Assiut Journal of Agriculture Science 54 (2) 2023 (18-31) Website: http://ajas.journals.ekb.eg/
ISSN: 1110-0486 / EISSN: 2356-9840 E-mail: ajas@aun.edu.eg

(Original Article)

Response of Some Bread wheat Cultivars to Nitrogen Fertilizer Rates Under Different Sowing Methods

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DOI: 10.21608/ajas.2023.196647.1237

Abstract

A field experiment was carried out at the Agronomy Department. Experimental Farm, Agriculture Fac., Assiut Univ., during the growing seasons of 2020/21 and 2021/22 to study the effect of nitrogen fertilizers rates and planting methods on grain yield and its components of six wheat cultivars (bread wheat) (Misr 2, Sids 14, Gemaiza 11, Shandweel 1, Giza 171 and Sids 12). A randomized complete block design (RCBD) was used in this experiment with three replications using strip - plot arrangement. The planting methods (flat, ridges and raised beds) were arranged horizontally, while nitrogen rates (50, 75 and 100 kg/feddan.) were arranged vertically as well as the tested wheat cultivars were dole out in the sub plots. The outcome expressed that Gemmeiza11 cultivar recorded the maximum significant mean values of all examined characters (seed index, weight of kernels per spike, grain yield (ardeb/feddan.) and straw yield (ton/feddan.)) compared with other wheat cultivars examined except the number of kernels spike^{-1} trait which reacted significantly for Sids 12 in both seasons. Furthemore, the nitrogen application level 100 kg/fed. recorded maximum significant average values of grain yield (ardeb/feddan.) and straw yield (ton/feddan) in both seasons. Also, planting wheat plants on raised beds gained the maximum mean values of grain and straw yields in both seasons compared to other tested planting methods.

Keywords: *Raised beds, Gemaiza 11, Grain yield, Straw yield.*

Introduction

Wheat in the world consider one of the most important cereal crops and in Egypt wheat is the main winter crop. It considers the most important source for human food and straw for animal feeding (El-Sheref and El-Sherif, 2020). wheat is consumed on a daily meal by the majority of the Egyptian population it is source of calories and proteins (El-Sorady *et al.* 2022). Wheat (*Triticum aestivum* L.) is used in many food industry products like bread, noodles, biscuits, and cakes (Peña *et al.* 2002).

In Egypt, we import about 5.8 million tons (according to FAO, 2021). which exhausts the Egyptian national economy as the production of this crop did

Received: 27 February 2023/ Accepted: 29 March 2023/ Published online: 1 April 2023

not cover its need. The Egyptian government is improving wheat production by sowing high yielding cultivars in accompanied by using the best practices in agriculture such as nitrogen fertilizers and planting methods (El-Sheref and El-Sherif. 2020).

Recently, climate change had an enormous effect on the agricultural production specially wheat as it is the largest cultivated area during the winter season in Egypt Climate change could reduce agricultural productivity if no adaptation measures are taken. Previous research on the effects of climate change on agricultural sector predicted a reduction on grain yield of wheat calculated by 30% in the year 2050. So, new adaptation ways to reduce the damage effect of climate change to crops should be tested and transferred to the farmers. (Khalil *et al.* 2009).

To increase crop productivity in intensive agriculture systems, nitrogen fertilizers is important tool. Wheat quality, yield and its component are relying heavily on the nitrogen fertilization and half of the world's food supply depend on Synthetic N-based fertilizers, with expected consumption level of 80 to 180 million tons of nitrogen fertilization by 2050. Although, crop productivity depends on nitrogen level, but excess rates of it could be harmful for each the environment and human health. Hence, to achieve each agronomic and environmental aims we need to manage the nitrogen fertilization in agricultural process and determine the optimal nitrogen levels (El-Sorady *et al.* 2022).

Abdel-Moneam *et al.* (2021) investigate that the best biomass yield /plant was in the cultivar Shandweel-1 at normal condition and Saad *et al.* (2022) reported that Gemaiza 11 recorded highest biomass, straw yield values and plant height compared to Misr1 which displayed higher levels of seed index.

Sowing methods have important effect on wheat production and broadcasting planting method (the common planting method way) requires higher seed rate and produce bad plant distribution. For that reason, we need to use better sowing methods to achieve more germination and uniform stand (Soomro *et al.* 2009). The objectives of this study were to evaluate the effect of planting methods and nitrogen fertilization on some bread wheat cultivars production in Assiut.

Materials and Methods

A field experiment was carried out at the Agric. Experimental farm of the Agriculture Faculty, Assiut Univ, Egypt, (27°12 N latitude and 310° 09E longitude and at 51 m above sea level) during 2020/2021 and 2021/2022 seasons.

The physical and chemical characteristics of the experiment site were as follow:

Soil characteristics	
1- Physical properties	
Sand %	25.9
Silt %	24.70
Clay %	49.40
Text grade	Clay
Water saturation %	71.2
Field capacity %	44.2
2- Chemical characteristics	
pH (1:2.5) suspension	7.80
Organic matter %	1.62
Total nitrogen %	0.09
Total caco3 %	1.20

The experiments were laid out in a randomized complete block design (RCBD) using strip plot arrangement. The planting methods (flat, ridges and raised beds) were arranged horizontally, while nitrogen rates (50, 75 and 100 kg/feddan) were arranged vertically. In addition, six bread wheat cultivars (Misr 2, Sids 14, Gemaiza 11, Shandweel 1, Giza 171 and Sids 12) were located in sub plots within the nitrogen strips, The experimental unit area was 8.75 m^2 (3.5 x 2.5 m) and in the ridges method plot consisted of five ridges and the raised beds method plot consisted of two beds. Seed level 60 kg/feddan was sown on 3 December and 24 November in first and second seasons, respectively. the form of Nitrogen fertilizer was urea (46% N) in three doses (20% with sowing and 40% before each 1st and 2nd irrigations). All other agricultural practices were applied as recommended for wheat production at this district. At harvest, ten surrounded stems were randomly taken for each experimental unit to determine number of kernels $spike^{-1}$, seed index, weight of kernels $spike^{-1}$, and the hole plot was used to determine grain and straw yields.

Grain yield (ardeb $fed.^{-1}$): Each experimental unit's wheat plants were harvested, threshed, and the grain yield was weighted in kilograms before being converted to ardeb per feddan (one ardeb = 150 kg).

Statistical analysis

All obtained data was conducted for analyzed of variance (ANOVA) using SAS program version 9.2 (SAS 2008)'s Proc Mixed, and means were compared using revised Least Significant Difference (RLSD) at a 5% level of significance. **(Steel** & Torrie, 1981).

Results and Discussion

Number of kernels/spike

Data in Table 1 shows that cultivars have high significant effect on the number of kernels/spike (NKS) in the two growing seasons and cultivar sids12 recorded the highest mean values (66.59 and 41.87 NKS in the 1st and 2nd season respectively). On the other hand, cultivars Sids 14 and Misr 2 recorded the lowest mean values for NKS in 1st and 2nd season respectively.

Table 1. Means of number of kernels per spike as affected by cultivars , nitrogen fertilizer 100 and sowing methods

Seasons	Nitrogen Treatment (N)	50 Kg/fed				75 Kg/fed				Kg/fed				General Mean	Mean		
	Sowing Method (M) Cultivar (C)	Flat	Ridges	Raised beds	Mean	Flat	Ridges	Raised beds	Mean	Flat	Ridges	Raised beds	Mean		Flat	Ridges	Raised beds
2020-2021	Giza 171	56.67	59.67	54.67	**57.00**	58.67	70.33	57.00	**62.00**	57.67	58.67	62.67	**59.67**	**59.56**	57.67	62.89	58.11
	Gemmiza 11	60.67	60.67	61.00	**60.78**	58.33	62.67	63.00	**61.33**	59.00	62.00	66.33	**62.44**	**61.52**	59.33	61.78	63.44
	Masr 2	65.67	59.00	64.67	**63.11**	60.67	57.00	56.33	**58.00**	61.33	62.33	61.33	**61.67**	**60.93**	62.56	59.44	60.78
	Sids 12	66.67	62.67	67.67	**65.67**	56.67	77.00	65.00	**66.22**	65.00	72.67	66.00	**67.89**	**66.59**	62.78	70.78	66.22
	Sids 14	45.67	54.00	50.33	**50.00**	50.33	52.33	54.67	**52.44**	59.00	49.33	50.00	**52.78**	**51.74**	51.67	51.89	51.67
	Shandaweel 1	54.33	68.80	58.00	**60.38**	56.00	64.00	59.67	**59.89**	62.00	65.33	63.33	**63.56**	**61.27**	57.44	66.04	60.33
	Mean	**58.28**	**60.80**	**59.39**	**59.49**	**56.78**	**63.89**	**59.28**	**59.98**	**60.67**	**61.72**	**61.61**	**61.33**	-	**58.57**	**62.14**	**60.09**
2021-2022	Giza 171	35.78	41.47	33.43	**36.89**	38.07	41.71	37.80	**39.19**	40.85	37.61	32.46	**36.98**	**37.69**	38.23	40.26	34.56
	Gemmiza 11	36.69	39.52	36.99	**37.73**	41.83	37.00	40.36	**39.73**	40.33	46.89	39.29	**42.17**	**39.88**	39.62	41.14	38.88
	Masr 2	32.86	38.49	36.32	**35.89**	30.94	39.28	32.76	**34.33**	38.00	35.59	36.58	**36.72**	**35.65**	33.93	37.79	35.22
	Sids 12	42.09	46.49	38.78	**42.45**	37.21	45.47	40.50	**41.06**	40.58	47.39	38.34	**42.10**	**41.87**	39.96	46.45	39.21
	Sids 14	39.26	41.22	32.36	**37.61**	34.49	36.12	34.93	**35.18**	38.32	39.39	30.44	**36.05**	**36.28**	37.36	38.91	32.58
	Shandaweel 1	40.26	44.50	42.45	**42.40**	38.97	35.17	36.91	**37.02**	37.01	37.97	37.85	**37.61**	**39.01**	38.75	39.21	39.07
	Mean	**37.82**	**41.95**	**36.72**	**38.83**	**36.92**	**39.12**	**37.21**	**37.75**	**39.18**	**40.81**	**35.83**	**38.61**	-	**37.98**	**40.63**	**36.59**

Season	2020-2021		2021-2022		season	2020-2021		2021-2022	
F test and LSD' 0.05	F test	LSD'0.05	F test	LSD'0.05	F test and LSD' 0.05	F test	LSD'0.05	F test	LSD'0.05
N	NS	-	NS	-	**N*M**	NS	-	NS	-
M	NS	-	NS	-	**N*C**	NS	-	NS	-
C	**	3.39	**	2.73	**M*C**	NS	-	NS	-
					N*M*C	NS	-	NS	-

Where NS,*and** mean non-significant, significant at 0.05 and 0.01 probability levels

Nitrogen levels and sowing methods and their interactions didn't record any significant effect on this trait, this might be due to that this trait is genetically controlled and the environment did not have a remarkable effect on it. Similarly, Knezevic *et al.* 2012 found that the heritability in wide sense for number of kernels/spike was 79.13%.

The highest mean value (77.00 NKS) over all the experiment was recorded from cultivar Sids 12 under ridges sowing method when it received 75kg nitrogen in the 1st season. In the 2nd season the same trend was found with the same cultivar but under 100 kg nitrogen fertilization.

Weight of 1000 kernels

Table 2 data shows that cultivars have high significant effect on the weight of 1000 kernels (seed index) (SI) in the two growing seasons and cultivar Gemmiza 11 recorded the highest mean values (55.95g in the 1st season and 52.64g in the 2nd season). While Misr 2 cultivar recorded the minimum mean values (43.27g in the 1st season and 37.82g in the 2nd season). In the same way, the nitrogen rates have a significant effect on the seed index in both season and nitrogen treatment 50 Kg/feddan produced the highest mean values (50.06g in the 1st season and 45.05g in the 2nd season). But sowing methods didn't record any significant effect on this trait, this consequence is contrary with Tahir *et al.* 2009 consequences may be due to different growing conditions of the two experiments. Cultivar Gemmiza 11 under ridges sowing method surpassed the other cultivars in the 1st season with 100 kg nitrogen and in the 2nd season under 50 kg nitrogen.

The highest mean value (59.39g) over all the experiment was recorded from cultivar Gemmiza 11 under ridges sowing method when it received 100kg nitrogen in the 1st season. In the 2nd season the same trend was found with the same cultivar but under 50 kg nitrogen fertilization.

Weight of kernels spike^{-1} (WKS)

Table 3 data show that cultivars have a high significant effect on WKS in both seasons. Thus, Gemmiza 11 cultivar recorded maximum mean values (3.43g in the 1st season and 2.10g in the 2nd season). This is related to the previous trait (Table 2) seed index that the same cultivar gained maximum mean value.

On the other hand, cultivars Sids 14 and Misr 2 recorded the lowest mean values for WKS in 1st and 2nd season respectively. Likewise, the first order between nitrogen rates and sowing methods has a significant effect on WKS but in the 2nd season only and nitrogen level 50 Kg N/fed with sowing method ridges appeared the maximum mean value in the 2nd season (1.94g). Otherwise, neither the previous interaction nor the other factors (nitrogen levels and sowing methods) and the rest interactions didn't record any significant effect in 1st season. on this trait.

Table 2. Means of weight of a thousand grains (g) as affected by cultivars , nitrogen fertilizer and sowing methods

Seasons	Nitrogen Treatment (N)	50 Kg/fed				75 Kg/fed				Kg/fed				General Mean	Mean		
	Sowing Method (M) Cultivar (C)	Flat	Ridges	Raised beds	Mean	Flat	Ridges	Raised beds	Mean	Flat	Ridges	Raised beds	Mean		Flat	Ridges	Raised beds
2020-2021	**Giza 171**	58.02	59.01	57.80	**58.28**	56.84	50.65	55.26	**54.25**	56.91	55.21	51.46	**54.53**	**55.68**	57.26	54.95	54.84
	Gemmiza 11	55.96	54.58	56.55	**55.70**	56.19	54.52	55.58	**55.43**	55.75	59.39	55.00	**56.72**	**55.95**	55.97	56.16	55.71
	Masr 2	42.38	43.64	44.52	**43.51**	42.35	46.33	44.92	**44.54**	41.50	42.12	41.69	**41.77**	**43.27**	42.08	44.03	43.71
	Sids 12	44.14	47.67	48.55	**46.79**	46.31	48.85	47.18	**47.44**	44.98	45.12	47.15	**45.75**	**46.66**	45.15	47.21	47.63
	Sids 14	51.73	50.70	52.29	**51.57**	50.67	48.15	52.21	**50.34**	44.41	48.98	50.48	**47.96**	**49.96**	48.93	49.28	51.66
	Shandaweel 1	45.25	44.44	43.85	**44.52**	46.39	45.13	45.35	**45.62**	41.91	44.11	42.77	**42.93**	**44.36**	44.52	44.56	43.99
	Mean	**49.58**	**50.01**	**50.59**	**50.06**	**49.79**	**48.94**	**50.08**	**49.60**	**47.58**	**49.16**	**48.09**	**48.28**	**-**	**48.98**	**49.37**	**49.59**
2021-2022	**Giza 171**	47.23	49.47	47.87	**48.19**	47.37	46.90	47.17	**47.14**	47.27	46.80	43.87	**45.98**	**47.10**	47.29	47.72	46.30
	Gemmiza 11	54.27	55.90	51.40	**53.86**	51.20	51.77	54.37	**52.44**	51.83	53.33	49.67	**51.61**	**52.64**	52.43	53.67	51.81
	Masr 2	40.10	38.13	38.63	**38.96**	36.70	39.30	36.63	**37.54**	37.10	38.93	34.83	**36.96**	**37.82**	37.97	38.79	36.70
	Sids 12	40.30	45.67	44.33	**43.43**	40.37	42.50	44.00	**42.29**	41.03	46.13	39.10	**42.09**	**42.60**	40.57	44.77	42.48
	Sids 14	43.80	46.70	45.50	**45.33**	45.27	45.23	44.53	**45.01**	42.27	45.37	38.83	**42.16**	**44.17**	43.78	45.77	42.96
	Shandaweel 1	40.10	41.67	39.87	**40.54**	39.13	39.73	39.40	**39.42**	39.47	41.07	37.27	**39.27**	**39.74**	39.57	40.82	38.84
	Mean	**44.30**	**46.26**	**44.60**	**45.05**	**43.34**	**44.24**	**44.35**	**43.98**	**43.16**	**45.27**	**40.59**	**43.01**	**-**	**43.60**	**45.26**	**43.18**

season	2020-2021		2021-2022		season	2020-2021		2021-2022	
F test and LSD' 0.05	**F test**	**LSD'0.05**	**F test**	**LSD'0.05**	**F test and LSD' 0.05**	**F test**	**LSD'0.05**	**F test**	**LSD'0.05**
N	*	1.42	*	1.33	**N*M**	NS	-	NS	-
M	NS	-	NS	-	**N*C**	NS	-	NS	-
C	**	1.6	**	1.03	**M*C**	NS	-	NS	-
					N*M*C	NS	-	NS	-

Where NS,*and** mean non-significant, significant at 0.05 and 0.01 probability levels

Table 3. Means of weight of kernels per spike (g) as affected by cultivars , nitrogen fertilizer and sowing methods

Seasons	Nitrogen Treatment (N)	50 Kg/fed				75 Kg/fed				Kg/fed				General Mean	Mean		
	Sowing Method (M) Cultivar (C)	Flat	Ridges	Raised beds	Mean	Flat	Ridges	Raised beds	Mean	Flat	Ridges	Raised beds	Mean		Flat	Ridges	Raised beds
2020-2021	Giza 171	3.28	3.47	3.17	**3.31**	3.33	3.51	3.14	**3.33**	3.26	3.24	3.23	**3.24**	**3.29**	3.29	3.41	3.18
	Gemmiza 11	3.39	3.31	3.42	**3.38**	3.27	3.41	3.49	**3.39**	3.28	3.69	3.65	**3.54**	**3.43**	3.31	3.47	3.52
	Masr 2	2.79	2.57	2.87	**2.75**	2.56	2.63	2.53	**2.58**	2.56	2.62	2.54	**2.57**	**2.63**	2.64	2.61	2.65
	Sids 12	2.94	2.99	3.28	**3.07**	2.63	3.76	3.06	**3.15**	2.94	3.26	3.10	**3.10**	**3.11**	2.84	3.34	3.15
	Sids 14	2.36	2.73	2.63	**2.57**	2.54	2.50	2.85	**2.63**	2.56	2.41	2.55	**2.51**	**2.57**	2.49	2.55	2.68
	Shandaweel 1	2.46	3.06	2.54	**2.69**	2.61	2.87	2.73	**2.73**	2.60	2.86	2.69	**2.72**	**2.71**	2.56	2.93	2.65
	Mean	**2.87**	**3.02**	**2.99**	**2.96**	**2.82**	**3.11**	**2.97**	**2.97**	**2.87**	**3.01**	**2.96**	**2.95**	**-**	**2.85**	**3.05**	**2.97**
2021-2022	Giza 171	1.69	2.05	1.60	**1.78**	1.80	1.95	1.78	**1.85**	1.93	1.76	1.41	**1.70**	**1.78**	1.81	1.92	1.60
	Gemmiza 11	2.00	2.21	1.90	**2.04**	2.14	1.92	2.18	**2.08**	2.08	2.50	1.95	**2.18**	**2.10**	2.07	2.21	2.01
	Masr 2	1.32	1.45	1.40	**1.39**	1.14	1.53	1.20	**1.29**	1.42	1.39	1.27	**1.36**	**1.35**	1.29	1.45	1.29
	Sids 12	1.70	2.14	1.71	**1.85**	1.50	1.95	1.78	**1.74**	1.65	2.17	1.49	**1.77**	**1.79**	1.62	2.09	1.66
	Sids 14	1.68	1.93	1.47	**1.69**	1.56	1.64	1.56	**1.59**	1.62	1.79	1.18	**1.53**	**1.60**	1.62	1.78	1.41
	Shandaweel 1	1.61	1.85	1.70	**1.72**	1.53	1.40	1.46	**1.46**	1.46	1.56	1.41	**1.48**	**1.55**	1.53	1.60	1.52
	Mean	**1.66**	**1.94**	**1.63**	**1.74**	**1.61**	**1.73**	**1.66**	**1.67**	**1.69**	**1.86**	**1.45**	**1.67**	**-**	**1.66**	**1.84**	**1.58**

season	2020-2021		2021-2022		season	2020-2021		2021-2022	
F test and LSD' 0.05	**F test**	**LSD'0.05**	**F test**	**LSD'0.05**	**F test and LSD' 0.05**	**F test**	**LSD'0.05**	**F test**	**LSD'0.05**
N	NS	-	NS	-	**N*M**	NS	-	*	0.12
M	NS	-	NS	-	**N*C**	NS	-	NS	-
C	**	0.16	**	0.11	**M*C**	NS	-	NS	-
					N*M*C	NS	-	NS	-

Where NS,*and** mean non-significant, significant at 0.05 and 0.01 probability levels

The maximum mean value of kernel weight spike^{-1} (3.76g) was recorded from cultivar Sids 12 under ridges sowing method when it received nitrogen level 75 kg/feddan in the 1st season. In the second season the same trend was found with the same sowing method but under 100 kg N/fed. nitrogen fertilization and cultivar Gemmiza 11.

Grain Yield (GY) (ardeb/feddan.)

Table 4 data denote that nitrogen rates have a highly significant effect on GY in both seasons. Application nitrogen level 100 Kg/fed. recorded the maximum mean values of GY (23.22 ardeb in the 1st season and 22.90 ardeb in the 2nd season). this is related to the number of spikes/m^2 (unshown data) that nitrogen level (100 Kg/feddan) recorded the maximum mean values too. Otherwise, nitrogen level 50 Kg/feddan recorded the minimum mean values in this respect (20.63 and 19.34 ardeb/fed. in 1st and 2nd season respectively). Likewise, the sowing methods have high significant effect on the GY in both season and sowing method raised beds recorded the maximum mean values of GY (25.55 ardeb in the 1st season and 25.49 ardeb in the 2nd season per feddan). On the other hand, sowing method on flat recorded the lowest mean values of GY(18.29 ardeb in the 1st season and 16.67 ardeb in the 2nd season). This might be due to that the raised beds planting significantly higher soil water drainage and reduced the soil water content. The reduced waterlogging stress promoted wheat seedling establishment and root growth, accelerated stem and tiller development (Du *et al.* 2021). also, the bed planting method gave the maximum number of spikes/m^2 (unshown data).

Similarly, the cultivars have high significant effect on GY in both season and cultivar Gemmiza 11 recorded the maximum mean values of GY (24.33 ardeb in the 1st season and 23.48 ardeb in the 2nd season per feddan). In contrast, cultivar Giza 171 estimated the minimum mean values (20.22 and 19.75 ardeb/fed. in 1st and 2nd season respectively). This is to be expected since the Gemmiza 11 cultivar surpassed all other tested cultivars with regard to weight of kernels/spike (Table 3) and consequently gained the maximum grain yield /fed.

In the same way, the first order between cultivars and nitrogen rates has high significant effect on GY in the two growing seasons and interaction of cultivar Gemmiza 11 with 100 Kg nitrogen/fed. gave the highest mean values (25.30 ardeb in the 1st season and 25.12 ardeb in the 2nd season per feddan). Otherwise, cultivar Giza 171 with 50 Kg nitrogen/fed gave the minimum mean values (19.42 ardeb in the 1st season and 18.06 ardeb in the 2nd season). Likewise, the first order between cultivars and sowing methods has high significant effect on GY in both season and cultivar Shandaweel 1 with raised beds recorded the maximum mean value in the 1st season (28.05 ardeb/fed.) and in the 2nd season cultivar Gemmiza 11 with raised beds recorded the highest mean value (28.09 ardeb/fed.).

Table 4. Means of grain Yield (ardeb / feddan) as affected by cultivars , nitrogen fertilizer and sowing methods

Seasons	Nitrogen Treatment (N)	50 Kg/fed				75 Kg/fed				Kg/fed				General Mean	Mean		
	Sowing Method (M) Cultivar (C)	Flat	Ridges	Raised beds	Mean	Flat	Ridges	Raised beds	Mean	Flat	Ridges	Raised beds	Mean		Flat	Ridges	Raised beds
2020-2021	Giza 171	16.85	19.72	21.68	**19.42**	18.03	20.48	21.96	**20.16**	19.17	21.11	22.96	**21.08**	**20.22**	18.02	20.44	22.20
	Gemmiza 11	20.05	23.76	25.87	**23.23**	21.17	24.40	27.81	**24.46**	22.01	24.88	29.01	**25.30**	**24.33**	21.08	24.35	27.56
	Masr 2	17.76	20.35	23.60	**20.57**	18.71	20.88	24.45	**21.35**	19.84	22.29	27.87	**23.33**	**21.75**	18.77	21.17	25.31
	Sids 12	16.91	18.95	24.83	**20.23**	17.53	20.48	25.76	**21.26**	18.19	23.04	26.43	**22.55**	**21.35**	17.54	20.82	25.67
	Sids 14	15.68	20.08	22.72	**19.49**	17.11	21.44	23.60	**20.72**	18.13	22.00	27.28	**22.47**	**20.89**	16.97	21.17	24.53
	Shandaweel 1	15.47	20.11	26.93	**20.84**	17.44	22.11	28.03	**22.52**	19.13	25.39	29.20	**24.57**	**22.64**	17.35	22.53	28.05
	Mean	**17.12**	**20.49**	**24.27**	**20.63**	**18.33**	**21.63**	**25.27**	**21.74**	**19.41**	**23.12**	**27.12**	**23.22**	**-**	**18.29**	**21.75**	**25.55**
2021-2022	Giza 171	13.55	18.59	22.05	**18.06**	16.35	20.03	22.72	**19.70**	17.79	21.09	25.57	**21.48**	**19.75**	15.89	19.90	23.45
	Gemmiza 11	17.17	21.84	25.57	**21.53**	18.77	24.11	28.51	**23.80**	20.51	24.67	30.19	**25.12**	**23.48**	18.82	23.54	28.09
	Masr 2	13.97	18.67	21.76	**18.13**	15.68	20.53	22.93	**19.72**	17.31	21.01	29.12	**22.48**	**20.11**	15.65	20.07	24.60
	Sids 12	14.48	21.39	24.19	**20.02**	16.80	22.56	25.41	**21.59**	18.96	23.47	28.40	**23.61**	**21.74**	16.75	22.47	26.00
	Sids 14	14.35	18.99	23.28	**18.87**	17.01	20.19	25.76	**20.99**	18.00	22.03	25.79	**21.94**	**20.60**	16.45	20.40	24.94
	Shandaweel 1	15.20	19.28	23.79	**19.42**	16.24	21.15	26.08	**21.16**	17.92	22.69	27.63	**22.75**	**21.11**	16.45	21.04	25.83
	Mean	**14.79**	**19.79**	**23.44**	**19.34**	**16.81**	**21.43**	**25.24**	**21.16**	**18.41**	**22.49**	**27.78**	**22.90**	**-**	**16.67**	**21.24**	**25.49**

season	2020-2021		2021-2022		season	2020-2021		2021-2022	
F test and LSD' 0.05	**F test**	**LSD'0.05**	**F test**	**LSD'0.05**	**F test and LSD' 0.05**	**F test**	**LSD'0.05**	**F test**	**LSD'0.05**
N	**	0.3	**	0.16	**N*M**	NS	-	*	0.78
M	**	0.22	**	0.58	**N*C**	**	0.46	**	0.54
C	**	0.24	**	0.26	**M*C**	**	0.41	**	0.49
					N*M*C	**	0.78	**	0.84

Where NS,*and** mean non-significant, significant at 0.05 and 0.01 probability levels

Similarly, the interaction between nitrogen rates and sowing methods has a significant effect on GY in the 2nd season only and the interaction of nitrogen level 100 Kg/fed with sowing method raised beds gave the maximum value in the 2nd season (27.78 ardeb/fed.). But, in the 1st season the previous interaction didn't record any significant effect on this trait, this might be due to the difference in climatic conditions between the 1st and 2nd season.

Likewise, the interaction between cultivars, nitrogen rates and sowing methods have high significant effect on GY in both seasons. Planting Shandaweel 1 cultivars on beds and fertilized it by 100 kg N fed^{-1} recorded the maximum average value of grain yield in the first season (29.20 ardeb/fed.) and in the 2nd season the same trend was found with the same sowing method and nitrogen level but with Gemmiza 11 cultivar (30.19 ardeb/fed.).

Straw Yield (SY) (Ton/ feddan.)

Table 5 Data reveal that nitrogen rates have high significant effect on SY in both seasons. Thus, nitrogen rate of 100 Kg nitrogen/fed. recorded the maximum mean values of straw yield (10.44 Ton in the 1st season and 10.22 Ton in the 2nd season). Otherwise, nitrogen level of 50 Kg nitrogen/fed. recorded the minimum mean values of SY (9.11 Ton in the 1st season and 8.47 Ton in the 2nd season per feddan). These similarly with Shirazi *et al.* (2014) as they noticed that the that straw yield increased with the highest rates of nitrogen fertilization.

Likewise, the sowing methods have high significant effect on the SY in both season and sowing method raised beds recorded the maximum mean values (11.28 Ton in the 1st season and 11.29 Ton in the 2nd season). Otherwise, sowing method on flat exhibited the minimum mean values of SY (8.23 and 7.55 Ton/fed. in 1st and 2nd season respectively). Furthermore, cultivars have high significant effect on SY in both season and cultivar Gemmiza 11 recorded the highest mean values of SY (10.19 and 9.86 Ton/ fed. in the 1st and 2nd season respectively). On the other hand, cultivar Sids 12 recorded the minimum mean values (8.83 and 8.59 Ton/fed. in 1st and 2nd season respectively).

In the same way, the interaction between nitrogen rates and sowing methods has a significant effect on SY in both season and the interaction of nitrogen level 100 Kg N/fed with sowing method raised beds recorded the maximum mean values (12.20 Ton in the 1st season and 12.5 Ton in the 2nd season per feddan). Otherwise, nitrogen level 50 Kg N/fed with sowing methods on flat recorded the lowest mean values (7.35Ton in the 1st season and 6.34 Ton in the 2nd season). Moreover, the interaction between cultivars and nitrogen levels has a significant effect on SY in 1st season and high significant effect on SY in 2nd season and interaction of cultivar Shandaweel 1 with nitrogen level 100 Kg/feddan exhibited the maximum mean values (11.01 Ton in the 1st season and 11.11 Ton in the 2nd season per feddan). On the other hand, cultivar Sids 12 with 50 Kg nitrogen/fed. gave the minimum mean values (8.05Ton in the 1st season and 7.77 Ton in the 2nd season per feddan).

Table 5. Means of straw yield (tons/feddan) as affected by cultivars , nitrogen fertilizer and sowing methods

Seasons	Nitrogen Treatment (N)	50 Kg/fed				75 Kg/fed				Kg/fed				General Mean	Mean		
	Sowing Method (M) Cultivar (C)	Flat	Ridges	Raised beds	Mean	Flat	Ridges	Raised beds	Mean	Flat	Ridges	Raised beds	Mean		Flat	Ridges	Raised beds
2020-2021	**Giza 171**	7.41	9.36	10.35	**9.04**	8.66	9.61	10.79	**9.69**	9.18	9.87	11.38	**10.14**	**9.62**	8.42	9.61	10.84
	Gemmiza 11	7.98	10.03	10.95	**9.65**	8.62	10.42	11.28	**10.11**	9.39	10.76	12.29	**10.81**	**10.19**	8.66	10.41	11.51
	Masr 2	7.26	9.53	11.13	**9.31**	8.22	9.72	11.51	**9.82**	9.18	10.32	12.03	**10.51**	**9.88**	8.22	9.86	11.56
	Sids 12	6.62	8.52	9.01	**8.05**	7.76	8.85	9.68	**8.77**	8.26	8.97	11.83	**9.69**	**8.83**	7.55	8.78	10.17
	Sids 14	7.30	9.65	10.57	**9.17**	8.42	9.66	11.34	**9.81**	9.59	9.80	12.02	**10.47**	**9.82**	8.44	9.70	11.31
	Shandaweel 1	7.54	9.46	11.37	**9.46**	8.10	10.02	11.96	**10.03**	8.65	10.75	13.62	**11.01**	**10.16**	8.10	10.08	12.32
	Mean	**7.35**	**9.43**	**10.56**	**9.11**	**8.30**	**9.71**	**11.09**	**9.70**	**9.04**	**10.08**	**12.20**	**10.44**	**-**	**8.23**	**9.74**	**11.28**
2021-2022	**Giza 171**	6.39	8.57	9.65	**8.21**	7.63	9.32	10.51	**9.15**	8.37	9.48	11.42	**9.76**	**9.04**	7.46	9.12	10.53
	Gemmiza 11	7.29	8.83	11.10	**9.07**	8.54	9.72	11.24	**9.84**	8.87	10.70	12.43	**10.67**	**9.86**	8.24	9.75	11.59
	Masr 2	6.33	8.83	9.91	**8.36**	7.89	8.81	10.91	**9.20**	8.18	9.33	12.27	**9.93**	**9.16**	7.47	8.99	11.03
	Sids 12	5.45	8.10	9.76	**7.77**	7.45	8.51	10.16	**8.71**	8.36	9.17	10.35	**9.29**	**8.59**	7.09	8.59	10.09
	Sids 14	6.70	9.31	10.69	**8.90**	7.58	9.51	11.23	**9.44**	8.71	9.66	13.41	**10.59**	**9.65**	7.67	9.49	11.78
	Shandaweel 1	5.88	8.84	10.78	**8.50**	7.96	9.20	12.30	**9.82**	8.35	9.88	15.11	**11.11**	**9.81**	7.40	9.31	12.73
	Mean	**6.34**	**8.75**	**10.32**	**8.47**	**7.84**	**9.18**	**11.06**	**9.36**	**8.47**	**9.70**	**12.50**	**10.22**	**-**	**7.55**	**9.21**	**11.29**

season	2020-2021		2021-2022		season	2020-2021		2021-2022	
F test and LSD' 0.05	**F test**	**LSD'0.05**	**F test**	**LSD'0.05**	**F test and LSD' 0.05**	**F test**	**LSD'0.05**	**F test**	**LSD'0.05**
N	**	0.18	**	0.35	**N*M**	*	0.42	*	0.54
M	**	0.31	**	0.43	**N*C**	*	0.3	**	0.43
C	**	0.12	**	0.2	**M*C**	**	0.22	**	0.36
					N*M*C	**	0.41	**	0.69

Where NS,*and** mean non-significant, significant at 0.05 and 0.01 probability levels

Similarly, the interaction between cultivars and sowing methods has high significant effect on SY in both season and cultivar Shandaweel 1 with raised beds recorded the highest mean values (12.32Ton in the 1st season and 12.73 Ton in the 2nd season per feddan). Otherwise, cultivar Sids 12 with sowing methods on Flat recorded the minimum mean values (7.55 Ton in the 1st season and 7.09 Ton in the 2nd season).

The interaction between cultivars and nitrogen levels with sowing methods have a high significant effect on SY in both seasons. Thus, sowing Shandaweel 1 cultivar on beds and supplemented with 100 Kg N/fed. recorded maximum mean values of SY (13.62 Ton in the 1st season and 15.11 Ton in the 2nd season per feddan).

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استجابة بعض اصناف قمح الخبز لمستويات التسميد الآزوتي تحت طرق زراعة مختلفة

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الملخص

تم اجراء تجربة حقلية خلال موسمي 21/2020 و22/2021 في مزرعة قسم المحاصيل البحثية – كلية الزراعة – جامعة اسيوط لدراسة تأثير معدلات النيتروجين وطرق الزراعة على محصول الحبوب لستة أصناف قمح الخبز (مصر 2، سدس 14، جميزة 11، شندويل 1، جيزة 171 وسدس 12). تم استخدام تصميم القطاعات الكاملة العشوائية (RCBD) بثلاثة مكررات باستخدام تصميم الشرائح المنشقة. تم ترتيب طرق الزراعة (المسطحة، الخطوط، المصاطب) أفقياً، بينما تم ترتيب معدلات النيتروجين (50، 75، 100 كجم / فدان) عمودياً في حين تم توزيع الاصناف في القطع المنشقة. أظهرت النتائج أن الصنف جميزة 11 سجل أعلى قيم معنوية لجميع الصفات محل الدراسة (معامل البذور، ووزن الحبوب / السنبلة، ومحصول الحبوب (اردب / فدان)، ومحصول القش (طن / فدان)) مقارنة بأصناف القمح الأخرى باستثناء الصنف سدس 12 الذي سجل أعلى قيمة معنوية لعدد الحبوب / السنبلة في كلا الموسمين. سجلت إضافة النيتروجين بمعدل 100 كجم / فدان أعلى قيم معنوية لمحصول الحبوب (اردب / فدان) ومحصول القش (طن / فدان). وتم الحصول على نفس الاتجاه مع طريقة الزراعة بالمصاطب. وكان للتفاعل بين الأصناف ومعدلات النيتروجين وطرق الزراعة تأثير معنوي كبير على محصول الحبوب في موسمي النمو. تم الحصول علي اعلي متوسط لقيم وزن الحبوب للفدان (29.20 اردب للفدان) من زراعة الصنف شندويل 1 على مصاطب وتسميدة بمعدل 100 كجم نيتروجين / فدان وفي الموسم الثاني وجد نفس الاتجاه بنفس طريقة الزراعة ومستوى النيتروجين السابقين، ولكن مع الصنف جميزة 11 (30.19 أردب / فدان).