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RESPONSE OF SOME NEWLY BREAD WHEAT CULTIVARS TO BIOFERTILIZER AND MINERAL NITROGEN FERTILIZATION RATES

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ABSTRACT

Egyptian agronomist strieved his best to increase yield via biofertilizers with less amount of mineral fertilizer. Thus a field experiments was carried out in a split plot design with randomized complete block design arrangement in three replications at Nubaria Agric. Res. Station, ARC, Nubaria region, Egypt (30° 66'N latitude and 30° 06' E longitude with an altitude of 15.00 meters above sea level), during two successive growing seasons (2019/202 and 2020/2021). The objective of this study was to investigate the effect of three nitrogen levels with a biofertilizer and 90 kg N/fed without the bifertilizer on yield and its components of Giza 171, Misr3, Misr1 and Sakha 95 wheat cultivars to maximize wheat productivity and minimize environmental pollution due to the use of mineral fertilization. The addition of the inoculum and four nitrogen levels (30 + B, 60 + B, 90 + B and 90 kg N/fed). Results showed superiority increases in yield and yield components in seasons under combined of 60 kg N + B and 90kg N + B treatments compared to 90 kg N only without the biofertilizer. Significant variations were recorded between the tested biofertilizer treatments for yield, yield components and their interaction of some characters in both seasons and combined data, except 1000- KW in the second season. Wheat cultivar, Giza 171 was the earliest cultivar, while was Sakha 95 the shortest cultivar. Also, Misr1 gave the highest number of spikes/m^2 while the least was Giza 171. Wheat cultivar Misr3 was superior in numbers of kernels/ spike and 1000-kernel weight. On the other hand, Sakha 95 had the highest grain yield ard/fed. Fertilizer combination 60kg N + B gave the shortest plants and the highest number of kernels/spikes, 1000- KW and grain yield ard/fed. Wheat cultivars responded positively under 60 kg N + biofertilizer for number of spikes/m^2.

Key words: ***Wheat (Triticum aestivum L.), Biofertilizer, Grain Yield, Yield Components.***

INTRODUCTION

Wheat is an important staple crop around the world. In Egypt, it is used as human food and its straw is used as animals feed. The gap between production and consumption in Egypt remains wide in spite of the exerted efforts for increasing wheat production (Attia and Barsoum 2013). To minimize this gap, it is necessary to enhance wheat productivity of unit area and to increase total cultivated area by choosing the highly yielding cultivars and suitable fertilization amount. The total biomass is a result of integration of metabolic reaction in the plants. Consequently, any factor influencing the metabolic activity of the plant at any period of its growth can affect the yield (Zaki *et al* 2012). Nitrogen (N) is an essential plant nutrient, widely applied as N-fertilizer to improve yields of cultivated important crops (Hassan *et al* 2014 and El-sorady *et al* 2022). The excessive applications of mineral fertilizers has some disadvantages, *i.e.,* causing serious environmental and health hazards to human and animal populations, increasing production costs and the pollution problems of soil and water

(EL-Esh 2007 and Koriem 2008). On the other hand, inoculation with different N_2-fixing bacteria, e.g., *Azospirillum* spp, *Azotobacter, Bacillus polymyxe*, *Klebsiella*, *Enterobacter,* and *Pseudomonas* resulted in considerable changes in plant growth and yield due to fixed nitrogen (El-Gizawy 2009 and 2010, Abd El-Razek and El-Sheshtawy 2013 and Attia and Barsoum 2013).

Biofertilizer is defined as a substance which contains living organisms that when applied to seed, plant surface, or soil, colonize the rhizosphere or the interior of plant and promote growth by increasing supply or availability of primary nutrients to the host plant (Vessey 2003 and El-Sheshtawy and Hager 2015).

Biofertilizers are well recognized as an important component of integrated plant nutrient management for sustainable agriculture and hold a great promise to improve crop yield Narula *et al* (2005).

Growing wheat in new reclaimed areas that are characterized as poor in organic matters and available nitrogen content would require more amounts of nitrogen fertilizers than those used in the old cultivated fertile soils.

Due to development of high nitrogen responsive cultivars and/or extension of growing wheat in the new lands, the recommended doses of nitrogen fertilizers would be increased.

Moreover, the interaction between cultivars and nitrogen fertilizer amount has been documented by El-Sorady *et al* (2022).

Thus, this investigation is aimed to

1- study the effect of the biofertilizer and mineral nitrogen rates on some agronomic traits, yield and yield components of some new bread wheat cultivars.

2- to reduce pollution resulting from the frequent use of mineral nitrogen and also reduce costs and environmental pollution.

MATERIALS AND METHODS

The study was carried out at Nubaria Research Station of the ARC, Nubaria region (30° 66'N latitude and 30° 06' E longitude with an altitude of 15.00 meters above sea level), during the two successive growing seasons, 2019/2020 and 2020/2021 and the preceding crop in the two growing seasons was maize. The soil analysis of the experimental site at Nubaria Research Station is presented in Table (1)

Table 1. Soil chemical and physical properties (Nubaria Agricultural Research Farm) in 2019-2020 and 2020-2021 seasons.

Soil property		Season	
		2019-2020	2020-2021
Ec (ds/m)		2.13	2.00
PH		8.27	8.45
Soluble cations meq/L	Ca++	6.77	7.85
	Mg++	1.98	2.00
	Na+	10.13	7.30
	K+	2.42	1.98
Soluble anions meq/L	CO3--	-	-
	HCO3-	4.11	3.77
	Cl-	11.82	10.91
	SO4--	5.37	5.78
CaCo3%		22.73	24.00
Organic M.%		0.30	0.23
Partical size distribution	Sand %	83.13	81.45
	Silt %	10.44	11.97
	Clay %	6.43	6.58
Soil Texture		Loamy Sand	Loamy Sand
Available macronutrients	N (ppm)	40.21	38.8
	P (ppm)	3.62	2.65
	K (ppm)	89.81	75.21

To study the effect of three mineral nitrogen fertilizer levels (30, 60 and 90kgN/fad) and bio fertilization (biogen) on yield and yield components of four bread wheat cultivars. Wheat grains were inoculated before sowing with free-living Nitrogen-fixing bacteria (Azotobacter) under the commercial name (Biogein) that contains a specific clone of *Azotobacter chroococcum* bacteria, conc.106 cells/ml. Biogein is produced by Biofertilizers Unit, General Organization of Agriculture Equalization Fund, Agricultural Research Centre, Giza, Egypt.

In each season, a split plot design in a randomized complete block design arrangement with three replications was used. The main plots contain four nitrogen treatments and sub plots contain genotypes. The treatments of nitrogen and biofertilizer that were applied on soil was:

1- 30kg N/fed mineral fertilizer and biofertilizer.
2- 60kg N/fed mineral fertilizer and biofertilizer.
3- 90kg N/fed mineral fertilizer and biofertilizer.
4- The recommended 90Kg N/fed mineral fertilizer only.

Mineral nitrogen fertilizer in the form of ammonium nitrate (33.5%N), as a source of nitrogen, was added in three equal doses at sowing, the first and the second irrigations. The basal doses of P, corresponding to 15 kg P_2O_5 as super phosphate (15.5% P_2O_5) was broadcasted at the time of soil preparation. Besides 50 kg of K as potassium sulfate (50% K_2O), was added with the first irrigation. Wheat cultivars used in this investigation are presented in Table (2):

Table 2. The cultivars used in this study and their pedigree.

Cultivar	Pedigree
Giza171	**ROLF07*2/KIRITATI CGSS05B00123T-099TOPY-099M-099NJ-6WGY-0B-0EGY**
Misr3	**ATTILA*2/ABW65*2/KACHU CMSS06Y00258 2T-099TOPM-099Y-099ZTM-099Y-099M-10WGY-0B-0EGY**
Misr1	**OASIS/KAUZ//4*BCN/3/2*PASTOR CMSS00Y01881T-050M-030Y-030M-030WGY-00M-0Y-0S**
Sakha95	**PASTOR//SITE/MO/3/CHEN/AEGILOPS SQUARROSA (TAUS)//BCN/4/WELL1 CMA01Y00158S-040POY-040M-030ZIM-040SY26M-0Y-0B-0ET**

The plot area was 8 m^2 (10 rows, 4m long and 20 cm apart). Seeds were drilled at a rate of 400 seeds/m^2. Sowing date was in November 23 and 25 in the first and second season, respectively. Harvest date was in the first week in May in the two seasons. All recommended agricultural practices for wheat production, except N fertilization were applied.

Data Recorded:

Date recorded were: number of days to 50% heading (DH), number of days to 50% physiological maturity (DM), plant height (cm) (PH), number of spikes/m^2 (NSM^2), number of kernels/spike (NKS), 1000- kernels weight (1000-KW), grain yield (GY) (ard/fed) (one ard= 155 kg grains and one fed= 4200m^2).

Statistical analysis:

Data were subjected to the proper statistical analysis as the technique of analysis of variance (ANOVA) of split plot designed according to Gomez and Gomez (1984). Treatments means were compared using the least significant difference (LSD) test as outlined by Waller and Duncan (1969). Computation was done using computer software SPSS IBM crop (2021). Combined analysis of variance across the two seasons was also performed if the homogeneity test was non-significant according to Levene (1960)

RESULTS AND DISCUSSIONS

Biofertilizer with mineral nitrogen fertilizer combined effect

Results in Tables (3 and 4) revealed clearly that the combination of biofertilizer with mineral nitrogen significant increases in the desired direction *i.e.* for all studied characters in both seasons and combined data except DH in both and across seasons combined, DM in the second season and combined, and 1000- KW in the first season. In the context 60 kg N/fed + biofertilizer gave the highest values of DM (138.81, 139.13 and 138.97), NKS (47.56, 48.63 and 48.09), 1000- KW (55.02, 59.28 and 57.15), grain yield ard/fed (14.92, 15.43 and 15.17) and plant height (100.94, 102.75 and 101.84 cm). Wheat plants fertilized by 90Kg N + biofertilizer gave the highest values of number of spikes/m^2 (279.63, 286.44 and 283.03), respectively.

The increase in plant height due to the biofertilizer used may be attributed to the increase of cell division and enlargement, which led to raising plant height according to enhancement of dry matter accumulation that was stored in the spike, therefore gave increase in length of spike.

Table 3. Effect of biofertilizer and nitrogen mineral fertilizer on days to 50% heading, days to 50%maturity, plant height (cm) and No. of Spikes/m^2 of four wheat varieties during two seasons (2019/2020 and 2020/2021) and their combined.

Firtilizer	DH (day)			DM (day)			PH (cm)			NSM2		
	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.
30 N + B	93.38	91.56	92.47	138.81	138.56	138.69	102.63	104.31	103.47	254.44	258.25	256.34
60 N + B	94.00	93.38	93.69	138.81	139.13	138.97	100.94	102.75	101.84	262.81	282.19	272.50
90 N + B	92.25	94.50	93.38	137.88	138.63	138.25	103.50	105.50	104.50	279.63	286.44	283.03
90 N	92.38	92.69	92.53	136.25	138.19	137.22	98.44	101.06	99.75	280.31	267.88	274.09
F-test	NS	NS	NS	**	NS	NS	**	**	**	**	**	**
LSD 0.05 (N)	-----	----	-----	1.33	----	----	2.66	3.65	1.99	10.27	11.00	10.41
cultivar	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.
Giza 171	90.63	91.50	91.06	138.13	138.25	138.19	103.19	105.56	104.38	258.44	263.69	261.06
Misr 3	93.00	93.06	93.03	137.94	138.50	138.22	101.31	102.88	102.09	272.13	277.31	274.72
Misr 1	94.56	94.25	94.41	138.44	139.50	138.97	105.44	107.13	106.28	286.50	290.88	288.69
Sakha 95	93.81	93.31	93.56	137.25	138.25	137.75	95.56	98.06	96.81	260.13	262.88	261.50
F-test	**	NS	**	NS	NS	NS	**	**	**	**	**	**
LSD 0.05 (C)	1.64	-------	1.18	-----	-----	-----	4.49	3.12	1.96	9.88	10.65	10.41
Interaction N x C	NS	NS	NS	NS	2.41	1.87	3.92	4.26	3.98	20.54	22.02	20.81

Comb. = Combined, *, **and NS indicated significant at 0.05 and 0.01 probability levels and nonsignificant, respectively.

The increase of number of kernels/spike may be attributed to the increase of spike length which caused by the biofertilizer applied Pramanik and Bera (2013).

Table 4. Effect of biofertilizer and nitrogen mineral fertilizer on No. of kernels/Spikes, 1000- Kernels weight and grain yield ard/faddan of four wheat cultivars during two seasons (2019/2020 and 2020/2021) and their combined across two seasons.

Firtilizer	NK/S			1000-KW (g)			GY ard/fed		
	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.
30 N+B	42.94	45.00	43.97	51.73	54.34	53.03	13.28	13.16	13.22
60 N+B	47.56	48.63	48.09	55.02	59.28	57.15	14.92	15.43	15.17
90 N+B	44.00	45.44	44.72	54.38	56.19	55.28	14.08	14.61	14.35
90 N	43.44	43.75	43.59	52.44	50.04	51.24	13.58	14.34	13.96
F-test	**	**	**	NS	**	**	**	**	**
LSD 0.05 (N)	2.43	2.85	2.03	-------	2.29	1.56	1.26	1.02	0.80
cultivar	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.
Giza171	44.81	45.50	45.16	52.73	54.16	53.45	12.54	13.14	12.84
Misr3	45.50	47.81	46.66	57.83	56.01	56.92	14.27	14.52	14.39
Misr1	44.00	45.13	44.56	54.24	55.48	54.86	14.49	14.90	14.69
Sakha95	43.63	44.38	44.00	48.77	54.19	51.48	14.55	14.98	14.77
F-test	NS	**	**	**	NS	**	**	**	**
LSD 0.05 (C)	-----	2.77	1.51	1.99	-------	2.00	1.15	1.33	0.65
Interaction N x C	4.35	4.96	3.02	3.55	5.03	2.21	2.05	1.83	1.31

Comb. = Combined, *, **and NS indicated significant at 0.05 and 0.01 probability levels and nonsignificant, respectively.

The increase in number of spikes/m^2 due to applied biofertilizer may be attributed to the increase of plant tillers which increased number of spikes/m^2. The increase of grain yield per faddan caused by the biofertilizer might be attributed to the increase of number of spikes/m^2 which led to raising grain yield/fad. These results are in harmony with Basha (2004) who found that biofertilization by the biofertilizer used in the present study was significantly affected wheat plants and positively number of spikes/ m^2, grain yields/fad, and number of spikes/m^2.

On the other hand, Kalboush (2003), in Egypt stated that biofertilizer treatments with the same biological compound significantly increased plant height, and grain yields of wheat.

Response of wheat cultivars

Results in Tables (3) and (4) show that the four bread wheat cultivars significantly differed in all studied traits in the two growing seasons and in the combined analysis across seasons, except days to heading (DH) in the second season, days to maturity (DM) in both seasons and combined, number of kernels/ spike (NKS) in the first season and 1000-kernel weight (1000-KW) in the second season. Misr1 cultivar had the longest heading duration (94.56, 94.25 and 94.41day), while Giza 171 was the earliest cultivar used (90.63, 91.50 and 91.06 day) in the first, the second season and in the combined data, respectively. Data in Table (3) indicate that the tallest plants, (105.44, 107.13 and 106.28 cm) were recorded for Misr1 cultivar. While, the shortest cultivar used (95.56, 98.06 and 96.81 cm), were recorded for Sakha 95 cultivar in the first, the second season and combined data across seasons, respectively.

Concerning the number of spikes/m^2, results showed that Misr1 recorded the highest number of spikes/m^2 (286.50, 290.88 and 288.69) followed by Misr 3 (272.13, 277.31 and 274.72) and then Sakha 95 (260.13, 262.88 and 261.50) in addition Giza 171 gave 258.44, 263.69 and 261.06 in both seasons and in the combined data, respectively. For the number of kernels/spike data in Table (4) cleared that Misr 3 had the highest number of kernels/spike (54.50, 47.81 and 46.66), while Sakha 95 gave the lowest number of kernels/spike (43.63, 44.38 and 44.00) in both seasons and combined, respectively. Regarding to 1000- kernel weight, Misr 3 gave the highest mean values of 1000-kernel weight (57.83, 56.01 and 56.92 g), while Sakha 95 produced the lowest values 1000-kernel weight (48.77, 54.19 and 51.48 g) in the two growing seasons and the combined data, respectively. The obtained data of grain yield (ard/fed) in Table (4) indicate that Sakha 95 gave the highest mean values of grain yield (14.55, 14.98 and 14.77 ard/fed) followed by Misr 1 (14.49, 14.90 and 14.69 ard/fed) and then Misr 3 (14.27, 14.52 and 14.39 ard/fed) and lately came Giza 171 (12.54, 13.14 and 12.84 ard/fed) in both seasons and in the combined analysis across seasons, respectively.

The differences among wheat cultivars could be due to their genetic constitutions and their interaction with the environmental factors prevailing during their development. These results similar with those obtained by Abd EI-Kareem *et al* (2013), Abdrabbo *et al* (2016) and Said and Abd El-Moneem (2016).

In addition, the increase in grain yield and other studied traits could be due to the increase in dry weight of vegetative organs of superior cultivar which might consider as a criterion for the photosynthetic efficiency of the plant. The results are in accordance with those reported by (Aboel-Ela, 2006).

Increase in yield and its components for all cultivars due to application of biofertilizer was obvious and might be due to the role of biofertilizer in enhancing soil biological activity, which improved nutrient mobilization from organic and chemical sources. Also, biofertilizer plays a significant role in regulating the dynamics of organic matter decomposition and the availability of plant nutrients and in increasing nitrogen fixation. In this respect, Sharief *et al* (1998), El-Garhi *et al* (2007) and Bahrani and Hagh (2010) reported a positive effect on yield and yield components of wheat when inoculated with biofertilizer was found. In the same trend, Khavazi *et al* (2005) stressed the importance for the broduction of biofertilizer in Iran and was found that yield improvements of more than 20% was observed for wheat as a result of application of *Azotobacter* and *Azospirillum* inoculums.

Interaction effect

The results obtained from El-Nubaria location illustrated significant effects for interactions among studied treatments in both and across the two seasons, except DH in both and across seasons and DM in the first season. However, the highest grain yield was obtained from inoculated plots of Misr1 and Sakha 95 in both and across seasons.

Table 5. Interaction effect between treatments (biofertilizer + mineral) fertilizer and wheat cultivars on No.spikes/m^2, No.of kernels of spike, 1000-KW and GY (ard/fed).

Trait	Cultivar	30 N + B			60 N + B			90 N + B			90 N		
		S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.
NSM^2	Giza 171	239.75	244.00	241.88	271.50	253.75	262.63	270.75	279.25	275.00	251.75	277.75	264.75
	Misr 3	267.50	271.00	269.25	243.50	285.25	264.38	295.00	301.50	298.25	282.50	251.50	267.00
	Misr 1	276.25	277.25	276.75	278.50	304.75	291.63	286.25	296.25	291.25	305.00	285.25	295.13
	Sakha 95	234.25	240.75	237.50	257.75	285.00	271.38	266.50	268.75	267.63	282.00	257.00	269.50
F (Nx C)		**											
NKS	Giza171	46.25	47.75	47.00	45.75	46.25	46.00	45.75	46.50	46.13	41.50	41.50	41.50
	Misr 3	38.25	43.75	41.00	46.50	50.25	48.38	47.75	47.50	47.63	49.50	49.75	49.63
	Misr 1	42.75	43.25	43.00	51.75	52.25	52.00	41.75	44.25	43.00	39.75	40.75	40.25
	Sakha 95	44.50	45.25	44.88	46.25	45.75	46.00	40.75	43.50	42.13	43.00	43.00	43.00
F (Nx C)		**											
1000KW	Giza 171	47.10	48.75	47.93	55.05	59.78	57.41	55.13	55.58	55.35	53.65	52.55	53.10
	Misr 3	55.83	57.23	56.53	56.23	55.38	55.80	58.05	57.35	57.70	61.20	54.10	57.65
	Misr 1	53.70	56.35	55.03	55.23	58.68	56.95	56.10	57.70	56.90	51.95	49.18	50.56
	Sakha 95	50.30	55.02	52.66	53.58	63.28	58.43	48.25	54.13	51.19	42.97	44.33	43.65
F (Nx C)		**											
GY	Giza171	12.90	12.83	12.86	13.63	14.45	14.04	12.20	12.63	12.41	11.45	12.65	12.05
	Misr 3	13.13	11.98	12.55	13.73	14.98	14.35	13.60	13.90	13.75	16.63	17.23	16.93
	Misr 1	13.40	13.50	13.45	15.89	16.50	16.20	14.95	15.85	15.40	13.70	13.75	13.73
	Sakha 95	13.68	14.33	14.00	16.43	15.80	16.11	15.58	16.08	15.83	12.52	13.72	13.12
F (Nx C)		**											

Comb. = Combined.

The data in Table (5) revealed the significant effects of interaction between treatments of fertilization and cultivars for NSM^2, NKS, 1000- KW and GY (ard/fed). Misr 3 gave the highest number of spikes/m^2 with the treatments (90 Kg N + biofertilizer), in the first, second and across seasons 295.00, 301.5 and 298.25, respectively. The treatment (60 kg N + biofertilizer) with Misr1 (304.75 and 291.63) and Sakha 95 (285.00 and 271.38) gave the highest value of NSM^2 in the second season and combined across seasons. The highest number of kernels/spike was obtained by Giza 171 (46.25, 47.75 and 47.00) respectively, at the level (30 kg N + B). However at the treatment (60 kg N + biofertilizer) the cultivar Misr3 (50.25 and 48.38) in the second season and combined data, Misr1 (51.75, 52.25 and 52.00), respectively and Sakha 95 (46.25, 45.75 and 46.00), respectively, in the first, second and across seasons, respectively gave the highest values of NKS.

For 1000- kernels weight Giza 171 (55.05, 59.78 and 57.41 g) respectively, Sakha 95 (53.58, 63.28 and 58.48g) respectively, in both season and combined data and Misr1 (58.68 and 56.95g) in second season and across seasons at the treatment (60kgN+biofertilizer) but Misr3 (58.05, 57.35 and 57.70 g) respectively, was superior at (90 kg N + biofertilizer) in both seasons and combined data. The data in Table (5) also showed the superiority of Giza 171 (13.63, 14.45 and 14.04 ard/fed), respectively, Misr1 (15.89, 16.50 and 16.20), respectively and Sakha 95 (16.43, 15.80 and 16.11 ard/fed) respectively, in both seasons and combined data at (60 kg N +B) for grain yield ard/fed. However Misr3 fertilized under 90 kg N only gave the highest GY ard/fed in both seasons and combined (16.63, 17.23 and 16.93 ard/fed) respectively.

In conclusion, the highest grain yield was obtained by, Misr1, Sakha 95 and followed by Giza 171, it is recommended to cultivate their seeds inoculated with biofertilizer (biogen) and added mineral fertilizer at the rate (60 kg N/fed + biofertilizer) in newly reclaimed area as El-Nubaria region.

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استجابة بعض اصناف قمح الخبز الحديثة للتسميد الحيوى
مع معدلات من التسميد النيتروجينى

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اقيمت تجربة حقلية خلال الموسمين الزراعيين (٢٠١٩-٢٠٢٠) و(٢٠٢٠-٢٠٢١) فى محطة البحوث الزراعية فى النوبارية، مركز البحوث الزراعية- منطقة النوبارية والتى تقع عند دائرة عرض ٣٠,٦٦ َ شمالا وخط طول ٣٠,٦ َ شرقا وارتفاع ١٥ م عن سطح البحر. كان تصميم التجربة قطاعات منشقة مرة واحدة فى تصميم قطاعات كاملة العشوائية فى ثلاثة مكررات. كانت الدراسة تهدف الى تأثير اضافة السماد المعدنى فى ثلاث مستويات (٣٠، ٦٠ و ٩٠ كجم نيتروجين/ فدان) مع المخصب الحيوى وإضافة ٩٠ كجم نيتروجين بدون المخصب الحيوى على بعض الصفات الزراعية وصفات المحصول والمحصول و مكوناته لاربعة اصناف من قمح الخبز استنبطها المربى المصرى بقسم بحوث القمح وهى جيزة ١٧١، مصر٣، مصر١، سخا٩٥ وأيضا تقليل استخدام الاسمدة المعدنية لتقليل التلوث الناتج عنها فى التربة والبيئة. وأشارت النتائج الى تفوق معاملتى ٦٠ كجم نيتروجين/فدان + المخصب الحيوى و معاملة ٩٠ كجم نيتروجين/فدان + المخصب الحيوى عن معاملة ٩٠ كم نيتروجين/فدان بدون إضافة المخصب الحيوى وذلك لصفات تاريخ طرد ٥٠% من السنابل و تاريخ النضج الفسيولوجى بالنسبة ل٥٠% من النباتات وارتفاع النبات وكذلك المحصول والمحصول ومكوناته خلال الموسمين وكذلك التحليل التجميعى، وقد كانت النتائج معنوية ماعدا وزن ١٠٠٠ حبة فى الموسم الثانى كانت غير معنوية. وأشارت النتائج إلى أن الصنف جيزة ١٧١ كان الاكثر تبكيرا فى عدد الأيام من الزراعة حتى ميعاد طرد السنابل، كما تميز سخا٩٥ بأنه أقل صنف طولا، مصر١ كان الأفضل فى عدد السنابل/م٢ بينما أقل الأصناف هو جيزة ١٧١ .وتميز الصنف مصر ٣ بتفوقه فى عدد حبوب السنبلة ووزن ١٠٠٠- حبة، الصنف سخا٩٥ كان الاعلى فى محصول الحبوب/فدان. وتشير النتائج أنه عند اضافة ٦٠ كجم نيتروجين/ فدان + المخصب الحيوى أعطى أفضل النتائج بالنسبة للمحصول والمحصول ومكوناته ماعدا عدد السنابل/م٢ .

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