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EVALUATION OF SOME WHEAT CULTIVARS AND LINES UNDER LOW AND HIGH INPUTS

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ABSTRACT

This study was carried out at Sakha Agricultural Research Station during the two growing seasons 1997-98 and 1998-99 to evaluate twelve wheat cultivars and lines under two treatments on wheat yield and its components, some agronomic, technological and viability traits using a split- plot design with four replications.

The two treatments were: a- Low input (35 kg N/fad + four irrigations)
b- High input (70 kg N/fad + six irrigations)

The low and high inputs were allocated to the main plots and the genotypes were assigned to the sub-plot.

The results showed that the cultivars and lines differed and significantly responded in all studied characters. Also, the high input treatment outyielded and surpassed the low one in all traits except for1000 kernel weight, germination %, plumule and radical length and crude protein %.

Moreover, the interaction between genotypes and treatments responded significantly in number of spikes/m^2, grain and straw yields, crude protein %, fat % and crude fiber %.

In conclusion, to grow wheat under the high input, the cultivars Sakha 8, Sakha 61, Sakha 69,are recommended. Meanwhile, Giza 164 and Sids 6 are recommended for growing wheat under low input conditions.

INTRODUCTION

Since early sixties of this century. Egypt is suffering a wide gab between production and consumption due to high birth rate unrational percapita consumption, and a limited area for growing wheat during winter season. Therefore, Shehab El-Dein (1993 a and b), suggested that increasing wheat production could be achieved through maximizing the production per unit area (vertical expansion) and/ or invading deserts to expand the cultivated area (horizontal expansion). He also indicated that the vertical expansion would be reached via developing high yielding cultivars and simultaneously implementing proper cultural practices. On the other hand, Mitkees et. Al., (1989), reported that using of several cultivars is the best policy for growing wheat allover Egypt.

Many Egyptian wheat breeders released many high yielding, i.e.. Gomaa et. al., (1984) released Sakha 61 for the Delta and Sakha 69 for wider cultivation. Also, in 1990, Gomaa et. al., developed four wheat cultivars Giza 162, Giza163, Giza164 and Sahka 92 which are characterized by superiority and wide adaptability in Middle and upper Egypt. Moreover, Mitkees et. al., (1998 b) released the wheat cv. Gemmeiza 5 and Shehab El Dein et. al.,

(1999)also developed the two rust resistant and high yielding cultivars Sakha 93 and Giza 168

To grow wheat or any other crop in deserts, water irrigation could be considered as the limiting factor, so saving water by cultivating drought tolerant cultivars will help in solving this problem and will maximize the benefits from the available irrigation water. Moreover, reducing the utilized amounts of N fertilizers will reduce the total production costs and will help in keeping environment clean and more healthy.

In Al-Qassim region, Ismail (1993) found that wheat yield. increased linearly with the increment of applied water up to about 500 m. In addition Ismail and Shehab EL-Din El, (1992) found that 923-964 mm of applied water gave the highest yield of wheat. Also, Shehab EL-din and Ismail (1997) rported that application 5.0 mm per day gave high grain yield, number of kernels/ spike, number of spikes/m2 and plant height. EL-Emeery et. al., (1994) reported that water amount had no significance on seed germination under optimal conditions in contrast with a significant effect under sub-optimal conditions. Also, they noticed that increasing water supply increased moisture, fat and crude fiber. On the other hand, low water supplies depressed seed yield as a result of lower number of grains/spike.

Numerous investigators in different parts of the world, have reported that applying optimum levels of nitrogen, greatly increased wheat grain yield and its components, as well as seed quality (Sharshar et. al., 1995, Sharshar et. al,. 2000 and Sobh et.al., 2000)

The main objective of this study was to evaluate the yield and other agronomic and technological characters for twelve wheat cultivars and lines under low and high inputs treatment to reduce production costs.

MATERIALS AND METHODS

The present investigation was carried out at Sakha Agricultural Research Station experimental Farm during the two wheat growing seasons 1997/1998 and 1998/1999 to evaluate twelve Egyptian wheat cultivars and lines under low and high inputs:

1- Low input: Four irrigations (at sowing, tillering, booting and milk stages) with 35 kg N/fad.
2- High input: six irrigation (at sowing tillering, elongation, booting, flowering and milk stage) with 70 kg N/fad.

The different genotypes were selected to comprise the following categories :

1- High yielding cultivars with wide adaptability, i.e. Sakha 69 and Sids1. Cultivars having high salinity tolerance such as Sakha 8.
2- Stripe rust resistant wheat cultivar Sakha 61.
3- Early maturity and long spike cultivars i.e. Sids 4, Sids 6 and Sids 7.
4- The heat tolerant cultivar Giza 164.
5- The new wheat promising cultivar Gemmeiza 5
6- New long spike wheat promising lines, Sakha 204 sakha,206 and Sakha 208

The soil physical and chemical analyses of the experimental site are shown in Table 1.

Table (1): Some physical and chemical properties of the experimental site

Properties	Values	
	1997/98	1998/99
1- Physical properties		
Sand %	17.00	15.20
Silt %	34.70	34.90
Clay %	44.80	48.30
Textural class	Clay	Clay
2- Chemical properties		
PH	8.00	8.10
O.M. %	2.00	2.10
Available-N ppm	40.00	42.12
Available-P ppm	8.00	9.35
Available- K ppm	279	262

The experiment was carried out during the last week of November using split plot design with four replications in which the main plots assigned for the low and high inputs, while, the sub-plots were cultivars and lines. Each plot consisted of 12 rows × 20 cm apart × 3.5 meter long, therefore, the plot size was 8.4 m^2

Phosphorus fertilizer was applied after land preparation before sowing in the form of super phosphate at the rate of 15 kg P_2O_5/fad. Seeding rate was 400 seeds/m^2, using the drilling sowing machine.

Nitrogen fertilizer was added in the form of urea 46% N at three equal splits, right before irrigation at sowing, tillering and booting stages. The other cultural practices are carried out as recommended.

The data collected from each plot were; days to heading and maturity that obtained by counting number of days from planting to the date on which about 50% of the heads were out of their flag leaf sheaths and 50% of the peduncles turned yellow, respectively. Ten randomly selected plants were measured from the soil surface to the tip of the main spikes excluding awns, and their average were calculated to determine plant height. Then the main spikes of the ten plants were picked to measure number of kernels/spike. Number of spikes/m^2 were determined from a random sample of 1.0 m^2 taken from each sub-plot. A 1000-seed random sample was hand counted to determine the kernel weight.

At harvesting time, the ten central rows of each sub-plot, were harvested and threshed to avoid border effects. The clean kernels were weighed and adjusted to ton/fa to determine grain yield.

Technological studies includes germination test which was estimated according to the international rules (ISTA, 1993), while radical length and plumule length, was measured according to (AOSA, 1986).

Percentages of moisture, fat, crude fiber, crude protein were determined according to the procedures outlined in (A.O.A.C. 1990).

Statistical analysis of variance of the two seasons, were made according to Gomez and Gomez (1983).

RESULTS AND DISCUSSION

Agronomic traits:

Data shown in Tables (2, 3) and Figure (1) revealed that there are significant differences among the tested cultivars and lines under both low and high inputs in days to heading and maturity and plant height in the two seasons. It was found that Gemmeiza 5 and Sids 1 were the latest cultivars while the earliest cultivar was Sakha line 208 and the data cleared that the low input treatment gave an earliest headling date comparing with the high input.

Shehab Eldin, 1993 b. found that differences in heading dates are influenced by cultivar genotypes as well as the prevailing environmental and climatic conditions

In general, the earliest cultivars in heading were the earliest in maturity and viceversa. The data indicated that late heading cultivars usually, have shorter periods for grain filling comparing to those of early ones (Duguid and Babel, 1994 and Mou et.al .,1994). However, maturity date is a quantitatively inherited character controlled by the caltivar genotype as well as the prevailing environmental climatic genotypes (Menshowy 1996 and Menshowy 2000).

The data clarified that plant height of different genotypes were significantly different in both treatments. The behavior of the different genotypes was different under the two treatments where the tallest cultivar under high input was Sids 1 followed by Sakha 69, Sakha 61 and Sids 4. On the other hand, the tallest cultivar under low input was Sids 1 followed by Sids 4, Sakha line 208 and Giza 164, respectively. These results show that the differences in plant height among cultivatllors might be attributed to the differences in their genetically make up (Abd El-Gawad et al, 1986).

Yield and its components:

Number of spikes/m^2 for the twelve studied wheat cultivars and lines at low and high inputs are presented in Tables (2,3). This data indicates that all cultivars recorded the highest number of spikes/m^2 at the high input. Giza 164 wheat cultivar gave the highest number of spikes followed by Sakha 8, Gemmeiza 5, Sids 1, Sakha 61 and Sakha 69, respectively. Meanwhile cultivars Sids (4, 6, 7) and Sakha lines (204, 206 and 208) gave the lowest number of heads.

Regarding to number of kernels/spike, it is obvious from Tables (4, 5) and Figure (2) that there are big differences among the low and the high treatments as well as among cultivars. Also, the data clear that, the highest number of kernels/spike were found at the high input. Regarding the behavior of the cultivars under high input, Sakha 8 gave the highest number followed by Sakha line 204, Sakha 69, Sids 1 and Sakha line 206, respectively.

Meanwhile, at low inputs Sakha line 204 gave the highest number of kernels/spike followed by Sakha 8 and Sakha line 206.

It is obvious from Tables (4 and 5) that 1000 kernel weight significantly responded to both genotypes and treatments. The high input treatment recorded the highest 1000-kernel weight comparing with the low

Tab. 2

Tab. 3

input. Sids 7 in the first year and Sids 4 in the second year gave the highest value where Sids 1 and Sakha line 208 were the highest 1000-kernel weight in the first and second seasons, respectively.

As shown in Table (4 and 5) and Figure (3), wheat grain yield was significantly responded to genotypes and treatments. It is clear that, the high input treatment outyielded the low input where Giza 164, Sids 6, Sakha 8 and Sakha 61 gave more yield than the other cultivars and lines. The high yielding ability of Giza 164 due to high number of spikes/m^2 and the heaviest kernel weight, while in Sids 9 kernel weight was the main factor for excess in yield.

Regarding to straw yield, it is clear from Tables (4 and 5) and Figure (4) that there are big differences among cultivars and lines as well as treatments. The highest straw yield was obtained from cultivars Sids 1, Sakha 69, Sakha 61, Gemmeiza 5 and Sakha 8 where Sakha line 204 and 206 gave the lowest straw yield. It is clear from the tables, Sids 1, Sakha 69, Sakha 61, Sakha 8, Gemmeiza 5 and Sids group (4, 6, 7) gave the highest straw yield under the high input treatment while Sakha lines 204, 206 and 208 gave the lowest straw yield. At the low input treatment the cultivars Sakha 8 and Sids 1 outyield the cultivars Sakha line 204, 206 and Giza 164 regarding straw yield. Genotypes which gave the highest straw yield are those who gave the tallest plants and the higher number of spikes/m^2. These results are in agreement with those found by El-Emeery *et al.* (1994), Towfeelis *et al.* (1998), Mostafa and Mahgoub (1998) and Eman and Abou-Warda (1998).

Germination % and seedling vigor:-

As shown in Table (6 and 7), the germination %, seedling vigor (radical length (cm) and plumule length (cm)) significantly responses to genotypes and treatments. The low input treatment gave the highest germination and seedling vigor in comparison with the high input treatment. Sakha line 208 and Sids 6 gave the lowest germination %, while Sakha line 208 and Gemmeiza 5 gave the lowest radical length. For plumule length the cultivar Sakha line 206, Sakha line 208, Giza 164 and Sids 1 recorded the least values. El-Emeery *et al*. (1994) reported that, low water supply which is received by wheat plants resulted in a higher amino acids composition of grain protein as comparing with high water supply which is very important in the metabolism during seed germination and seedling growth.

Chemical composition:

It is clear from Tables (8 and 9) and Figures (5-8) that, crude protein % , fat % and crude fiber % are significantly responded to genotypes and treatments, while the moisture content % did not affect significantly.

Regarding crude protein %, the highest mean values are recorded to cultivars Sakha 8, Sakha lines (204, 206, 208) and Sids (4, 6, 7) while Giza 164 occupied the last rank. Concerning to treatments, The low input treatment gave the highest crude protein % for all cultivars except Sakha 61, Gemmeiza 5 and Giza 164 is comparison with the high input treatment.

As for fat and crude fiber percentages all the cultivars gave the highest values under the high input except the cultivars Sakha 8, Sids (4,7) and Sakha (204, 208) for fat % and the cultivars Sakha 8,Sids 7 and

Sakha 7208 for crude fiber % and this is reflected on the high significance of the interaction between the cultivars and treatments.

These results are in accordance with those obtained by Ali (1976) and El-emery *et al.*(1994).

REFERENCES

Abd El-Gawad. A.A.; A.E.El-Tabbakh. A.S.; Edris and A.M.Abo Shetaia (1986). Potential productivity of wheat in Egypt VLL. Response of wheat cultivars to different nitrogen levels Annals Agric. Sci., Fac., Ain Shams Univ., Cairo, Egypt, 31 (2): 1159-1172.

A.O.A.C. (1990). Official Methods of Analysis of the Association of Official Analytical Chemists 15 th (Edition, Published by Association of Official Analytical Chemists, Arlington, Virginia, USA.)

A.O.S.A., (1986). Association of Official Seed Analysis Seed Vigor Testing Hand Book, No., 32, p.1

Ali. A.M.M. (1976). Effect of some cultural treatments on growth, yield and its components in wheat. Ph. D.,Cairo, Univ.

Duguid, S. D.; and A.L. Brule-Babel. (1994). Rate and duration of grain filling in five spring wheat (*Triticum aestivum L*.) genotypes Can. J. Plant Sci., 74 (4): 681-686.

Elemeery,M. I.; Nadia, A. El-Aidy and A.M. Abdel-Shafi (1994). Effect of water supply on viability, chemical composition of grain and yield and its components of wheat. Annals Agric. Sci., Ain Shams Univ., Cairo, 39 (1): 137-157

Eman, M. M.Sadek and A.M.A. Abou-Warda (1998). Water and nitrogen use efficiency and their effect on grain yield of wheat. Nilevalley and Red sea Regional program Annual coordination meeting September, 205-210.

Gomaa, A. A.; O . S. Khalil ; R . A . Abo Elenein ; Kadria F. Hegazi ; Enayat H. Ghanem ; A. Shafi Ali; F.F. El-Sayed ; M. A. Gouda ; M. El-Shami ; A.A. Ageez ; M.E. Saleh ; M. El-Hadidi ; S. Attia ; and M. G. Mosaad. (1984). Sakha 69 and Sakha 61 : two new bread wheat high – yielding varieties. Second General Conference of ARC , Giza, Egypt , April 9-11 , 1984.

Gomaa, A.A.; O.S. Khalil A.M. Abdel-Shafi Enayat H. Ghanem; M.A. Gouda; F.F. El-Sayed; A.A. Ageez; M.M. El-Menoufi; M.M. El-Shami; M.G. Mosaad; R.A. Mitkees; M.M. El-Hadidi; T. Shehab El-Din; A.H. Bassioni; M.S. Saleh; A.M. Eissa; G.S. Yousef; A.A. Bassioni; Y.H. El-Daoudi; (1990). Four new high yielding varieties of bread wheat for Egypt. Agric. Res. Rev., 68: 1373-1386.

Gomez, K.A. and A.A. Gomez (1983). Statistical Procedures for Agricultural Research. A. Wiley Interscience Publication, John Wiley &Son, 2nd. Ed.

I.S.T.A. (1993). International Rules for Seed Testing. Seed Sci. and Technol., 21: 25-46.

Ismail, S.M. and shehab T.M. El-Din (1992). Wheat yield response to water and Nitrogen under sprinkler irrigation, Egyptian Joumal of Agricultural Engineering, 9(4): 617-623.

Ismail, S.M. (1993). Optimal irrigation and wheat yield response to applied water, J. of King Saud Univ., 5 (1): 41-56.

Menshowy, A.M (1996). Genetic Studies on earliness in wheat. M.Sc. Thesis, Faculty Agric., Zagazig Univ.

Menshowy, A.M (2000). Genetic Studies on earliness in wheat. Ph.D. Thesis, Faculty Agric., Zagazig Univ.

Mitkess, R.A.; Enayat H. Ghanem; M.G. Mosaad; A.M. Eissa; M.M. El-Hadidi and M.M. El-Menoufi (1989). Yield stability of some newly released bread wheat varieties. Field Crops Res. Inst. ARC, Giza, Egypt.

Mitkees, R.A; El-Menoufi, M.M.A.; Hamada, A.A.; El-Sayed, F.F.; Ageez, A.A.; Mahrous, M.A.; Ashoush, H.; Gomaa, A.A.; Khalil O.H.S.; Kadria F. Hegazi; Enayat H. Ghanem*; Ali, A.A.; Mosaad, M.G.; El-Shami, M.M.; Bassiouni, A. H.; Eissa, A.M.K.; Ahehab El-Din, T.M.; Abdel-Aleem, M.M.; Mahmoud, S.Kh.; Eid, M.A.M.; Mostafa, M.A,; Iskandar, M.H.; Hanna, N.S.; Sabry, S.R.S.; Iman. M.M. Sadek; Abdel-Ghani, A.M.; Sharshar, M.S.A.; Abdel-Latif, A.H.; Abo. Warda, A.M.; Sharshar, M.S.A.; Abdel-Latif, A.H.; Abo. Warda, A.M. A. ; Abdel-Gwad, Y.G.; Mousa, A.M; Abdel-Majeed, S.A.; Zaid, H.M.; Tammam, A.M.; Nagwa. R. Abdel-Fatah; Mosherf, M.Kh.; El-Sayed, E.A.M.; Hayam.S. Mhgoub; Towfaeles, M.B.; Abd El-Halim, S.; Mostafa, A.K.; Hefnawy, F.A.; EL-Daoudi, Y.H.; Khlifa, M.O. and El-Shamy, M.M. (1998) Gemmeiza 5, A New Egyptian Bread Wheat Cultivar .Annals of Agric. Sc., Moshtohor, 36 (1) : 43-59.

Mostafa A.K and H.S. Mahgoub (1998). Effect of irrigation water amount under N levels on yield of some bread wheat varieties and lines Nilevalley and Red sea Regional program Annual coordination meeting September, 200-202.

Mou, B.; W.E. Kronstad, and N.N. Saulescu. (1994). Grain filing parameters and protein content in selected winter wheat population: II. Associations. Crop Sci., 34:838-841.

Sharshar, M.S.; M.M. El-Shami, A.H. Abd El-Latif and Nadia.A.(1995). Response of some agronomic and quality traits of wheat to nitrogen and zinc fertilization. Egypt. J. Appl. Sci., 10 (9): 189-204

Sharshar. M.S.; M.M. Sobh and A.S. Fatma. 2000. Effect of some N-Biofertitizers sources as supplementary fertilization on wheat yield, yield components and quality under graded levels of N-chemical fertilizer. J. Product .& Dev., 5 (1): 1-11

Shehab El-Din, T.M. (1993 a). Effect of twenty nitrogen fertilization levels on spring wheat (*T. aestivum*, L. em. Thell) in sandy soil. J. Agric. Mansoura Univ., 18: 2241-2245.

Shehab El-Din, T.M. (1993 b) Response of two spring wheat cultivars (*Triticum aestivum* L. em. Thell) to ten seeding rates in sandy soils. Agric Mansoura Univ., 18: 2235-2240.

Shehab El-Din, T.m. and E.S. Ismail (1997). Effect of different Irrigation Sceduling Bases on spring wheat in Sandy soil.j. Agric. Mansoura Univ., 22(3) : 635-642.

Shehab El-Din, T.; R.A. Mitkees; ; M.M. El-Shami; M.A. Gouda; M.M. Abdel-Aleem; A.M. Abdel-Ghani; N.S. Hanna; S.R.S. Sabry; A.H.Abdel-Latif; M.S.Sharshar; Eman M.M. Sadek; Abo-Warda; M. Kh. Moshref; E.A.M. El-Sayed; Hayam S. Mahgoub; A.K. Mostafa; M.G. Mosaad; A.H. Bassiouni; M.M.A. El-Menoufi; S.Kh. Mahmoud; M.A. Mahrous; A.A. Ageez; M.A.M. Eid; M.H.Iskandar; M.A. Mostafa; A.A. Hamada; Y.G. Abdel-Gwad; A.M. Mousa; S.A. Abdel-Majeed; A.M. Tammam; Nagwa R. Abdel- Fatah.; H.Ashoush; F.A. Hefnawy; H. Hendawy; S.El-Din Ali; M.B. Towfeeles; A.A. Abdel-Kreem; A.A. Khttab; A.A. Gomaa; O.H.S. Khalil; Kadria Hegazi; Enayat H. Ghanem; A.A. Ali; F.F. El-Sayed; Ikhlas Shafik and Abo-Naga. (1999). Sakha 93 and Giza 168: two new high yielding and rust diseases resistant bread wheat cultivars.J.Agric. Sci. Mansoura Univ., 24 (5): 2157-2168.

Sobh. M.M.; M.S. Sharshar and Soad, A. El-Said 2000. Response of wheat plants to nitrogen and potassium application in salt affected soil. J. Product & Dev., 5(1): 83-97

Tawfeelis M.B.; M.G. Mosaad and A.M.A. Shafi Ali (1998). Effect of irrigation interval on wheat yield in Egypt new lands. Nilevalley and Red sea Regional program Annual coordination meeting September, 6-11.

تقييم بعض أصناف القمح تحت المدخلات المنخفضة والعالية

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أجريت هذه الدر اسه في مزرعة محطة البحوث الزراعية بسخا موسمى ١٩٩٨\٩٧، ١٩٩٩\٩٨ لتقييم اثنا عشر صنفا وسلاله تحت معا ملتين على المحصول ومكوناته وبعض الصفات الزراعية والتكنولوجية والحيوية. وكانت المعاملات:-

أ- المدخلات المنخفضة ٣٥ كجم نتروجين للفدان + أربع ريات

ب - المدخلات العالية ٧٠ كجم نتروجين للفدان + ست ريات

واستخدم تصميم القطاعات المنشقة مره واحدة في أربع مكررات حيث وضعت معاملتي المدخلات في القطع الرئيسية والأصناف والسلالات في القطع المنشقة.

أوضحت النتائج أن الأصناف والسلالات المستخدمة اختلفت عن بعضها إختلافا معنويا في جميع الصفات المدروسة. كما أن المعاملة ذات المدخلات العالية تفوقت على المعاملة ذات المدخلات الأقل في جميع الصفات ماعدا وزن الـ ١٠٠٠ حبه، نسبة الإنبات، طول الريشة، طول الجذير والنسبة المئوية للبروتين الخام.

وكان التفاعل بين الأصناف والمعاملات معنويا في صفات عدد السنابل للمتر المربع، محصول الحبوب، محصول القش والنسب المئوية لكل من البروتين الخام، الدهن والألياف الخام.

وعموما تعتبر الأصناف الآتية وهى سخا ٨، سخا ٦١و شخا ٦٩، من الأصناف الجيدة التى أعطت محصولا عاليا فى ظل المدخلات العالية. أما الصنفان جيزه ١٦٤، سدس ٦ فهما الصنفان اللذان يوصى بزراعتهما فى حالة المدخلات الأقل والتفوق في المدخلات المنخفضة.

Table (2):Means of days to heading, days to maturity, plant height (cm) and No. of spikes/m^2 of 12 bread wheat cultivars and lines as affected by low and high inputs (Nitrogen and water), season 1997/98

Varity (A)	Days to heading			Days to maturity			Plant height (cm)			No.of spikes/m^2		
	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	High (B)	Mean
Sakha 8	89.00	92.00	90.50 b	142.00	151.00	146.50 ab	106.00	121.00	113.50 b	307.18 c	417.57 a	362.38 a
Sakha 61	84.00	91.00	87.50 c	140.00	153.00	146.50 ab	110.00	127.00	118.50 a	337.13 bc	370.30 b	353.72 ab
Sakha 69	90.00	94.00	92.00 b	142.00	154.00	148.00 a	109.00	1.29.00	119.00 a	334.90 bc	357.43 b	346.17 ab
Gemiza 5	89.00	96.00	92.50 a	142.00	155.00	148.50 a	109.00	126.00	117.5 a	345.30 bc	369.80 b	357.55 ab
Sids 1	93.00	98.00	95.50 a	144.00	153.00	148.50 a	111.00	129.00	120.00 a	385.64 b	335.64 bc	360.64 a
Sida 4	80.00	82.00	81.90 d	128.00	145.00	136.50 c	115.00	119.00	117.00 a	357.18 b	375.74 b	366.46 a
Sids 6	80.00	85.00	82.50 d	136.00	148.00	142.00 b	109.00	118.00	113.50 b	389.36 b	374.26 b	381.81 a
Sids 7	79.00	82.00	80.50 d	124.00	144.00	134.00 c	108.00	114.00	111.00 b	354.70 b	357.67 b	356.19 ab
Giza 164	84.00	92.00	88.00 c	133.00	147.00	140.00 b	98.00	110.00	104.00 c	333.16 bc	422.77 a	377.97 a
Sakha line 204	77.00	84.00	80.50 c	124.00	142.00	133.00 c	104.00	109.00	106.50 c	355.41 b	271.53 d	313.47 c
Sakha line 206	83.00	90.00	86.50 d	131.00	145.00	138.00 c	100.00	111.00	105.50 c	333.17 bc	304.95 c	319.06 b
Sakha line 208	68.00	84.00	76.00 e	109.00	126.00	117.50 d	95.00	111.00	103.00 c	345.05 bc	256.44 d	300.75 c
Mean	83.00	89.17	81.08	132.92	146.92	139.92	106.17	118.67	112.42	348.18	351.18	349.68
A	* *			* *			* *			*		
B	* *			* *			* *			* *		
A×B	N.S			N.S			N.S			*		

Means designated by different letters in the same column are significantly different at 5% according to Duncan's multiple range test.

Table (3): Means of days to heading, days to maturity, plant height (cm) and No .of spikes/m^2 of 12 bread wheat cultivars and lines as affected by low and high inputs (Nitrogen and water), season 1998/99

Varity (A)	Days to heading			Days to maturity			Plant hight (cm)			No.of spikes/m^2		
	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean
Sakha 8	90.00	96.00	93.00 b	144.00	152.00	148.00 ab	108.00	123.00	115.05 b	310.25 c	421.75 a	366.00 a
Sakha 61	85.00	92.00	88.50 c	141.00	154.00	147.50 ab	111.00	129.00	120.00 a	340.50 bc	374.00 b	357.25 ab
Sakha 69	91.00	95.00	93.00 b	143.00	156.00	149.50 a	110.00	130.00	120.00 a	338.25 bc	361.00 b	349.63 ab
Gemiza 5	90.00	97.00	93.50 a	143.00	156.00	149.50 a	110.00	128.00	119.00 a	348.75 bc	373.50 b	361.13 ab
Sids 1	94.00	99.00	96.50 a	145.00	155.00	150.00 a	113.00	130.00	121.50 a	389.50 b	339.00 bc	364.25 a
Sida 4	81.00	83.00	82.00 d	129.00	147.00	138.00 c	116.00	120.00	118.00 a	360.75 b	379.50 b	370.13 a
Sids 6	81.00	86.00	83.50 d	137.00	149.00	143.00 b	110.00	119.00	114.50 b	393.25 b	379.00 b	385.63 a
Sids 7	80.00	83.00	81.50 d	126.00	146.00	136.00 c	109.00	115.00	112.00 b	358.25 b	361.25 b	359.75 ab
Giza 164	85.00	93.00	89.00 c	134.00	149.00	141.50 b	99.00	111.00	105.00 c	336.50 bc	427.00 a	381.75 a
Sakha line 204	78.00	85.00	81.50 d	125.00	143.00	134.00 c	105.00	110.00	107.5 c	359.00 b	274.25 d	316.63 c
Sakha line 206	84.00	91.00	87.50 c	133.00	146.00	139.50 bc	101.00	113.00	107.00 c	336.50 bc	308.00 c	322.25 b
Sakha line 208	69.00	84.00	76.50 e	127.00	111.00	119.00 d	96.00	112.00	104.00 c	348.50 bc	259.00 d	303.75 c
Mean	84.00	90.33	87.17	135.58	147.00	141.29	107.33	120.00	113.67	351.67	354.69	353.18
A	* *			* *			* *			* *		
B	* *			* *			* *			* *		
A×B	N.S			N.S			N.S			* *		

Means designated by different letters in the same column are significantly different at 5% according to Duncan's multiple range test.

Table (4): Means of No. of kernel/spike, 1000-kernel weight (gm), Straw yield (Ton/fad.) and grain yield of bread wheat cultivars and lines as affected by low and high inputs (Nitrogen and water) in 1997/98.

Varity (A)	No. of kernels/spike			1000-kernel weight (gm)			Straw yield (Ton/fad.)			Grain yield (Ton/fad.)		
	Low (B)	height (B)	Mean	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	High (B)	Mean
Sakha 8	57.01	69.34	63.18 a	44.01	46.09	45.05 b	2.75 c	5.92 a	4.34 ab	2.48 b	2.82 a	2.65 ab
Sakha 61	45.84	54.36	50.10 b	44.85	46.88	45.87 b	2.72 c	6.44 a	4.58 a	2.29 b	2.75 a	2.52 ab
Sakha 69	43.86	62.36	53.11 b	47.62	45.35	46.49 d	2.42 c	7.01 a	4.72 a	2.17 b	2.65 a	2.41 b
Gemiza 5	39.93	54.83	47.38 c	44.75	46.24	45.50 b	2.62 c	5.87 a	4.25 ab	2.21 b	2.48 b	2.35 b
Sids 1	46.27	60.99	53.63 b	44.31	43.61	43.96 b	2.57 c	7.33 a	4.95 a	2.14 b	2.85 a	2.50 b
Sida 4	36.53	43.25	39.89 c	53.76	55.94	54.85 a	2.53 c	5.49 a	4.01 b	2.44 b	2.53 b	2.49 b
Sids 6	42.90	57.21	50.06 b	50.54	50.15	50.35 a	2.31 c	5.51 a	3.91 b	2.66 a	3.00 a	2.83 a
Sids 7	32.77	45.87	39.32 c	52.38	55.25	53.82 a	1.88 d	5.12 ab	3.50 bc	2.20 b	2.52 b	2.36 b
Giza 164	37.87	50.99	44.43 c	50.10	54.06	52.08 a	1.83 d	5.03 ab	3.43 bc	2.87 a	3.09 a	2.98 a
Sakha line 204	57.33	65.57	61.45 a	43.27	47.57	45.42 b	1.90 d	4.00 b	2.95 d	1.33 c	1.78 c	1.56 c
Sakha line 206	55.69	61.19	58.44 ab	41.83	48.22	45.03 b	1.51 d	4.18 b	2.85 d	1.58 c	2.09 a	1.84 c
Sakha line 208	28.74	40.50	34.62 d	38.71	49.55	44.13 b	2.49 c	4.52 b	3.51 bc	1.86 c	2.84 a	2.35 b
Mean	43.72	55.54	49.63	46.29	49.13	47.71	2.29	5.54	3.95	2.19	2.62	2.40
A	* *			*			* *			*		
B	* *			* *			* *			* *		
A×B	N.S			N.S			*			* *		

Means designated by different letters in the same column are significantly different at 5% according to Duncan's multiple range test.

Table (5): Means of No. of kernel/spike, 1000-kernel weight (gm), Straw yield (Ton/fad.) and grain yield of bread wheat cultivars and lines as affected by low and high inputs (Nitrogen and water) in 1998/99.

Varity (A)	No. of kernels/spike			1000-kernel weight (gm)			Straw yield (Ton/fad.)			Grain yield (Ton/fad.)		
	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean
Sakha 8	57.58	70.03	63.80 a	44.45	46.55	45.50 b	2.78 c	5.98 a	4.38 ab	2.50 b	2.85 a	2.68 ab
Sakha 61	46.30	54.90	50.60 b	45.30	47.35	46.33 b	2.75 c	6.50 a	4.62 a	2.31 b	2.78 a	2.55 ab
Sakha 69	44.30	62.98	53.64 b	45.80	48.10	46.95 b	2.44 c	7.08 a	4.76 a	2.19 b	2.68 a	2.43 b
Gemiza 5	40.33	55.38	47.85 c	45.20	46.70	45.95 b	2.65 c	5.93 a	4.29 ab	2.23 b	2.50 b	2.36 b
Sids 1	46.73	61.60	54.16 b	44.05	44.75	44.40 b	2.60 c	7.40 a	5.00 a	2.16 b	2.88 a	2.52 b
Sida 4	36.90	43.68	40.29 c	54.30	56.50	55.40 a	2.56 c	5.54 a	4.05 b	2.46 b	2.56 b	2.51 b
Sids 6	43.33	57.78	50.55 b	50.65	51.05	50.85 a	2.33 c	5.57 a	3.95 b	2.69 a	3.03 a	2.86 a
Sids 7	33.10	46.33	39.71 c	52.90	55.80	54.35 a	1.90 d	5.17 ab	3.54 bc	2.22 b	2.55 b	2.39 b
Giza 164	38.25	51.50	44.88 c	50.60	54.60	52.60 a	1.85 d	5.08 ab	3.47 bc	2.90 a	3.12 a	3.01 a
Sakha line 204	57.90	66.23	62.06 a	43.70	48.05	45.88 b	1.92 d	4.01 b	2.97 d	1.34 c	1.80 c	1.57 c
Sakha line 206	56.25	61.80	59.03 ab	42.25	48.70	45.48 b	1.53 d	4.22 b	2.87 d	1.60 c	2.11 a	1.86 c
Sakha line 208	29.03	40.90	34.96 d	39.10	51.05	45.08 b	2.51 c	4.57 b	3.54 bc	1.88 c	2.87 a	2.38 b
Mean	44.17	56.09	50.13	46.75	49.71	48.23	2.31	2.59		2.21	2.64	2.43
A	* *			*			* *			*		
B	* *			* *			* *			* *		
A×B	N.S			N.S			*			* *		

Means designated by different letters in the same column are significantly different at 5% according to Duncan's multiple range test.

Table (9): Means of chemical composition of bread wheat cultivars and lines as affected by low and high inputs (Nitrogen and water) in 1998 /1999 .

Varity (A)	Crude protein (%)			Fat (%)			Crude fiber (%)			Moisture content (%)		
	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean
Sakha 8	16.00 a	12.53 c	14.26 a	1.66 c	2.23 ab	1.94 b	2.25 d	3.42 b	2.83 d	12.30	13.42	12.85
Sakha 61	14.35 b	12.40 c	13.37 b	1.85 bc	2.77 a	2.31 a	2.72 c	4.30 a a	3.51 b	12.49	13.45	12.97
Sakha 69	15.04 ab	12.18 c	13.61 b	1.91 b	2.26 a	2.08 ab	3.25 b	4.46 a	3.85 b	12.24	13.35	12.80
Gemiza 5	14.57 b	12.10 c	13.33 b	1.78 bc	2.55 a	2.16 a	3.66 b	4.84 a	4.25 a	12.35	13.34	12.85
Sids 1	16.73 a	10.16 d	13.44 b	1.92 b	2.62 a	2.27 a	2.57 cd	5.07 a	3.82 b	12.48	13.59	13.04
Sida 4	16.44 a	13.24 bc	14.84 a	1.89 bc	2.08 ab	1.98 b	3.00 bc	5.39 a	4.19 a	12.38	13.45	12.91
Sids 6	16.72 a	11.16 cd	13.94 ab	1.81 c	2.34 a	2.07 ab	2.40 d	4.23 a	3.32 b	12.50	13.40	12.95
Sids 7	16.69 a	12.40 c	14.55 a	1.88 bc	2.22 ab	2.05 b	2.69 c	3.69 b	3.19 c	12.27	13.42	12.84
Giza 164	13.85 b	11.16 c	12.51 c	1.96 b	2.27 a	2.12 a	2.58 c	4.37 a	3.48 b	12.58	13.32	12.95
Sakha line 204	17.49 a	11.90 cd	14.69 a	1.87 bc	2.07 ab	1.97 b	2.75 c	4.42 a	3.58 b	12.74	13.10	12.92
Sakha line 206	16.38 a	10.92 d	13.65 ab	2.00 a	2.36 a	2.18 a	2.97 c	4.76 a	3.86 b	12.39	12.96	12.67
Sakha line 208	15.72 ab	12.59 c	14.16 a	1.89 bc	2.21 ab`	2.05 b	2.84 c	3.51 b	3.17 c	12.42	13.10	12.76
Mean	15.83	11.90	13.86	1.87	2.33	2.10	2.81	4.37	3.59	12.43	13.33	12.88
A	* *			*			*			N.S		
B	* *			*			* *			N.S		
A×B	* *			* *			* *			N.S		

Means designated by different letters in the same column are significantly different at 5% according to Duncan's multiple range test.

Table (7): Means of germination and seedling vigor of bread wheat cultivars and lines as affected by low and high inputs (Nitrogen and water) in 199 8 /1999

Varity (A)	Germination (%)			Seedling vigor					
				Radical length (cm)			Plumule length (cm)		
	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	Height (B)	Mean
Sakha 8	100.00 a	98.13 b	99.07 a	14.64 bc	13.91 c	14.28	12.54 c	12.41 c	12.48
Sakha 61	100.00 a	100.00 a	100.00 a	15.00 b	14.83 bc	14.92	13.33 b	12.91 c	13.12
Sakha 69	100.00 a	98.75 b	99.38 a	14.82 bc	13.06 c	13.94	12.35 c	12.05 c	12.20
Gemiza 5	100 .00 a	100.00 a	100.00 a	14.48 bc	12.45 d	13.46	12.77 c	12.53 c	12.65
Sids 1	100.00 a	100.00 a	100.00 a	14.72 bc	13.73 c	14.23	13.01 b	11.81 d	12.41
Sida 4	100.00 a	98.00 b	99.00 a	16.04 a	13.37 c	14.71	13.14 b	12.88 c	13.01
Sids 6	100.00 a	95.63 c	97.82 b	14.28 bc	14.21 bc	14.25	12.88 c	12.40 c	12.64
Sids 7	100.00 a	99.38 ab	99.69 a	15.88 a	15.38 a	15.63	13.24 b	13.20 b	13.22
Giza 164	100.00 a	100.00 a	100.00 a	13.91 c	13.87 c	13.89	13.35 b	10.97 d	12.16
Sakha line 204	98.75 b	98.13 b	98.44 ab	14.22 bc	14.21 bc	14.21	14.99 b	12.34 c	13.67
Sakha line 206	100.00 a	100.00 a	100.00 a	14.63 bc	13.52 c	14.08	14.99 b	11.86 d	13.43
Sakha line 208	100.00 a	95.50 c	97.75 b	16.56 a	11.07 d	13.82	16.25 a	11.42 d	13.83
Mean	99.90	98.63	99.26	14.93	13.63	14.28	13.57	12.23	12.90
A	*			*			* *		
B	*			* *			* *		
A×B	*			* *			* *		

Means designated by different letters in the same column are significantly different at 5% according to Duncan's multiple range test.

Table (6): Means of germination and seedling vigor of bread wheat cultivars and lines as affected by low and high inputs (Nitrogen and water) in 199 7 /1998

Varity (A)	Germination (%)			Seedling vigor					
				Radical length (cm)			Plumule length (cm)		
	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean
Sakha 8	99.00 a	97.16 b	98.10 a	14.50 bc	13.77 c	14.14	12.42 c	12.29 c	12.36
Sakha 61	99.00 a	99.00 a	99.00 a	14.85 b	14.68 bc	14.76	13.20 b	12.78 c	12.99
Sakha 69	99.00 a	97.77 b	98.39 a	14.67 bc	12.93 c	13.80	12.26 c	11.93 c	12.10
Gemiza 5	99.00 a	99.00 a	99.00 a	14.34 bc	12.45 d	13.40	12.64 c	12.41 c	12.53
Sids 1	99.00 a	99.00 a	99.00 a	14.72 bc	13.59 c	14.16	12.88 b	11.69 d	12.29
Sida 4	99.00 a	97.03 b	98.02 a	15.88 a	13.24 c	14.56	13.01 b	12.75 c	12.88
Sids 6	99.00 a	94.69 c	96.85 b	14.14 bc	14.07 bc	14.11	12.78 c	12.75 c	12.78
Sids 7	99.00 a	98.40 ab	98.70 a	15.72 a	15.21 a	15.47	13.11 b	13.07 b	13.09
Giza 164	99.00 a	99.00 a	99.00 a	13.77 c	13.73 c	13.75	13.22 b	10.86 d	12.04
Sakha line 204	97.77 b	97.16 b	97.47 ab	14.08 bc	14.07 bc	14.08	14.84 b	12.22 c	13.53
Sakha line 206	99.00 a	99.00 a	99.00 a	14.50 bc	13.39 c	13.95	14.84 b	11.74 d	13.29
Sakha line 208	99.00 a	94.55 c	96.78 b	16.49 a	10.96 d	13.73	16.09 a	11.31 d	13.70
Mean	98.90	97.65	98.27	14.81	13.51	14.16	13.44	12.15	12.80
A	*			*			* *		
B	*			* *			* *		
A×B	*			* *			* *		

Means designated by different letters in the same column are significantly different at 5% according to Duncan's multiple range test.

Table (8): Means of chemical composition of bread wheat cultivars and lines as affected by low and high inputs (Nitrogen and water) in 1997 /1998 .

Varity (A)	Crude protein (%)			Fat (%)			Crude fiber (%)			Moisture content (%)		
	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean
Sakha 8	15.84 a	12.41 c	14.12 a	1.64 c	2.21 ab	1.92 b	2.23 d	3.39 b	2.81 d	12.17	13.29	12.73
Sakha 61	14.21 b	12.28 c	13.24 b	1.83 bc	2.74 a	2.29 a	2.69 c	4.26 a	3.48 b	12.37	13.32	12.85
Sakha 69	14.89 ab	12.06 c	13.48 b	1.89 b	2.24 a	2.06 ab	3.22 b	4.42 a	3.82 b	12.12	13.22	12.67
Gemiza 5	14.43 b	11.98 c	13.20 b	1.76 bc	2.52 a	2.14 a	3.62 b	4.79 a	4.21 a	12.23	13.21	12.72
Sids 1	16.56 a	10.06 d	13.31 b	1.90 b	2.59 a	2.25 a	2.54 cd	5.02 a	3.78 b	12.36	13.46	12.91
Sida 4	16.28 a	13.11 bc	14.69 a	1.87 bc	2.06 ab	1.96 b	2.97 bc	5.34 a	4.16 a	12.26	13.32	12.79
Sids 6	16.55 a	11.05 cd	13.88 ab	1.79 c	2.32 a	2.05 ab	2.38 d	4.19 a	3.29 b	12.38	13.27	12.83
Sids 7	16.52 a	12.28 c	14.41 a	1.86 bc	2.20 ab	2.03 b	2.66 c	3.65 b	3.16 c	12.15	13.29	12.72
Giza 164	13.71 b	11.05 c	12.39 c	1.94 b	2.25 a	2.10 a	2.55 c	4.33 a	3.44 b	12.46	13.19	12.83
Sakha line 204	17.32 a	11.78 cd	14.54 a	1.85 bc	2.05 ab	1.95 b	2.72 c	4.38 a	3.55 b	12.61	12.97	12.79
Sakha line 206	16.22 a	10.81 d	13.51 ab	1.98 a	2.34 a	2.16 a	2.94 c	4.71 a	3.83 b	12.27	12.83	12.55
Sakha line 208	15.56 ab	12.47 c	14.02 a	1.87 bc	2.19 ab	2.03 b	2.81 c	3.48 b	3.15 c	12.30	12.97	12.61
Mean	15.67	11.78	13.73	1.85	2.31	2.08	2.78	4.33	3.56	12.30	13.20	12.75
A	* *			*			*			N.S		
B	* *			*			* *			N.S		
A×B	* *			* *			* *			N.S		

Means designated by different letters in the same column are significantly different at 5% according to Duncan's multiple range test.

Table (9): Means of chemical composition of bread wheat cultivars and lines as affected by low and high inputs (Nitrogen and water) in 1998 /1999 .

Varity (A)	Crude protein (%)			Fat (%)			Crude fiber (%)			Moisture content (%)		
	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean	Low (B)	high (B)	Mean
Sakha 8	16.00 a	12.53 c	14.26 a	1.66 c	2.23 ab	1.94 b	2.25 d	3.42 b	2.83 d	12.30	13.42	12.85
Sakha 61	14.35 b	12.40 c	13.37 b	1.85 bc	2.77 a	2.31 a	2.72 c	4.30 a a	3.51 b	12.49	13.45	12.97
Sakha 69	15.04 ab	12.18 c	13.61 b	1.91 b	2.26 a	2.08 ab	3.25 b	4.46 a	3.85 b	12.24	13.35	12.80
Gemiza 5	14.57 b	12.10 c	13.33 b	1.78 bc	2.55 a	2.16 a	3.66 b	4.84 a	4.25 a	12.35	13.34	12.85
Sids 1	16.73 a	10.16 d	13.44 b	1.92 b	2.62 a	2.27 a	2.57 cd	5.07 a	3.82 b	12.48	13.59	13.04
Sida 4	16.44 a	13.24 bc	14.84 a	1.89 bc	2.08 ab	1.98 b	3.00 bc	5.39 a	4.19 a	12.38	13.45	12.91
Sids 6	16.72 a	11.16 cd	13.94 ab	1.81 c	2.34 a	2.07 ab	2.40 d	4.23 a	3.32 b	12.50	13.40	12.95
Sids 7	16.69 a	12.40 c	14.55 a	1.88 bc	2.22 ab	2.05 b	2.69 c	3.69 b	3.19 c	12.27	13.42	12.84
Giza 164	13.85 b	11.16 c	12.51 c	1.96 b	2.27 a	2.12 a	2.58 c	4.37 a	3.48 b	12.58	13.32	12.95
Sakha line 204	17.49 a	11.90 cd	14.69 a	1.87 bc	2.07 ab	1.97 b	2.75 c	4.42 a	3.58 b	12.74	13.10	12.92
Sakha line 206	16.38 a	10.92 d	13.65 ab	2.00 a	2.36 a	2.18 a	2.97 c	4.76 a	3.86 b	12.39	12.96	12.67
Sakha line 208	15.72 ab	12.59 c	14.16 a	1.89 bc	2.21 ab`	2.05 b	2.84 c	3.51 b	3.17 c	12.42	13.10	12.76
Mean	15.83	11.90	13.86	1.87	2.33	2.10	2.81	4.37	3.59	12.43	13.33	12.88
A	* *			*			*			N.S		
B	* *			*			* *			N.S		
A×B	* *			* *			* *			N.S		

Means designated by different letters in the same column are significantly different at 5% according to Duncan's multiple range test.