, 2020, and 1958 kg/ fad, respectively (13.74, 13.47 and 13.05 ardab/ fad). The significant differences were only found between these three groups.

The combined analysis of the three seasons indicates a better evaluation of the tested varieties. The results showed that the 7 varieties could be classified into 3 distinct groups in regard to grain yield/ fad as follows :

I- The higher yielding varieties : (4 varieties)
- Sids 9 with 2600 kg/ fad (17.34 ardab/ fad),
- Sids 5 with 2582 kg/fad (17.22 ardab/ fad),
- Sids 1 with 2549 kg/ fad (17.00 ardab/ fad), and
- Sids 8 with 2484 kg/ fad (16.57 ardab/ fad)

without marked differences among them.

II- The moderate yielding varieties (2 varieties) :
- Sids 6 with 2365 kg /fad (15.77 ardab/ fad), and
- Sids 7 with 2320 kg/ fad (15.47 ardab/ fad).

III- The inferior variety Sids 4 with the lowest grain yield of 1893 kg/ fad (or 12.62 ardab/ fad) which was significantly lower as compared with the other six varieties .

It could be concluded that two of the long spike varieties (Sids 9 and Sids 5) insignificantly surpassed the commercial variety Sids 1 .

The superiority of Sids 9 and Sids 5 is due to the greater number of spikelets/ spike, greater number of grains/ spike, and longer spikes compared with the other varieties .

The previous results indicated that the commercial cultivar Sids 1 was superior in some important yield components, particularly number of spikes/ m^2 due to higher tillerage, but it recorded the lowest grain

index and latest heading and maturity dates, the lowest spike length, the lowest number of grains/ spike and a lower number of spikelets/ spike.

It could be concluded that Sids 5 and Sids 9 could be considered as promising varieties as far as yield is concerned and may be used in breeding programs.

The results also showed the superiority of the commercial cultivar Sids 1 which proved its high yield potentiality compared with the leading long spike varieties . Also, Sids 1 yielded more straw and showed lower response to N as will be discussed in the following topics. Consequently, it could be concluded that it is not advisable to substitute this cultivar by the new long spike varieties .

Many investigators reported marked differences in the yielding ability of wheat varieties (**Barthakur *et al.*, 1979; Eissa, 1979; Hussein *et al.* , 1981b; Saleh, 1981; Mossad *et al.*, 1983; El- Helaly, 1984; El- Sayed *et al.*, 1984, Olugbemi, 1984; Abd El- Gawad *et al.*, 1985b; Saleh *et al.*, 1985; Abdel- Aleem, 1987; Mahfouz, 1987; Mahmoud, 1988; Abo- Warda, 1989; El- Ashmony, 1990; Ellen, 1990; Hayam Mahgoub, 1990; Rady and Abo El- Zahab, 1990; Ibrahim and Abdel- Aal, 1991; Andrews *et al.*, 1992; Shams El- Din and El- Habbak, 1992; El- Bana and Ali, 1993; Hifnawi, 1993; Khieralla *et al.*, 1993a; Omar, 1993; Tomar *et al.*, 1993; El- Kalla *et al.*, 1994; Sulttan *et al.*, 1994; Ibrahim *et al.*, 1995; Massoud, 1995; Mossad and Tawfiles, 1995; Ali *et al.*, 1996; El- Sawi, 1996;**

Khattab *et al.*, 1996; Mady, 1996; Abd El- Ghany, 1997; and Abo-Warda, 1997.

Abo- Warda (1997) evaluated Sids 4, Sids 5, Sids 6, Sids 7 Sids 8, Sids 9, Sids 10 and Sakha 69, He concluded that Sids 5 was the best variety among the long spike lines and produced the highest grain yield (2235 kg or 14.9 ardab/ fad), but its grain yield could not surpass or equal Sakha 69 in two experimental seasons. He did not recommend growing long spike lines in Sandy soils.

10.2 Effect of N level :

The increase in N level significantly increased grain yield of wheat in the three successive seasons as well as their combined average.

In 1995/ 96 season, applying N at 30, 60, 90, 120 and 150 kg/ fad significantly increased grain yield by 23.90, 38.61, 37.35, 39.93 and 43.83 %, respectively compared with the control.

The differences in grain yield between 30, 60, 90, 120 and 150 kg N/ fad levels were not significant, and the only significant differences in that season were those between the check treatment and the other 5 levels.

In 1996/ 97 season, similarly applying N at 30, 60, 90, 120 and 150 kg N/ fad significantly increased grain yield by 52.92, 60.26, 76.41, 66.11, and 78.39%, compared with the check treatment, respectively.

Significant differences were observed between 30 and each of 90, 120 and 150 kg N/ fad levels, and between 120 and 150 kg N/ fad levels.

In 1997/ 98 season, the effect of the increase in N level on grain yield was more evident where increases of 160.39, 215.15, 250.65, 268.18 and 264.94% were observed due to applying 30, 60, 90, 120 and 150 kg N/ fad compared with the check treatment .

In that season, the differences between the grain yield between 30 and each of 60, 90, 120 and 150 kg N/ fad were significant, Also, the differences in grain yield between 60 and each of 120 and 150 kg N/ fad levels reached the level of significance.

The three seasons average indicates a more clear effect of N level. The application of 30, 60, 90, 120 and 150 kg N/ fad significantly increased grain yield by 55.62, 74.20, 84.73, 85.24 and 90.92%, respectively compared with the check treatment .

The differences in grain yield between 30 and each of 60, 90, 120 and 150 kg N/ fad levels, and between 60 and 150 kg N /fad levels were significant, whereas no significant differences were recorded between 90, 120 and 150 kg N/ fad levels.

It could be concluded that N is fundamentally needed for producing higher grain yield. Under the conditions of the experiment a level of 90 kg N/ fad could be recommend on the overall average of the tested varieties .

The increase in the grain yield is mainly due to the beneficial effect of N on all growth and yield component characters namely, plant height, number of spikelets/ spike, number of grains/ spike; spike length, number of spike/ m^2. Also, a good supply of N increased vegetative growth and grain filling period, consequently, grain yield was increased.

Similar results were also obtained by **Eissa (1979), El- Helaly (1984), El- Sayed *et al.* (1984), Hussein *et al.* (1984b), Olugbemi (1984), Abdel- Hadi *et al.* (1985), Eman Sadek (1985), Basillious and Mosaad (1988), Gheith *et al.* (1989), Eissa (1990), Ellen (1990), Hayam Mahgoub (1990), Basillious and Abd- El- Aleem (1992), Shams El- Din and El- Habbak (1992), Abd El- Gawad *et al.* (1993b), Abo Warda (1993), Fayed *et al.* (1993), Khieralla *et al.* (1993a), Shalaby *et al.* (1993), Shehab El- Din (1993), Sulttan *et al.* (1993), El- Zein (1994), Sharshar *et al.* (1995), Ayoub *et al.* (1995), Eissa (1996), Mady (1996), Abd El- Ghany (1997), and Eman Sadek and Abo- Warda (1998b).**

10.3. Interaction Effect :

The interaction between variety and N level significantly affected grain yield/ fad in 1996/ 97 and 1997/ 98 seasons as well as the three seasons average. On the other hand, this interaction was not significant in 1995/ 96 season.

In 1996/ 97 season, it was evident that the response of the 7 varieties to N was significant. The highest response was at 90 kg N/

fad by Sids 1 and Sids 4, at 120 kg by Sids 5, and at 150 kg N/ fad by Sids 6, Sids 7, Sids 8 and Sids 9.

In that season, the highest grain yield was 3178 kg/ fad (21.19 ardab/ fad) which was recorded with Sids 8 supplied with 150 kg N/ fad. and the lowest yield was 860 kg/ fad (5.74 ardab/ fad) which was produced by untreated Sids 4 plants.

In 1997/ 98 season, the tested variety showed significant differences in their response to N levels. The highest response values to N were recorded at 90 kg N/ fad by Sids 5, at 120 kg N/ fad by Sids 4, Sids 6 and Sids 7 and at 150 kg N/ fad by Sids 1, Sids 8 and Sids 9.

The maximum grain yield/ fad in that season was recorded with Sids 9 supplied with 150 kg N/ fad, being 2889 kg/ fad (19.27 ardab/ fad) and the minimum yield was only 430 kg/ fad (2.87 ardab/ fad) which was produced by the unfertilized plants of Sids 8.

The three seasons average indicated a better illustration for variety x N level interaction. The response of the tested varieties to N level was different. The highest values were recorded at 90 kg N/ fad by Sids 1 (2875 kg/ fad) and Sids 5 (2914 kg / fad); at 120 kg N/ fad by Sids 6 (2749 kg/ fad); and at 150 kg N/ fad by Sids 4 (2235 kg/ fad), Sids 7 (2759 kg/ fad), Sids 8 (3003 kg/ fad) and Sids 9 (2975 kg / fad).

The overall average of the three seasons showed that the highest wheat grain yield was 3003 kg / fad (20.03 ardab/ fad) which was obtained by Sids 8 supplied with 150 kg N/ fad and the lowest grain

yield was 1145 kg / fad (7.64 ardab/ fad) which was produced by the untreated Sids 7 plants.

The significant interaction between variety and N level showed also that the response to the applied N for Sids 1 was not that great as shown by the long spike varieties. Increasing N from zero to 150 kg N/ fad induced an increase in grain yield of 43.15, 90.91, 100.72, 122.33, 140.84, 112.21 and 65.06 %, with Sids 1, Sids 4, Sids 5, Sids 6, Sids 7, Sids 8 and Sids 9, respectively.

This comparison showed clearly the greater response of the long spike varieties to the higher doses of N compared with the commercial cultivar Sids 1.

It could be concluded that under the conditions of the experiments growing Sids 1, Sids 5 supplied with 90 kg N/ fad, Sids 8 and Sids 9 supplied with 120 kg N/ fad, are the best combinations for producing a grain yield of 19.18, 19.44, 18.98 and 19.44 ardab/ fad, respectively .

The significant interaction effect between variety and N level on grain yield of wheat was also reported by **Eissa (1979), Abd- El-Aleem (1980), Konov *et al.* (1984), Abd- El- Gawad *et al.* (1986b), Eissa *et al.* (1990), Basillious (1992), Shalaby *et al.* (1993), Freitas *et al.* (1994), Abdel- Ghany (1997) and Eman Sadek and Abo- Warda (1998a).**

On the other hand, **Abo- Warda and Eman Sadek (1998)** evaluated 3 wheat varieties under 3 levels of N and found that no significant interaction on grain yield was detected.

11. Straw Yield per Faddan (t/ fad) :

The effects of variety, N levels and their interaction on straw yield of wheat in the three successive seasons as well as their combined average are presented in Tables 23 and 24.

11.1 Effect of Variety :

The results showed significant differences among the tested varieties throughout the three seasons of experimentation as well as in their combined average.

In 1995/ 96 season, Sids 4 produced the highest straw yield, being 7.58 t/ fad which significantly surpassed the 6 remaining varieties. This variety was followed by Sids 1, Sids 6 and Sids 5 as one group without significant differences among them. The remaining three varieties Sids 7, Sids 8 and Sids 9 formed one group which was significantly inferior in straw yield compared with the other 4 varieties .

In 1996/ 97 season, a different trend was observed. Sids 1, Sids 8, Sids 5 and Sids 6 produced higher straw yield in a descending order as follows: 5.80, 5.56, 5.45, and 5.45 t/ fad, respectively showing no significant differences among them. These 4 varieties are followed by Sids 7 (5.12 t/ fad), and Sids 9 (5.11 t/ fad) as intermediate group with significant difference when compared with Sids 1. The worst variety in that season was Sids 4 with an inferior average of 4.73 t/ fad which was significantly surpassed by the rest varieties .

Table (23): Effect of nitrogen levels on straw yield (ton/ fad) of seven wheat varieties in the three successive seasons (1995/ 96/ 1996/ 97 and 1997/ 98).

	1995/ 96							1996/ 97							1997/ 98						
N level Kg / fad / Varieties	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean
Sids 1	4.54	5.07	6.66	8.00	7.17	8.10	6.59	4.71	5.00	6.24	6.40	5.80	6.65	5.80	2.23	4.22	5.70	6.89	6.77	7.34	5.52
Sids 4	4.43	6.38	9.55	9.26	7.42	8.44	7.58	1.75	4.98	4.87	6.70	4.35	5.74	4.73	1.18	3.20	4.89	5.49	5.11	5.43	4.21
Sids 5	5.29	6.61	7.01	8.10	5.19	7.24	6.57	3.8	5.75	5.61	6.85	4.78	5.91	5.45	1.22	4.52	4.70	6.58	4.71	6.08	4.64
Sids 6	4.37	6.26	7.15	8.81	5.93	6.99	6.59	2.43	5.42	6.21	7.49	4.75	6.22	5.42	1.35	4.29	4.85	6.44	5.13	5.69	4.63
Sids 7	3.66	6.08	5.69	6.82	5.78	6.24	5.71	2.12	6.35	5.25	6.20	5.28	5.53	5.12	1.16	4.38	4.32	5.17	5.58	5.15	4.29
Sids 8	4.54	6.63	5.49	5.89	6.67	6.00	5.87	3.73	5.51	5.18	6.55	5.96	6.45	5.56	0.92	4.19	4.09	5.38	5.41	5.39	4.23
Sids 9	4.99	5.20	5.67	7.04	6.97	6.07	5.99	3.87	4.79	4.58	5.83	5.11	6.47	5.11	2.02	3.59	4.41	5.19	4.95	5.86	4.34
Mean	4.55	6.03	6.75	7.71	6.45	7.01	6.41	3.20	5.40	5.42	6.57	5.15	6.14	5.31	1.44	4.05	4.71	5.88	5.38	5.85	4.55
L.S.D 5%																					
Varieties (V)	0.52							0.47							0.42						
Nitrogen (N)	1.17							0.49							0.70						
V x N	1.28							1.16							1.02						

Table (24): Effect of N levels on straw yield (t/ fad) of seven wheat varieties (combined analysis of 1995/ 96, 1996/ 97 and 1997/ 98 seasons).

N level kg / fad / Varieties	0	30	60	90	120	150	Mean
Sids 1	3.83	4.76	6.20	7.10	6.58	7.36	5.97
Sids 4	2.45	4.85	6.43	7.15	5.62	6.54	5.51
Sids 5	3.44	5.63	5.78	7.18	4.89	6.41	5.55
Sids 6	2.72	5.32	6.07	7.58	5.27	6.30	5.54
Sids 7	2.32	5.60	5.09	6.06	5.55	5.64	5.04
Sids 8	3.06	5.44	4.92	5.94	6.01	5.95	5.22
Sids 9	3.62	4.52	4.89	6.02	5.68	6.14	5.15
Mean	3.06	5.16	5.63	6.72	5.66	6.33	5.43
L.S.D 5%							
Varieties (V)	0.273						
Nitrogen (N)	0.456						
V x N	0.668						

In 1997/ 98 season, similarly as in the former season, Sids 1 produced the highest straw yield, being 5.52 t/ fad, which significantly surpassed the rest 6 varieties. The other 6 varieties are arranged in a descending order as follows: Sids 5, Sids 6, Sids 9, Sids 7, Sid 8 and Sids 4 with an average straw yield of 4.64, 4.63, 4.34, 4.29, 4.23 and 4.21 t/ fad respectively, with only one significant difference between Sids 5 and Sids 4.

The three seasons average indicated the superiority of Sids 1 with an average of straw yield 5.97 t/ fad which was significantly higher than the remaining varieties .

Sids 1 was followed by a group of 3 varieties, i.e., Sids 5, Sids 6, Sids 4, with an average straw yield of 5.55, 5.54, and 5.51 t/ fad , respectively as an intermediate group. The rest 3 varieties, Sids 8 (5.22 t/ fad), Sids 9 (5.15 t/ fad) and Sids 7 (5.04 t/ fad) produced significantly lower yield compared with the other 4 varieties.

It could be concluded that the commercial variety Sids 1 was the leading variety in straw yield/ fad followed by Sids 5 and Sids 6 the long spike varieties .

The superiority of Sids 1 in this character is mainly due to its higher plant height, and greater number of tillers/ m^2 .

The differences in straw yield among wheat varieties were also reported by **Eissa (1979), Hussein *et al.* (1981b), El- Helaly (1984), Abd El- Gawad *et al.* (1985b), El- Ashmoony (1990), Shams El-Din and El- Habbak (1992), Omar (1993), Ibrahim *et al.* (1995),**

Mady (1996), Abd- El- Ghany (1997), Abo- Warda (1997) and Ali (1997).

11.2. Effect of N level :

The results showed that the increase in N level significantly increased straw yield/ fad in the three successive seasons as well as in their combined average.

In 1995/ 96 season, applying N at 30, 60, 90, 120, and 150 kg/ fad significantly increased straw yield by 32.53, 48.35, 69.45, 41.76 and 54.07 %, respectively, compared with the control. The higehst response was recorded by 90 kg N/ fad level and the further increase in N level reduced the straw yield.

In 1996/ 97 season, similarly, the application of 30, 60, 90, 120 and 150 kg N/ fad significantly increased straw yield by 68.75, 69.38, 105.31, 60.94 and 91.88 %, respectively over the check treatment . Similarly, the highest response was recorded at 90 kg N/ fad. level.

In 1997/ 98 season, the response of straw yield to N level was more clear and the highest response was recorded at 90 kg N/ fad level. The application of 30, 60, 90, 120 and 150 kg N/ fad significantly increased straw yield by 181.25, 227.08, 308.33, 273.61 and 306.25 %, respectively compared with the control treatment.

Similarly, the greatest response was that to the 90 kg N/ fad level as indicated in the previous seasons.

The three seasons average indicated that N at 30, 60, 90, 120 nd 150 kg/ fad significantly induced and increase in straw yield over the

check treatment by 68.63, 83.99, 119.61, 84.97 and 106.86 %, respectively.

It is worthy to note that the highest increase was that recorded by the 90 kg N/ fad level being 119.61 % and no further increase was obtained beyond this level.

It could be concluded that N at 90 kg N/ fad was the best level for producing the highest straw yield. The increase in straw yield is mainly due to the effect of N on plant height, number of tillers / m^2 and the other component characters .

Similar results were also obtained by **Eissa (1979), El- Helaly (1984), El- Sayed *et al.* (1984), Hussein *et al.* (1984b) Eman Sadek (1985), Basillious and Mosaad (1988), Gheith *et al.* (1989), Abd El-Gawad *et al.* (1993b), Abo- Warda (1993), Al- Abdulsalam *et al.* (1993), Sayed *et al.* (1993), Abo- Shetaia and Abd El- Gawad (1995), Eissa (1996), Mady (1996), and Abd El- Ghany (1997).**

11.3. Interaction Effect :

The results in Tables 23 and 24 showed that the interaction between variety x N level significantly affected straw yield/ fad in 1995/ 96, 1996/ 97, 1997/ 98 seasons as well as their combined average.

In 1995/ 96 season, the response of the tested varieties to N level was quite different. The highest response value was recorded at 60 kg N /fad by Sids 4, at 90 kg N/ fad by Sids 5, Sids 6, Sids 7 and Sids 9, at 120 kg N/ fad by Sids 8 and at 150 kg N/ fad by Sids 1.

In 1996/ 97 season, similarly marked variation was observed in the varietal response to the applied N levels. The results indicated that the highest response value was achieved at 150 kg N/ fad by Sids 1, Sids 8 and Sids 9; at 90 kg N/ fad by Sids 4, Sids 5 and Sids 6; and at 30 kg N/ fad by Sids 7.

In 1997/ 98 season, also the tested varieties varied in their response to N levels. The results showed that the highest response value was attained at 150 kg N/ fad by Sids 1, and Sids 9; at 120 kg N/ fad by Sids 7 and Sids 8; and at 90 kg N /fad by Sids 4, Sids 5 and Sids 6.

It is evident that on the overall average of the 3 seasons, the maximum straw yield was 7.34 t/ fad which was produced by Sids 1 supplied by 150 kg N/ fad. On the other hand, the lowest straw yield was 1.18 t/ fad which was produced by the untreated Sids 4 plants.

The significant interaction between varieties and N levels was also reported by **Abd- El- Aleem (1980), Basillious (1992), Abd- El-Ghany (1997), and Abo- Warda and Eman Sadek (1998).**

12. Nitrogen Percentage in Grain :

The results of the effect of N levels on N percentage in grain of the seven wheat varieties and the interaction between varieties and N levels on this trait in the three successive seasons and their combined average are presented in Tables 25 and 26.

12.1. Effect of Variety :

The results indicated significant differences among the tested varieties in their content of N in grain in one season out of three as well as in the combined three seasons average.

Table (25): Effect of nitrogen levels on nitrogen % of seven wheat varieties in the three successive seasons (1995/ 96/ 1996/ 97 and 1997/ 98).

	1995/ 96							1996/ 97							1997/ 98						
N level kg / fed / Varieties	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean	0	30	60	90	120	150	Mean
Sids 1	2.10	1.99	2.13	1.78	1.94	1.94	1.98	1.20	1.11	1.22	1.20	1.32	1.43	1.25	1.84	1.68	1.79	1.39	1.50	1.60	1.63
Sids 4	2.26	2.02	2.13	1.94	2.05	1.89	2.05	1.22	1.41	1.37	1.39	1.43	1.68	1.41	1.58	1.79	2.13	2.13	2.13	2.21	1.99
Sids 5	2.13	1.81	2.21	1.92	1.73	2.06	1.97	1.30	1.41	1.22	1.18	1.43	1.28	1.30	1.71	2.05	1.50	1.67	1.63	1.47	1.67
Sids 6	2.13	2.02	2.31	2.02	1.98	2.25	2.12	1.35	1.39	1.52	1.45	1.43	1.39	1.42	1.75	1.71	1.55	1.74	1.75	1.83	1.72
Sids 7	1.53	1.90	2.42	1.83	1.96	2.04	1.94	1.18	1.66	1.62	1.54	1.58	1.70	1.54	1.30	1.56	1.69	1.53	1.80	1.56	1.57
Sids 8	1.95	2.10	2.05	2.42	1.73	2.36	2.10	1.31	1.24	1.69	1.45	1.50	1.47	1.44	1.81	2.00	2.03	1.81	1.79	2.05	1.91
Sids 9	1.95	1.97	1.83	1.72	1.73	2.07	1.88	1.37	1.48	1.36	1.43	1.43	1.70	1.46	1.85	1.50	1.56	1.69	1.75	1.85	1.70
Mean	2.00	1.97	2.16	1.94	1.87	2.09	2.01	1.27	1.38	1.43	1.37	1.44	1.52	1.40	1.69	1.75	1.75	1.71	1.76	1.79	1.74
L.S.D 5%																					
Varieties (V)	N.S.							0.147							N.S.						
Nitrogen (N)	N.S.							N.S.							N.S.						
V x N	N.S.							N.S.							N.S.						

Table (26): Effect of N levels on nitrogen % of seven wheat varieties (combined analysis of 1995/ 96, 1996/ 97 and 1997/ 98 seasons).

N level kg / fed / Varieties	0	30	60	90	120	150	Mean
Sids 1	1.71	1.59	1.71	1.45	1.58	1.66	1.62
Sids 4	1.68	1.74	1.88	1.82	1.87	1.93	1.82
Sids 5	1.71	1.76	1.64	1.59	1.60	1.60	1.65
Sids 6	1.74	1.70	1.79	1.74	1.72	1.82	1.75
Sids 7	1.34	1.70	1.91	1.63	1.78	1.77	1.69
Sids 8	1.69	1.78	1.92	1.89	1.67	1.96	1.82
Sids 9	1.72	1.65	1.58	1.61	1.64	1.87	1.68
Mean	1.66	1.70	1.78	1.67	1.69	1.80	1.72
L.S.D 5%							
Varieties (V)	0.134						
Nitrogen (N)	N.S.						
V x N	N.S.						

In 1996/ 97 season, the differences in N % reached the level of significance. In that season the highest N % was recorded with Sids 7 (1.54 %) and the lowest N content was observed with the commercial cultivar Sids 1 (1.25 %).

The tested varieties in 1996/ 97 season could be arranged in regard to N % in grain in a descending order as follows : Sids 7 (1.54%), Sids 9 (1.46%), Sids 8 (1.44%), Sids 6 (1.42%), Sids 4 (1.41%), Sids 5 (1.30%) and Sids 1 (1.25%). Sids 7 was significantly superior compared with Sids 1 and Sids 5. Also, Sids 1 was significantly inferior compared with Sids 4, Sids 6, Sids 7, Sids 8 and Sids 9.

In 1995/ 96 and 1997/ 98 seasons, no significant differences were found among the tested varieties .

The three seasons average indicated significant differences in N% in grain of the tested varieties . The results showed that the highest N% was 1.82 % which was recorded with Sids 4 and Sids 8, and the lowest N content was 1.62% which was obtained by the commercial cultivar Sids 1. The other four varieties contained between 1.65% N (Sids 5) and 1.75 %N (Sids 6) and were significantly different in N%.

It could be concluded that Sids 4 and Sids 8 were superior in N% and surpassed significantly the commercial cultivar Sids 1 in this character .

The results obtained herein are mainly due to the genetical make up of the tested varieties. Similar results were also obtained by Ellen

(1990) who reported significant variations in N% of the different wheat varieties .

12.2. Effect of N level :

The results in Tables 25 and 26 indicated that the increase in N level had no significant effects on N% in grain in the three successive seasons as well as in their combined average.

In general, increases in N% were observed due to raising N level in the three seasons, but all those increases were below the level of significance.

The three seasons average showed also slight and insignificant increases in N% in grain as a result of increasing N level. The lowest N% was 1.66% of the check treatment and the highest N% was 1.80% of 150 kg N/ fad level. However, all differences were not significant.

The present results are not in agreement with those obtained by **Ellen (1987) and Sulttan *et al.* (1993)** who found that the increase in N application significantly increased N% in grain.

12.3 Interaction Effect :

The results in Tables 25 and 26 indicated that the effect of the interaction between variety and N level on N% in grain was not significant in the three seasons as well as in the combined average.

This result indicates that each experimental factor acted independently in affecting this character.

13. Nitrogen Uptake in Grain :

The results presented in Table 27 showed that N uptake in grain markedly varied among the tested varieties. Sids 8 recorded the highest N uptake, being 45.01 kg/ fad averaged over the 6 N levels.

On the other hand, Sids 4 showed the lowest N uptake, being 34.72 kg N/ fad on the average of the 6 N levels combined over the three seasons.

Under the check treatment, the highest N uptake was achieved by the commercial cultivar Sids 1, with an average of 33.34 kg/ fad, and Sids 7 was the worst variety with an average uptake of 15.34 kg/ fad.

At the 30 kg N/ fad level, Sids 5 was the highest variety in N uptake (44.92 kg/ fad) and Sids 4 was the worst variety with an average of 30.68 kg/ fad.

At the 60 kg N/ fad level Sids 7, Sids 8, Sids 1, Sids 5 and Sids 6 were the highest in N uptake with average uptake of 48.98, 48.25, 46.73, 45.71 and 45.40 kg/ fad, respectively.

The greatest N uptake was recorded at the level of 60 kg N/ fad with Sids 1 and Sids 7 indicating a lower response to N compared with the other varieties showing higher response to the higher N levels.

Also, Sids 5 responded till 30 kg N and the further increase in N level slightly increased N uptake. On the other hand, Sids 8 and Sids 9 showed higher response to N where marked increases were induced in N uptake till the highest N level, i.e., 150 kg fad.

Table (27): Nitrogen uptake in grain (kg/ fad) as affected by variety and N level (combined analysis of 1995/ 96, 1996/ 97 and 1997/ 98 seasons).

N level kg / fad / Varieties	0	30	60	90	120	150	Mean
Sids 1	33.34	36.48	46.73	41.69	41.61	46.32	41.03
Sids 4	19.67	30.68	35.03	38.70	41.09	43.13	34.72
Sids 5	24.80	44.92	45.71	46.34	46.07	46.56	42.40
Sids 6	21.50	37.42	45.40	47.33	47.26	49.99	41.46
Sids 7	15.34	37.95	48.98	42.32	46.67	48.83	40.02
Sids 8	23.88	42.52	48.25	51.75	47.51	56.16	45.01
Sids 9	30.99	39.50	42.61	45.36	47.79	55.63	43.65
Mean	24.22	38.50	44.67	44.78	45.43	49.52	41.18

The results showed that N uptake increased with increasing N level, and the increase was at its maximum with 30 and 60 kg N/ fad levels, then the increase was very slight with further N levels.

Applying N at 30, 60, 90, 120 and 150 kg N/ fad increased N uptake by 58.96, 84.43, 84.89, 87.57 and 104.46%, respectively.

The present results showed that a level of 60 kg N/ fad was an optimum level to achieve a high N uptake and further increase in N levels was not efficient in raising N uptake considerably.

The highest N uptake reached 56.16 kg/ fad which was recorded by Sids 8 supplied with 150 kg N/ fad. Also, Sids 9 at 150 kg N/ fad recorded an uptake of 55.63 kg N/ fad in grain.

The results reported by **Nitant and Chhillar (1983), and Kapur *et al.* (1985),** indicated that N uptake in wheat increased with increasing N rates.

Also, the results obtained by **Malesevic (1987)** indicated that wheat varieties differed markedly in N uptake and N uptake was most efficient in Slopljanka, Una, Kolubara and Line NS 7016.

14. Nitrogen Use Efficiency :

The results of N use efficiency as affected by variety and N levels combined over the three successive seasons are given in Table 28

The results showed clearly that the tested varieties markedly varied in N use efficiency. The highest efficiency was recorded with Sids 7 (19.82 kg grain/ kg N) and Sids 5 (19.38 kg grain/ kg N) on the

Table (28): Nitrogen use efficiency as affected by variety and N level (combined analysis of 1995/ 96, 1996/ 97 and 1997/ 98 seasons) (kg grain/ kg fertilizer).

N level kg / fed / Varieties	30	60	90	120	150	Mean
Sids 1	11.49	13.32	10.28	5.70	5.61	9.28
Sids 4	19.75	11.55	10.62	8.55	7.09	11.51
Sids 5	36.74	22.28	16.26	11.91	9.73	19.38
Sids 6	32.18	21.68	16.49	12.60	10.07	18.60
Sids 7	36.24	23.66	16.13	12.31	10.76	19.82
Sids 8	32.50	18.33	14.72	11.93	10.60	17.62
Sids 9	19.74	14.93	11.28	9.27	7.82	12.61
Mean	26.95	17.97	13.68	10.32	8.81	15.55

average of the five N rates. The lowest efficiency was recorded with the commercial cultivar Sids 1, being 9.28 kg grain/ kg N.

The tested varieties could be arranged in a descending order according to N use efficiency in the following order on the average of the three seasons as follows: Sids 7 (19.82), Sids 5 (19.38), Sids 6 (18.60), Sids 8 (17.62), Sids 9 (12.61), Sids 4 (11.51) and Sids 1 (9.28).

These results indicate that Sids 7 and Sids 5 are the most responsive varieties to N, whereas Sids 1 is the least responsive variety.

The results showed also that N use efficiency decreased greatly with the increase in N level. Applying 30, 60, 90, 120 and 150 kg/ fad produced N use efficiency of 26.95, 17.97, 13.68, 10.32 and 8.81 kg grain/ kg N, respectively.

In other words raising N level from 30 to 60, 90, 120 and 150 kg N/ fad reduced N use efficiency by 33.32, 49.24, 61.71 and 67.31%, respectively.

It could be concluded that the long spike wheat varieties showed greater response to N compared with Sids 1, and the N use efficiency reduced greatly with increasing N level.

The present results agree with those reported by **Strivastava and Mehrotra (1982), Malesevic (1987) and Anderson *et al.* (1991)** who found great differences in N use efficiency among the different wheat cultivars. Also, **Miceli *et al.* (1992)** reported that N use efficiency was inversely and linearly related to total N supply.

15. Apparent Nitrogen Recovery :

The results of the N recovery as influenced by variety and N level combined over the three successive seasons are presented in Table 29.

The results showed that the seven wheat varieties showed marked differences in N recovery on the average of the 5 N levels applied.

The combined three seasons average indicated that Sids 7 was at the top in N recovery % with a value of 41.97 and Sids 1 recorded the lowest recovery %, being 11.52.

The tested varieties could be arranged in a descending order in their recovery % as follows: Sids 7 (41.97), Sids 8 (34.99), Sids 6 (32.41), Sids 5 (31.62), Sids 4 (23.39), Sids 9 (18.83) and Sids 1 (11.52).

Sids 7 was the variety with the highest recovery % at all N levels, with one exception at 90 kg/ fad N level, where it followed Sids 8. Also, Sids 1 recorded the lowest recovery % at all N levels, except at 60 kg N/ fad, where it surpassed Sids 9.

The effect of N level on recovery percentage indicated that on the average of the seven wheat varieties combined over the three seasons, the increase in N level was inversely and linearly related with recovery %.

The application of 30, 60, 90, 120 and 150 kg N /fad, recorded recovery percentages of 47.60, 34.09, 22.85, 17.68 and 16.91 %, respectively.

Table (29): Apparent nitrogen recovery (%) as affected by variety and N level (combined analysis of 1995/ 96, 1996/ 97 and 1997/ 98 seasons).

N level kg / fed / Varieties	30	60	90	120	150	Mean
Sids 1	10.47	22.32	9.28	6.89	8.65	11.52
Sids 4	36.70	25.60	21.14	17.85	15.64	23.39
Sids 5	67.07	34.85	23.93	17.73	14.15	31.62
Sids 6	53.07	39.83	28.70	21.47	18.99	32.41
Sids 7	75.37	56.07	29.98	26.11	22.33	41.97
Sids 8	62.13	40.62	30.97	19.69	21.52	34.99
Sids 9	28.37	19.37	15.97	14.00	16.43	18.83
Mean	47.60	34.09	22.85	17.68	16.91	27.83

In other words, the recovery % at 30 kg N/ fad level was 2.81 folds compared with that at 150 kg N/ fad level, and about two folds that recorded at 90 kg N/ fad.

It could be concluded that the increase in N level markedly reduced N recovery and the commercial cultivar Sids 1 recorded the lowest recovery %.

The results reported by **Mashhady (1984)** indicated that wheat plants utilized 30- 40% of the applied N, but this decreased as N rates increased. Also, **Destain *et al.* (1991)** reported that recovery of fertilizer N by winter wheat averaged 73% and it was influenced by site and crop variety .