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EFFECT OF SEEDING RATE AND NITROGEN FERTILIZATION LEVEL ON BREAD WHEAT UNDER RAINFED CONDITIONS OF NORTH SINAI

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ABSTRACT

This present study was carried out during 2003/2004 and 2004/2005 winter seasons in a private farm at Rafah, El-Areish, North Sinai Governorate, Egypt. This work aimed to study the effect of seeding rate (50 , 65 and 80 kg grains / fad.) and nitrogen fertilization level (40 , 60 and 80 kg N / fad) on grain yield, and yield attributes of Sids 1 wheat cultivar under rainfed conditions and newly cultivated sandy soil as well.

The number of spikes/m^2 was not significantly affected by seeding rate in the first season, but however, was significantly increased due to the increase of seeding rate up to 65kg/fad. in the second season as confirmed by the combined analysis.

The grain weight/spike, number of grains/spike and 1000-grain weight were not significantly affected by varying the seeding rate in both seasons and their combined. However, the grain yield/fad, as well as the straw and total yields/fad. were significantly increased with each increase of seeding rate up to 80kg/fad. This was observed in harvest and crop indices when the seeding rate was increased from 40 to 80kg/fad.

Regarding N fertilization level, the grain yield/fad. and all its components were significantly increased with each N increment up to the addition of 80kg N/fad. The straw yield/fad failed to respond to the second N increment and hence the harvest index and crop index. The response equations of grain yield/fad. to the increase of N level were of the second order to where the increase of grain yield was diminishing in the two seasons, indicating that a predicted maximum N level of 72.6 kg N/fad. was quite enough to maximize the grain yield to 1022.9 kg/fad. in the first season whereas 84.0 kg/fad. were needed to maximize the grain yield to only 892.9kg/fad. in the second season.

The interaction between the two factors under study was without significant effect on grain, straw and biological yields/fad. The number of grains/spike and straw and biological yields/fad. were *significantly affected by the interaction between seeding rate and N level. Under the three seeding rates, any increase in N level was accompanied by a significant increase in the averages of these characters but with different magnitudes.*

Wheat grain yield/fad was positively and significantly correlated with most of the studied characters. Path analysis revealed that the main sources of grain yield variation according to their relative importance were number of spikes/m^2, number of grains/spike and 1000-grain weight, where the direct and indirect effects of these traits contributed more than 86.89 % from the grain yield variation.

Key words: Seeding rate, nitrogen fertilization, bread wheat, rainfed conditions, North Sinai.

INTRODUCTION

Continuous and great efforts are being made all over the world to increase the yield and quality of wheat in order to satisfy the needs of the ever growing population. Increasing wheat yield per unit area is a National target to minimize the gab between the production and consumption therefore intensive efforts are being made for increasing wheat production. More than 96% of the total area of, Egypt is desert. Success in cultivating part of this desert where the soils are sandy and are mostly rainfed with wheat will certainly be the best solution of this problem with wheat will certainly be the best solution of this problem. These areas are characterized by a relatively low rainfall rate (150-200mm/year), which is not enough to meet the wheat water consumption. Plant density is a factor of particular importance in wheat production in addition of nitrogen fertilization Mosalem (1993), found that increasing seed rate from 40 to 70 kg/ fad increased grain and biological yields/fad. but decreased number and weight of grains/spike and 1000-grain weight. Also EL-Bana (2000) found that increasing seeding rate from 50 to 70 or 90 kg/fad. significantly increased each of number of spikes/m^2 and grain and straw yields/fad but, significantly decreased number of grains / spike, whereas, 1000-grain weight was not significantly affected. Saleh (2002) showed that increasing seeding rate from 60 to 120 or 180 kg /ha significantly increased number of spikes/m^2 and number of grains / spike but, no significant differences were observed in 1000-grain weight and grain yield/ha. Also, Saleh (2003) found that a lower seeding rate of 60 kg / ha had favourable effect on number of grains / spike, but grain yield and number of spikes/m^2 were significantly increased with the increase of seeding rate up to 120 kg/fad. Similar results were recorded by Hayatullah *et al.* (2000), Aly *et al.* (2004), Nadia and

Maha (2004) and Amit *et al*. (2008). however Maha and Bassiony (1994 a & b), Abd El-Maksoud (1999) and El-Bana (1999) found that harvest index and grain yield / fad of wheat were insignificantly affected by different seeding densities.

Regarding the effect of nitrogen fertilization level on yield and its attributes of wheat, Abd El-Maksoud (2002) reported that the highest yield could be obtained by addition 80 kg N/fad. Moreover, Saleh (2002) got the highest yield of wheat due to the addition of 225 kg N/ha. Grain yield of wheat was increased by increasing the number of spikes/m^2 (Munir *et al.,* 2000; Iskandar, 2000; Saleh, 2002 and 2003; Aly *et al*, 2004; Nadia and Maha, 2004; Hussain *et al.,* 2006 and Mowafy, 2008), number of grains/ spike (Mowafy, 2002 and Saleh 2002 & 2003), and 1000-grain weight (Abd El-Maksoud, 2002; Mowafy,2002; Aly *et al*., 2004 and Hussain *et al*, 2006).

Since, the present work was carried out to study the effect of seeding rate and nitrogen fertilization level on wheat yield and its attributes in a rainfed newly sandy soils, Hodjickristodoulou (1989) showed that grain yield of *Triticum aestivum* verities was significantly correlated with number of tiller/m^2 and 1000- grain weight under ranfed conditions. Ghanem *et al*., (1994) reported that there were significant differences among fourteen bread and duram wheat cultivars for grain yield, number of spikes/m^2, number of kernels per spike and kernerl weight under rainfed areas in the Northwest coast of Egypt.

MATERIALS AND METHODS

Two field experiments were carried out, during 2003/2004 and 2004/2005 seasons, in a private farm at Rafah, El-Areish, North Sinai, Governorate, Egypt to study the effect of seeding rate and nitrogen fertilization level on grain yield, and yield attributes of Sids 1 wheat cultivar grown in newly sandy soils under rainfed conditions. The soil texture was sandy with an average pH of 8.3 and organic matter content of 0.17%. The available N, P and K contents were 8.2, 6.32 and 195 ppm, respectively. (averaged oven the two seasons for the upper 20 cm of soil depth). The experiments were rainfed using only one irrigation at sowing.

The experiment included 9 treatments in a split-plot design of four replicates, the three seeding rates (50, 65 and 80 kg grains/fad) were allocated in the main plots, whereas, the three nitrogen levels (40, 60 and 80 kg N/fad) were assigned to the sub-plots.

Sowing took place on 15 November in the two seasons. The experimental field was fertilized with ordinary superphosphate (15.5 % P_2O_5) at a rate of 150 kg/ fad and potassium sulphate (50% K_2O) at a rate of

50 Kg/fad. Ammonium sulphate (20.5% N) was split into three equal splits i.e. at sowing, tillering and booting stages. The area of each sub-plot was 13.5 m^2 (3 × 4.5 m) and included 20 rows, 15 cm apart. The other cultural practices for growing wheat under rainfed conditions were followed.

At harvest (140 days from sowing) the third and fourth row (0.3m^2) were sampled to record number of spikes/m^2. Also, ten plants previously labeled at seedling stage were taken recording number of grains/spike, grain weight/spike and 1000-grain weight. Straw, grain and biological yields/fad were determined from the middle five rows in 2 meter long (1.5m^2). Both harvest and crop indices were calculated.

The proper statistical analysis of split plot design was used according to Sendecor and Cochran (1981). Combined analysis was performed for the characters recorded in both seasons. Differences among treatments were judged according to Ducan's Multiple Range -Test (Ducan, 1955).

Means followed by different letters are statistically significant. In interaction tables small letters were used to compare means in columns. Whereas capital ones are used compare means in rows. The combined data of yield components and yield were subjected to simple correlation and path coefficient calculated according to Svab (1973). The response equations of grain yield/fad. to seeding rates and N levels were calculated according to Sendecor and Cochran (1981). The predicted maximum seeding rate or N level which could have used to maximize the grain yield/fad. was calculated using the following equation as explained by AbdulGalil *et al.*, (2003):

$$X \max = \frac{b}{2c} U + Xo$$

$$\hat{Y} \max = \frac{b^2}{4c} + a$$

Where:

a: The grain yield/fad. at the first seeding rate or N level.
b: The linear component of the response equation.
c: The quadratic component of the response equation.
u: The increment of seeding rate (15kg) or N level (20kgN/fad.).
Xo: The first level of seeding rate (50kg/fad) of N level (40kg N/Fad).

Table 1. Mean monthly temperatures (^{o}C), ranfull (mm) and relative humidity at El-Arish during the two seasons

Months	Temperature (C^{o})		Rainfull (mm)		Relative humidity (R-H)	
	2003/2004	2004/2005	2003/2004	2004/2005	2003/2004	2004/2005
November	19.5	19.45	14.30	16.20	82.25	79.70
December	14.95	14.25	20.10	22.40	76.80	81.35
January	16.75	14.28	0.00	6.77	77.55	77.62
February	14.7	14.61	17.50	8.20	76.70	77.73
March	16.8	16.95	10.50	7.50	78.15	78.47
April	18.75	19.43	0	2.03	76.55	77.30

RESULTS AND DISCUSSION

1. *Effect of seeding rate:*

Data presented in Tables 2, 3 and 4 showed the effect of seeding rate on yield and its attributes of wheat in the two growing seasons and their combined analysis. Combined analysis data revealed that seeding rates had a significant influence on number of spikes/m^2, straw, grain and biological yields/fad, harvest and crop indices. Increasing seeding rate up to 65kg/fad resulted in a significant increase in number of spikes/m^2, harvest and crop indices, while straw, grain and biological yields/fad were significantly increased when wheat plants sown a rate of 80kg/fad. However, number of grains/spike, grain weight/spike and 1000-grain weight were insignificantly affected by seeding rates. The relative increase due to raising seed rate from 45 to 65 kg/fad, in number of spikes/m^2 was about 6.06%, harvest index was about 4.78% and in crop index was about 7.21%, while the relative increase due to raising seeding rates from 50 to 80kg,/fad was 32.17% in grain yield/fad. 18.70% in straw yield/fad and about 22.64% in biological yield/fad. These results clearly indicate that the increase of seeding rate beyond 65kg/fad. in the second season and the combined analysis failed to significantly increase the number of spikes/m^2 due to the failure the larger number of plants when dense sown at 80kg seeding rate, to produce productive tillers. This probably could be attributed to intensive competition among dense sown plants for growth resource, particularly soil moisture. The lack of soil moisture, caused by the nil precipitation in the first season and the very low amount of rainfall in the second season, during January (Table 1) , when tillers were developing and in the spike initiation stage, could account for the failure of dense sown plants to carry larger number of spikes/m^2. Since the number of spikes/m^2 did not vary significantly in the first season and beyond the seeding rate of 65kg/fad. in the second season, dense and light sown wheat plants produced spikes with similar

number of grains/spike, as well as, similar 1000-grain weight. Therefore, the grain weight/spike did not vary significantly due to varying the seeding rate in the two seasons.

However, on a plot areas basis, the grain yield/fad. was significantly increased with each increment in seeding rate up to 80kg/fad, indicating that dense sowing compensated the failure of large number of tillers to carry spikes through a significant increase in the number of plants/plot.

The following response equations were calculated for grain yield/fad. in the two seasons.

$$\widehat{Y}\ 1^{st} = 842.0 + 149.5\ x - 26.5X^2$$

$$\widehat{Y}\ 2^{nd} = 645.0 + 156.5\ X$$

These equations clearly indicate that the grain yield/fad. showed diminishing increase due to the increase of seeding rate in the first season, but however, non-diminishing increase in the second season. Reference to Table 2 showed that the number of spikes did not respond to the increase of seeding rate in the first season, and responded to the increase of seeding rate up to only 65kg/fad. in the second season. Reference in Table 2 showed that the grain weight/spike did not respond to the increase of seeding rate, due to the failure of both the grain number/spike and the 1000-grain weight to seeding rate increase (Tables 2 and 3). Therefore, the failure of seeding rate to increase the number of spike/m^2 particularly in the first season could account for the response of grain yield/fad which responded linearly to the increase of seeding rate in the second season, and quadratically in the first one. These increases could mainly be ascribed to variation in the amount of rainfall received during February and March. It was quite evident that more soil moisture was more available to wheat plants in the first than in the second season (Table 1), due to more amount of rainfall in February and March. These results are in agreement with those reported by Abd El-Maksoud (1999), El-Bana (2000), Iskandar (2000), Saleh (2002 and 2003), Aly *et al*. (2004), Jaime *et al.* (2004) and Nadia El-Wakil and Maha Abd-Alla (2004).

2. *Effect of nitrogen level:*

Most of all studied characters, except harvest and crop indices were significantly affected by nitrogen fertilization and this was true in the two growing seasons and their combined.

Number of spikes/m^2, number of grains/spike, grain weight/spike, 1000-grain weight and both grain and biological yields/fad. were increased significantly by each nitrogen level increment from 40 to 80kg N/fad. The relative increases due to the increase of nitrogen from 40 up to 80kg N/fad. in number of spikes/m^2 was 44.57%, in number of grains/spike was 11.18%, in grain weight/spike was 14.02%, in 1000-grain weight was 4.40%, in grain yield/fad was 27.96% and finally in biological yield/fad was 18.85%. Straw yield/fad. was significantly increased by adding nitrogen up to only 60kg N/fad. with relative increase of 15.13%. However nitrogen fertilization increased insignificantly both harvest and crop indices. It seems evident that wheat plants were in bad need for the increase of N level up to the highest one tried in this study i.e. 80kg N/fad. This effect was move pronounced in the number of spikes/m^2 which amounted to 44.57% due to the increase of N level from 40 to 80kg/fad compared with only 14.02% in grain weight/spike.

These results strengthen the view, that the number of spikes/m^2, rather than the grain weight/spike, was the main yield component limiting the increase of grain yield/fad.

The following response equations were obtained for the grain yield/fad. in the two seasons.

$$\widehat{Y}\ 1^{st} = 835.0 + 231.0X - 71.0\,X^2$$

$$\widehat{Y}\ 2^{nd} = 654.0 + 217.5X - 49.5X^2$$

These equations clearly indicate that the response of grain yield/fad. to the increase of N level was diminishing. The calculations of the predicted maximum N level which could have been used to maximize the grain yield to 892.9 and 1022.9 kg/fad. in the two seasons were 72.60 and 84.0 kg N/fad. in respective order.

This clearly indicates that wheat plants were more efficient but less response to N in the first than in the second season. These results further indicate that less amount of N were needed in the first than in the second season to maximize the grain yield to a higher maximum (1022.9 kg/fad) than in the second season (892.9 kg/fad.). Data in Table 1 showed that the amount of rainfall received during February and March were higher in the first (28mm) than in the second season (15.70 mm), though the reverse was true regarding the amount of rainfall received during November, December and January. The monthly mean temperature were almost the same during the two seasons. Therefore, it could be possible to say that the amount of rainfall during February and March might have had governed the response of wheat to N fertilization where the addition of only 40kg N/fad. produced much more grain yield in the first (835.0/fad) than in the second season (654.0/fad.). It is well known that wheat plants are in more need for photosynthesis to cover the needs of the developing spikes and plant elongation during February and March i.e. during their reproduction stage (Evans *et al*.,1972). These results are in accordance with those obtained by Iskandar (2000), Munir *et al*. (2000), Abd El-Maksoud (2002), Saleh (2002 & 2003), Aly *et al.* (2004), Nadia El-Wakil and Maha Abd-Allah (2004) and Hussain *et al.* (2006).

Effect of interaction:

The number of grains/spike was significantly affected by the interaction between seeding rates and nitrogen fertilizer levels. Table 5 and Figure 1 shows that the highest number of grains/spike (61.63) was achieved by using the seeding rate of 80kg/fad. and fertilizing with 80kg N/fad. On the other hand, the lowest number of grains/spike was attained in plots sown at 80 kg/ fad. seeding rate and fertilized with 40kg N/fad. However, there was insignificant differences between 50 and 65kg grains/fad under nitrogen level of 40 kg N/fad. Also, the differences between 50 and 80kg grains/fad under 60kg N/fad and between 50 and 65 seeding rates under 80kg N/fad were not significant. However the number of grains/spike was gradually and significantly increased by any increase in nitrogen level irrespective of seeding rate.

Table 5. Number of grains/spike as affected by the interaction between seeding rates and nitrogen fertilizer levels (combined)

Nitrogen levels (Kg/fad)	Seeding rates (Kg/fad.)		
	50	65	80
40	A 55.88 c	A 55.38 c	B 53.25 c
60	A 58.38 b	B 57.88 b	A 58.75 b
80	B 60.75 a	B 60.50 a	A 61.63 a

The highest straw and biological yields/fad as affected by the interaction between the two studied factors are given in Tables (6 and 7) and Figures (2 and 3). The highest averages were obtained with seeding rate of 80kg grains/fad in plots fertilized with 60 or 80kg N / fad. whereas the lowest average were obtained with 50kg seeding rate when 40kg N/fad was applied. Irrespective of N-fertilization, straw and biological yields/fad. were significantly increased with any increase in seeding rate. However the response to N was up to 80 kg N/fad. under 50 kg seeding rates and up to 60kg N /fad under the other higher two seeding rates (65 and 80 kg grains/fad.).

However, neither the grain yield/fad. nor any of its main components *i.e.* spikes/m^2 and grain weight/spike were significantly affected by the interaction between seeding rates and N levels in both seasons and their combined. This clearly indicates that the main effects of seeding rates and N levels governed the variation of grain yield/fad. where the effect of N levels had more pronounced effect than seeding rates in all there respects.

Table 6. Straw yield as affected by the interaction between seeding rates and nitrogen fertilizer levels (combined)

Nitrogen levels (Kg/fad)	Seeding rates (Kg/fad)		
	50	65	80
40	C 0.614 c	B 0.744 b	A 0.875 b
60	C 0.739 b	B 0.943 a	A 1.042 a
80	C 0.876 a	B 0.951 a	A 1.028 a

Table 7. Biological yield as affected by the interaction between seeding rates and nitrogen fertilizer levels (combined)

Nitrogen levels (Kg/fad)	Seeding rates (Kg/fad)		
	50	65	80
40	C 2.184 c	B 2.505 b	A 2.901 c
60	C 2.523 b	B 2.991 a	A 3.233 a
80	C 2.848 a	B 3.040 a	A 3.132 b

4. *Grain yield analysis*

a) Correlation study

The simple correlation coefficients between grain yield on one hand and the other studied characters on the other hand are shown in Table 8 for the averages of the two seasons.

Grain yield was positively and highly significantly correlated with all studied traits i.e. number of spikes/m^2 (0.513**), number of grains/spike (0.789**), weight of grains/spike (0.757**), 1000-grain weight (0.617**), straw yield/fad (0.716**), biological yield/fad. (0.902**), harvest index (0.791**) and crop index (0.792**).

Also, positive and significant correlations were detected between number of spikes/m^2 and each of straw and biological yields and harvest and crop indices, between number of grains/spike and each of weight of grains/spike and 1000-grain weight, between weight of grains/spike and 1000-grain weight, between 1000-grain weight and harvest and crop indices, between straw yield/fad. and biological yield fad. and finally between harvest index and crop index. However, the correlation coefficient between any pairs of studied characters were positive, but not significant.

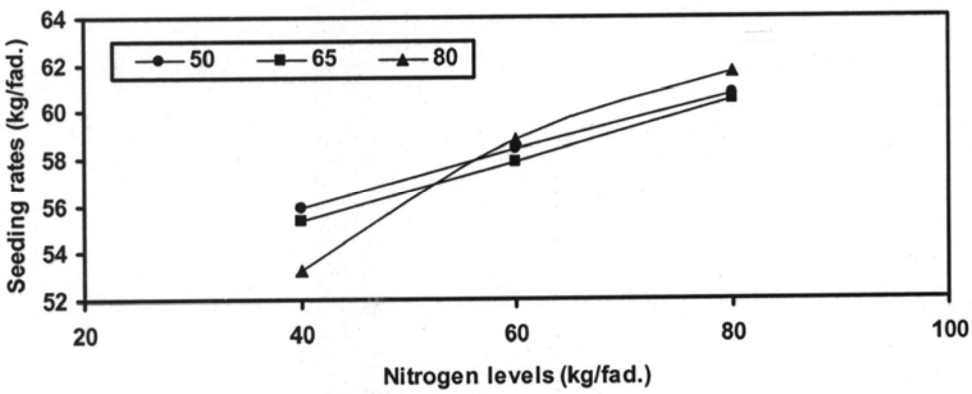

Figure 1. Number of grains/spike as affected by the interaction between seeding rates and nitrogen fertilizer levels (Combined)

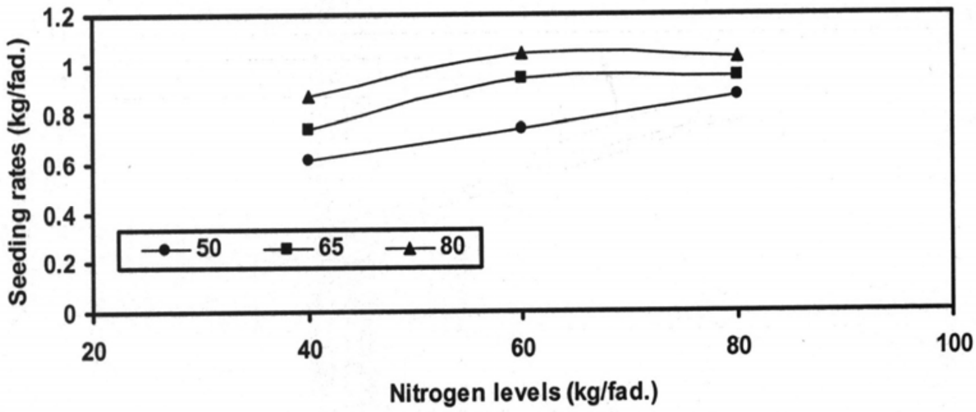

Figure 2. Straw yield ton/fad. as affected by the interaction between seeding rates and nitrogen fertilizer levels (Combined)

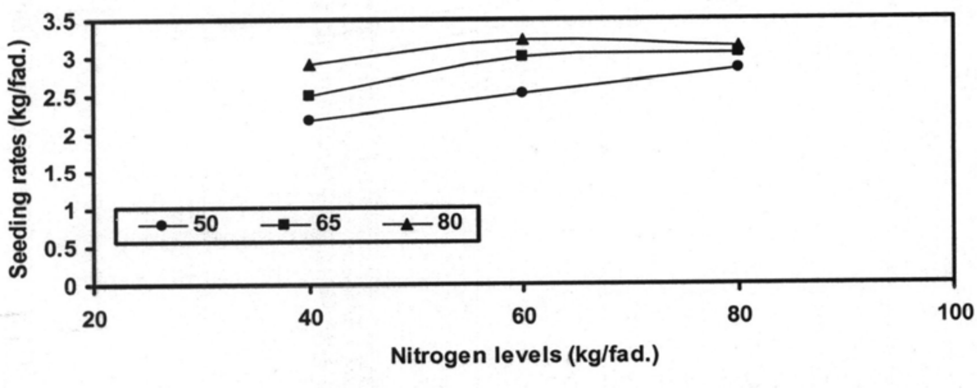

Figure 3. Biological yield ton/fad. as affected by the interaction between seeding rates and nitrogen fertilizer levels (Combined)

(b) Path analysis:

Path analysis was carried out to determine the relative importance of number of spikes/m^2, number of grains/spike and 1000-grain weight to wheat grain yield variation. The effects of direct and indirect of the forementioned characters on wheat grain yield are shown in Table (9) for the averages of the two seasons. Number of spikes/m^2 showed a highly direct effect compared with that of number of grains/spike or 1000- grain weight. However, the indirect effect of number of spikes/m^2 through the other two components were negative, while the indirect effects of both number of grains/spike and 1000-grain weight via number of spikes/m^2 were positive, but with low values.

Table 9. Partioning of simple correlation coefficients between grain yield (ton/fad.) and its components of wheat

Sources	Values
Number of spikes /m^2	
Direct effect	2.7662
Indirect effect via number of grains / spike	-1.3717
Indirect effect via 1000-grain weight	-0.8811
Total (ry_1)	0.5134
Number of grains / spike:	
Direct effect	0.6739
Indirect effect via 1000-grain weight	0.0354
Indirect effect via number of spikes /m^2	0.0800
Total (ry_2)	0.7893
1000-grain weight	
Direct effect	0.3545
Indirect effect via number of spikes/m^2	0.1773
Indirect effect via number of grains / spike	0.0850
Total (ry_3)	0.6171

The relative importance of the three abovementioned characters to grain yield variation of wheat as percentage are presented in Table 10. It is clear that number of spikes/m^2, number of grains/spike, 1000-grain weight and their interactions contributed as much as to 86.89% of the total yield variation to grain yield variation. However the residual effects contributed to grain yield only 13.11% of the total variation. It is interesting to observe that the most important source of grain yield variation according to their importance were the number of spikes/m^2 (29.68%), number of grains/spike (18.38%) and 1000-grain weight (11.94%) however, the total percentage contributed of the interaction among them reached 26.89%.

Table (10): Direct and joint effects of grain yield components presented as a percentage of variation of wheat

Sources	C.D.	%
Number of spikes / m^2	0.2968	29.68
Number of grains / spike	0.1838	18.38
1000-grain weight	0.1194	11.94
Number of spikes / m^2 x number of grains / spike	0.0951	9.51
Number of spikes / m^2 x 1000-grain weight	0.0861	8.61
Number of grains/spike x 1000-grain weight	0.0877	8.77
R^2	0.8689	86.89
Residual	0.1311	13.11
Total	1.000	100.00

C.D. = Coefficient of determination
% = Percentage contributed

Conclusively, it can be concluded that improving the productivity of wheat under rainfed conditions could be achieved when the studied factors i.e. seeding and nitrogen levels were severed to increase mainly the number of spikes/m^2, followed by the number of grains/spike and 1000-grain weight. These results are in the same line with those obtained by Darwish (1994), El-Bana and Basha (1994), Moselhy (1995), El-Bana (2000), Iskandar (2000), Mowafy (2002) and Nadia El-Wakil and Maha Abd-Allah (2004).

REFERENCES

Abd El-Maksoud, M.F. (1999): Varietals response of some wheat cultivars to varying planting densities and time of last irrigation. Ph.D. Thesis, Faculty of Agriculture, Zagazig. University, Egypt.

Abd El-Maksoud, M.F. (2002): Response of some wheat cultivars to biofertilizer and nitrogen fertilizer levels. *Zagazig Journal of Agriculture Research,* **29** (3): 891-905.

AbdulGalil, A.A.; H,.A. Basha, S.A. Mowafy and Seham M. Mohamed (2003): Effect of P addition on the response of four wheat cultivars to N fertilization level under sandy soil conditions. *Minufya Journal of Agriculture Research*, **28** (1): 1-22.

Aly, A.G.M., G.E. Zeiton, A.H., Bassiouny and A.U. El-Banna (2004): Productivity of wheat cultivars grown at El-Kahattara and El-Areish under different levels of planting densities and N-fertilization. *Zagazig Journal of Agriculture Research*, **31** (YA): 1225-1256.

Amit, J.J., S.C. Shah, H.R. Paresh and B. Hitesh (2008): Integrated effect of seed rates and weed management treatment in wheat (*Tricitum aestivum*, L.). *Research Journal Agriculture and Biology Science*, **4** (6): 704-711.

Darwich, A.A. (1994): Agriculture studied on wheat. Ph.D. Thesis, Faculty of Agriculture, Zagazig University, Egypt.

Duncan, D.B. (1955): Multiple range and multiple F-test, *Biometrics*, **11**: 1-24.

El-Bana, A.U. (1999): Response of some wheat cultivars to planting densities and nitrogen fertilization under newly cultivated soil conditions. M. S.c. Thesis, Faculty of Agriculture, Zagazig University, Egypt.

El-Bana, A.U. (2000): Effect of seeding rates and PK fertilizer levels on grain yield and yield attributes of wheat under newly cultivated sandy soil conditions. *Zagazig Journal of Agriculture Research*, **27**(S): 1161-1178.

El-bana, A.Y.A. andH.A. Basha (1994): Response of yield and yield attributed of wehat (***Tricitum aestivum***, L.) to planting density under newly cultivated sandy soil. *Zagazig Journal of Agriculture Research*, **21** (3A): 671-681.

Evans, L.T.; J. Bingham and M.A. Roskams (1972): The pattern of grain set within ears of wheat *Aust. Journal of Biology Science*, **25**: 1-8.

Ghanem, E.H., A.M. Abd-Shafi Ali, S.R.S., Sabry, N.S. Hannas, M.M. Abdel Aleem, S.K. Mahmoud and Y.M. El-Dacudi (1994): A new bread wheat *(Triticum aestivem L.*) cultivars for rainfed areas in the Northwest coast of Egypt. *Bull. Faculty Agriculture, Cairo University*, **45** (2): 431-356.

Hakjichristodoulou, A. (1989): Environmental correlation among grain yield and other important traits of wheat in dry land S. *Euphytica*, **44**: 143-150.

Hayatullah, K., A.K. Muhammad, H. Iqtida, Z.K. Muhammad and K.K. Masood (2000): Effect of sowing methods and seed rates on grain yield and yield components of wheat variety Pak-81. *Pakistan Journal Biology Science,* **3** (7): 1177-1179.

Hussain, I., M.A. Khan and E.A. Khan (2006): Bread wheat varieties as influenced by different nitrogen levels. *Journal of Zhejang University Science,* **7** (1): 70-78.

Iskandar, M.H. (2000): Mean performance interrelationships and path coefficient for yield and yield components of some Egyptian long spikes wheat cultivars using various seeding rates and nitrogen levels in East Delta Region. *Egyptian Journal of Applied Science*., **15** (1): 36-55.

Jaime, L.L., J. Manent, J. Viudas, A. Lopezand P. Santiveri (2004): Seeding rates influence on yield and yield components of irrigated winter in Mediterranean climate. *Agronomy Journal*, **96:** 125-1265.

Maha, M. Abd-Allah and A.H. Bassiouny (1994a): Response of wheat cultivars to nitrogen fertilization. *Egyptian Journal of Applied Science*, **9** (6): 838-852.

Maha, M.Abd-Allah and A.H. Bassiouny (2004b): Response of two released wheat cultivars to various planting densities. *Egyptian Journal of Applied Science,* **9** (8): 836-849.

Mosalem, M.E. (1993): Response of wheat cultivars to nitrogen level and seeding rate. Journal of Agriculture Science, Tanta Univeristy, **19** (4): 791-805.

Moselhy, N.M.M. (1995): Raising wheat under desert conditions in Egypt. Ph.D. Thesis, Faculty of Agriculture, Zagazig University, Egypt.

Mowaf, S.A.E. (2008): Effect of organic manuring and fertilization levels of floral fertility, inter and intra spikelets competition and grain yield potentiality of three bread wheat cultivars under sandy soil conditions. *Zagazig Journal of Agriculture Research*, **33**(5): 1015-1052.

Mowafy, S.A.E. (2002): Effect of organic maturing and splitting of different levels of nitrogen on wheat under sprinkler irrigation in sandy soils. *Zagazig Journal of Agriculture Research*, **29** (1): 51-52.

Munir, A.A.E., M.S. El-Krmany and A.A. Abo-Ellil (2000): Effect of irrigation and nitrogen fertilizer on yield and yield components of some wheat cultivars. *Al-Azhar Journal of Agriculture Research,* **32:** 73-88.

Nadia, M. El-Wakil and Maha, M. Abd-Allah (2004): Influence of seeding rate and nitrogen fertilization level on yield and its attributes of some wheat cultivars. *Egyptian Journal of Applied Science*, **19** (2): 129-150.

Saleh, M.E. (2002): Response of two wheat cultivars to seeding rate and nitrogen level. *Zagazig Journal of Agriculture Research*, **29** (5): 1367-1378.

Saleh, M.E. (2003): Effect of row spacing, rate of seeding and nitrogen fertilizer level on the productivity of Sids 1 wheat cultivars. *Zagazig Journal of Agriculture Research*, **30** (4): 1203-1221.

Snedecor, G.W. and W.G. Cochran (1981): *Statistical methods.* Applied to Experiments in Agriculture and Total. 7th Iowa State Collage. Amer. Iowa, USA.

Svab, J. (1973*):* *Biometriai modszerek a kutatasban-Mezogazdasagi* .Kiado, Budabest.

تأثير معدل التقاوي ومستوى التسميد النيتروجيني على
على قمح الخبز تحت ظروف التغذية المطرية بشماء سيناء

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أقيمت هذه الدراسة خلال موسمي ٢٠٠٣/٢٠٠٤، ٢٠٠٤/٢٠٠٥ بإحدى المزارع الخاصة في رفح بالعريش محافظة شمال سيناء بمصر وذلك لدراسة تأثير ثلاث معدلات للتقاوي (٥٠-٦٥-٨٠كجم حبوب/فدان) وثلاث مستويات للتسميد النيترويجني (٤٠-٦٠-٨٠كجم نيتروجين/فدان) على المحصول ومكوناته وكذلك تحليل المحصول لصنف القمح سدس١ تحت ظروف التغذية المطرية بالأراضي الرملية بشمال سيناء. استخدم تصميم القطع المنشقة من أربع مكررات حيث وزعت معدلات التقاوي عشوائياً في القطع الرئيسية بينما احتلت مستويات التسميد النيتروجيني القطع المنشقة.

تشير النتائج المتحصل عليها أن عدد السنابل/م٢ ومحصول القش والمحصول البيولوجي ومعامل الحصاد ومعامل المحصول زادت معنويا مع زيادة معدلات التقاوي حتى ٦٥ كجم بذور/ فدان بينما أدت معدلات التقاوي إلى ٨٠كجم بذور/فدان إلى زيادة معنوية في محصول الحبوب، وعلى أي حال كانت الاختلافات في عدد الحبوب/سنبلة ووزن الحبوب/سنبلة ووزن الألف حبة نتيجة زيادة معدلات التقاوي لم تصل إلى مستوى المعنوية.

أدت تلك الزيادة في مستوى التسميد النيتروجيني حتى ٨٠كجم/نيتروجين فدان إلى زيادة معنوية في عدد السنابل/م٢ وعدد الحبوب/سنبلة ووزن الألف حبة ومحصول الحبوب وكذلك المحصول البيولوجي/فدان بينما أدت زيادة معدل التسميد النيتروجيني حتى ٦٠كجم نيتروجين/فدان إلى زيادة معنوية في محصول القش/فدان وكان لزيادة مستوى النيتروجين تأثير معنوي على كل من معامل الحصاد ومعامل المحصول عند مضاعفة مستوى التسميد النيتروجيني حتى ٨٠كجم/فدان. كان لتداخل الفعل بين عاملي الدراسة تأثير معنوي على عدد الحبوب/سنبلة ومحصول القش/فدان والمحصول البيولوجي للفدان ولم يلاحظ ذلك على محصول الحبوب/فدان أو عدد السنابل/م٢ أو وزن حبوب السنبلة.

أوضحت معادلة الاستجابة للتسميد النيتروجيني أنه كان من الممكن معظمة محصول الحبوب إلى ١٠٢٢.٩كجم/فدان بإضافة ٧٢.٦%كجم/نيتروجين فدان في الموسم الأول مقارنة بـ ٨٩٢.٩كجم/فدان في الموسم الثاني وبإضافة أعلى ٨٤.٠كجم نيتروجين/فدان وقد تم تفسير هذه الاستجابة على أساس كمية الأمطار الساقطة خلال شهري فبراير ومارس حيث كانت أعلى نسبياً في الموسم الأول عن الموسم الثاني مما لعبا دوراً أساسياً في زيادة تأثير النيتروجين.

ارتبط محصول الحبوب ارتباطا موجبا ومعنويا مع معظم الصفات المدروسة. ويشير تحليل معامل المرور إلى أن المصادر الرئيسية لاختلاف المحصول في القمح تبعاً لأهميتها النسبية هي عدد السنابل/م٢ وعدد الحبوب/ سنبلة ووزن الألف حبة حيث كانت التأثيرات المباشرة وغير المباشرة لهذه الصفات أكثر تأثيراً (٨٦.٨٩%) في تباين محصول حبوب القمح.

وتوصي الدراسة بزراعة الصنف سدس١ مع التسميد بمعدل ٨٥ كجم نيتروجين فدان وبمعدل تقاوي ٨٠ كجم لمعظمة المحصول تحت ظروف التغذية المطرية في شمال سيناء للمساهمة في تقليل الفجوة القمحية.