FACULTY OF AGRICULTURE

Minia J. of Agric. Res. & Develop.
Vol. (39), No. 2, pp. 255-270, 2019

EFFECT OF INTEGRATED MINERAL AND BIO NITROGEN FERTILIZATION ON SOME AGRONOMIC TRAITS, YIELD AND ITS COMPONENTS IN BREAD WHEAT

Fouad, H. M.; A. A. Tantawy; M. A. Salem and Dalia. A. Abd-El Wahab

Dept. of Agronomy, Faculty of Agric., Minia Univ., El-Minia, Egypt.

Corresponding author email: hassan.mostafa@mu.edu.eg

Received: 25July (2019) **Accepted: 25August (2019)**

ABSTRACT

The objective of this study was to estimate effect of three bread wheat varieties and seven mineral and bio-nitrogen fertilization on some agronomic traits and grain yield and its components. The experimental design was split–plot with three replications. Three bread wheat varieties (Giza 168, Sids 13 and Sids 4) were randomly allocated in the main plot. The subplots were seven fertilization treatments (bio N fertilizer, Mineral N fertilizer, 100%MN+bio, 80%MN+bio, 60%MN+bio, 40%MN+bio and 20%MN+bio) during the two successive growing winter season 2015/2016 and 2016/2017 at the Exp. Farm Fac. of Agric., Minia University., El-Minia, Egypt. Mean square of varieties, fertilization treatments and their interaction showed significant difference for most of the studied traits in the two growing seasons. Sids 4 and Sids 13 were recorded the highest grain yield 7.39 in 1st season and 6.84 ton/ha in 2nd season, respectively. Treatment 80%MN + Minia azoten bio fertilizer resulted in the highest grain yield per ha 7.67 ton and the highest harvest index 33.76 % in 2nd season. This indicated that Minia azoten bio-fertilizer caused increase in grain yield/ha and harvest index with save 20 % from mineral nitrogen fertilization. Sids 13 with 80%MN+Minia azoten bio fertilizer recorded the highest grain yield per ha (10.36 ton) in 1st season. Giza 168 with the same treatment gave the highest grain yield (8.78 ton/ha) in 2nd season.

Keywords: split, azoten, bio fertilizer, harvest index

INTRODUCTION

Wheat (*Triticum aestivum*, L.) is one of the most strategic crops used in human food and animal feed in the world and Egypt. Average harvested area, total production and grain yield/hectare of wheat in Egypt in 2017 was the 1.34 million hectare, 8.8 million tons and 6.5 tons/hectare, respectively (FAO Statistics Division 2017). However, wheat consumption surpassed 15-16 million tons. Anually, Egypt imports about 55% of wheat consumption to meet the great demands and minimize the gap between production and consumption of wheat, thus increasing production per unit area is necessity. This could be achieved by cultivating high-yielding varieties and application recommended cultural practices. (Zaki *et al.*, 2012).

Nitrogen fertilization had a vital role to increase yield and yield attributes in various crops, especially wheat. The results of modern scientific studies have mentioned the threat uses some of the chemical fertilizer in agriculture because it has a harmful effect on the environment and human health. Therefore, there is a new trend toward minimizing using these chemical fertilizers and herbicides and focusing on bio-organic farming.

The high cost of chemical nitrogen fertilizers and the low purchasing power of most farmers reduce use nitrogen fertilizers in suitable amounts, retard crop production. Besides, a substantial amount of the urea-N is lost by different ways like ammonia volatilization, denitrification and leaching losses, causing environmental pollution problems and develop a more profitable and sustainable farming Badran, 2009. Abd El-Lattief (2012) importance of bio-fertilization in the improvement growth and productivity of bread wheat crop as well as the expansion of bio-agriculture to reduce agriculture costs and environmental pollution via lowering mineral fertilizers application.

Badr *et al.,* 2009 showed the positive effect of inoculation wheat with *Azotobacter*. In Egypt, application bio-fertilizers decreased the pH soil, which had led to increased availability of trace elements that enhance plant growth. Bio-fertilizers are eco-friendly and have been proved to be effective and economical alternate of chemical fertilizers with lesser input of capital and energy (Hafeez *et al.,* 2002).

Bio-fertilizer contains live cells of efficient strains of nitrogen fixing, phosphate solubilizing or cellulolytic micro-organisms used for application to seed, soil or composting areas to accelerate microbial processes to augment the extent of availability of nutrients. Asif *et al.,* (2012) concluded that no. of spikes/unit area, no. of grains/spike and harvest index were significantly increased by increasing N fertilization levels. Abedi and Kazemeini (2011) reported that higher grain yield was observed in treatment 240 kg N ha^{-1} than the other treatments. Marino *et al.,* (2009**)** concluded that increase the N rate increased hulled and un-hulled GY,

biomass, spikes/m^2, grains/m^2; decreased 1000 grain weight and in some cases no differences were noticed among fertilized treatments for plant height and no. of spikelets per spike. Iqtidar *et al.,* (2006) reported that increasing the N level from 50 to 200 kg ha^{-1} significantly increased the plant height, grains/spike, spikes / m^2, and grain yield compared to control. Noureldin *et al.,* (2013) reported that increasing N up to 180 kg ha^{-1} increased grain yield and its components. The efficiency of N application in winter wheat is an important indicator for rational fertilization of N-fertilization.

Esmailpour *et al.,* (2013) noticed that using bio-fertilizer *Azotobacter* had led to an increase in grain yield of wheat in comparison to the control. Ghaderi-Daneshmand *et al.,* (2012) found that using bio-fertilizer (biophospor and nitroxin) had led to significant differences in grains / spike, and grain weight compared to the control, which eventually increased the final yield, in addition to the decreasing of the environmental pollution. El-Habbasha *et al.,* (2013) noticed a significant effect on vegetative growth, yield, and its components when using *Azospillium* in wheat.

Singh *et al* (2016**)** studied the impact of bio-fertilizers with different NPK levels on growth and yield of bread wheat. The growth and yield attributes showed an increase with increasing the NPK fertilizer levels. *Azotobacter* caused significant improvement in the growth and yield attributes over control. Heidaryan and Feilinezhad (2015) indicated that significant effect of nitrogen on all the studied traits under nitrogen treatment, the highest grain yield was achieved by biofarm fertilizer. In general, separate and combined application of nitrogen and phosphorus biological fertilizers can improve yield and yield components of wheat.

The current study aims to estimate effect of three bread wheat varieties and seven mineral and bio-nitrogen fertilization treatments and the interaction between them on agronomic traits and grain yield and its components.

MATERIAL AND METHODS

The study was carried out at the Exp. Farm Fac. of Agric., Minia University., El-Minia, Egypt during the two successive growing winter season 2015/2016 and 2016/2017.

Experimental layout:

The experimental design was split–plot with three replications. Three bread wheat varieties (Giza 168, Sids 13 and Sids 4) were randomly allocated in the main plot. The sub-plots were seven fertilization treatments as follows: 1- Only bio fertilizer (Minia azoten) (Bio). 2- Recommended rate of mineral nitrogen fertilizer (80 kg N/faddan) (MN). 3-100% from recommended mineral nitrogen (80 kg N/faddan) + bio fertilizer) (100%MN +bio). 4- 80% from recommended mineral nitrogen (64 kg N/faddan) + bio fertilizer (80%MN+bio). 5- 60% from recommended mineral nitrogen (48 kg N/faddan) + bio fertilizer (60%MN+bio). 6- 40% from

recommended mineral nitrogen (32 kg N/faddan) + bio fertilizer (40%MN+bio). 7- 20% from recommended mineral nitrogen (16 kg N/faddan) + bio fertilizer (20%MN+bio).

The bio fertilizer containing *Azotobacter* under the trade name of Minia azoten. The source of Minia azoten was the unit of bio fertilizer production Fac. of Agric, Minia university, El-Minia Egypt.

- The bio fertilizer was done after 1-2 days of the first irrigation of sowing.
- Nitrogen fertilizers in the form of urea (46% N) was added as follows: 20% at sowing, 40% at first irrigation and 40% at second irrigation. In both seasons the grains was planted 28th November. The plot size was 3 x 3 m^2 included of 10 rows, each 3 m long and 30 cm apart.

The mechanical and chemical analysis of experimental soil are shown in Table 1.

Table 1. Mechanical and chemical analysis of experimental soil

Mechanical analysis		Chemical analysis	
Parameter	Value	Parameter	Value
Clay %	54.74	p H	7.96
Silt %	35.34	N%	0.88
Sand %	9.92	P mg/100g	12.87
-	-	K ppm	16

Service laboratory for soil, water and plant analyses, Fac. of Agric., Minia Univ.

At harvest ten guarded plants from each plot were taken randomly to determine the ten following studied traits: Plant height [PH] in cm, Spike length in cm. [SL], Biological yield per ha [BY] in ton. and Grain yield per ha [GY] in ton., Harvest index% [HI], the ratio of grain yield per plant to biological yield per plant, Number of spike per plant [NS/P], Number of spikelet per spike [NSPT/S], Number of grains per spike [NG/S)], Weight of grains per spike in gm [WG/S] and 1000 grain weight in gm [1000-GW].

- Biological and grain yield were token from all plants in eight internal rows of the plot and expressed as ton per hectare (ton/ha).

The pedigree of the three varieties were used in the study are given in (Table 2).

Statistical analysis:

Data were subjected to the proper statistical analysis of variance of split plot design as mentioned of by Gomez and Gomes (1984).

Treatments means were compared using the least significant difference (LSD) test at 5% and 1% level of probability as outlined by EL Rawi and Khalafalla (1980).

All statistical analysis were performed using analysis of variance technique by MSTAT-C (1990) at put in software package.

Table 2. The pedigree of three bread wheat varieties.

Varieties	Pedigree
Giza 168	MIL/Buc//Seri CM93046-8M-04-0M-2Y-0B
Sids 13	ALMAZ-19=KAUZ"S"//TSI/SNB"S". ICW94-0375-4AP-2AP-030AP-0APS-3AP-0APS-050AP-0AP-0SD
Sids 4	Maya〔S〕/Man〔S〕//CMH 74A-592/3/Giza 157*2

RESULTS AND DISCUSSION:

Mean square of varieties, fertilization treatments and varieties-fertilization interaction (Tab1e 3) showed significant difference for most of the studied traits in the first 2015/2016 and second 2016/2017 growing seasons. Similar results were reported by many authors as Badran (2011), Ghaderi-Daneshmand *et al.,* (2012), El-Habbasha *et al.,* (2013), Abd El-Razek and El-Sheshtawy (2013) and Al-Naqeeb *et al* (2018).

Table 3. Mean square of the studied traits for fertilization treatments and varieties and their interactions in the two-growing season

Season	S.V	Rep	Var (A)	Error(A)	Fert (B)	(A x B)	Error B
	d.f	2	2	4	6	12	36
2015/2016	PH	83.16	2126.02**	25.90	759.03**	526.57**	137.50
	SL	11.16	6.49*	0.75	9.81**	8.83**	2.41
	BY/P	193.35	1027.44	257.02	1250.91**	2918.90**	79.70
	GY/P	9.48	152.91	34.52	67.09	175.43**	29.03
	HI	93.56	82.74	105.36	69.98*	123.34**	27.18
	NS/P	10.00	14.24**	0.16	1.57**	2.82**	0.28
	NSPT/S	6.16	1.21	4.92	3.39	10.91	10.15
	NG/S	168.87	821.78*	75.59	475.32**	338.98**	53.68
	WG/S	0.08	16.17*	1.42	4.96	13.30**	2.15
	1000GW	86.77	408.74**	8.25	18.62**	36.17**	5.53
2016/2017	PH	63.35	30.02	60.49	570.44*	426.59	221.44
	SL	1.48	26.33**	0.24	17.77**	7.04	4.11
	BY/P	326.92	758.92*	80.59	1831.07**	1060.29**	18.22
	GY/P	137.92	3.11	35.35	25.69	42.85	29.41
	HI	208.83	79.43	57.64	221.14**	158.77**	31.85
	NS/P	0.85	22.93**	1.07	2.11*	0.49	0.70
	NSPT/S	8.44	27.68**	0.92	9.99	4.50	5.95
	NG/S	204.41	1970.14**	97.05	264.11**	77.66	56.78
	WG/S	0.85	83.69**	1.73	10.01**	9.83**	1.51
	1000GW	0.3	595.06**	15.56	9.94	11.66	10.69

* and ** significant at 0.05 and 0.01 level of probability, respectively.

Mean of the studied traits of the three varieties in the first 2015/2016 and the second 2016/2017 growing season are presented in Table 4.

Average of the varieties of plant height varied from 65.52 cm for Giza168 to 84.86 cm for sids 4 in first season and from 71.95 for Sids 13 to 74.29 cm for Sids 4. Mean of spike length varied from 10 to 11.09 in 1st season and from 9.05 to 11.29 cm in 2nd season. Sids 4 gave the highest one in plant height, spike length, biological yield, number of spikes/plant, number of spikelets/spike and no. of grains/spike with mean (84.86 and 74.29 cm), (11.09 and 11.29 cm), (26.23 and 26.86 ton/ha), (5.60 and 6.87), (15.24 and 16.95) and (62.24 and 67.05) in the first and second season, respectively.

Sids 4 and Sids 13 were recorded the highest grain yield 7.39 in first season and 6.84 ton/ha in second season, respectively (Fig. 1). Also, the same two varieties recorded the highest 1000 grain weight in first season 42.70 and second season 42.45 gm, respectively.

Respect to harvest index, Giza 168 stated the highest 29.58 and 30.43% in 1st and 2nd growing season, respectively.

Table 4. Mean of the studied traits of three varieties in first 2015/2016 (S1) andsecond 2016/2017 (S2) growing season.

Trait	Season	Giza168	Sids13	Sids4	LSD0.05	LSD0.01
PH cm.	S1	65.52	70.48	84.86	4.37	7.22
	S2	73.57	71.95	74.29	6.67	11.04
SL cm.	S1	10.00	10.38	11.09	0.74	1.23
	S2	9.05	10.10	11.29	0.42	0.69
BY ton/ha	S1	22.71	22.88	26.23	13.75	22.76
	S2	23.88	26.29	26.87	7.7	12.74
GY ton/ha	S1	6.58	6.35	7.39	5.04	8.34
	S2	6.81	6.84	6.82	5.1	8.44
HI %	S1	29.58	25.99	29.25	8.81	14.57
	S2	30.43	26.24	26.28	6.5	10.78
NS/P	S1	4.68	3.96	5.60	0.35	0.57
	S2	4.92	5.23	6.87	0.89	1.47
NSPT/S	S1	14.76	15.05	15.24	1.9	3.15
	S2	14.67	15.62	16.95	0.82	1.36
NG/S	S1	51.86	51.00	62.24	7.46	12.34
	S2	47.90	54.91	67.05	8.45	13.96
WG/S gm	S1	21.74	23.42	23.02	1.02	1.69
	S2	21.03	22.12	24.90	1.13	1.87
1000GWgm.	S1	35.30	34.80	42.70	2.46	4.08
	S2	34.10	42.45	36.36	3.38	5.6

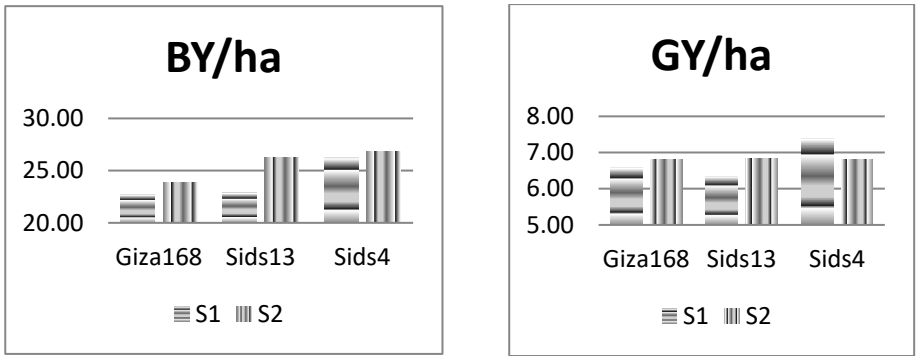

Fig.1. Biological yield and grain yield affected by three varieties in the first (S1) and second (S2) seasons

Mean of the studied traits of the seven fertilization treatments in the first 2015/2016 and the second 2016/2017 growing season are presented in Table 5.

Application of only bio-fertilizer Minia azoten recorded the highest number of spikes per plant 6.44 in the second season 2016/2017.

Application of only recommended rate of mineral nitrogen fertilization recorded the highest biological yield 26.22 ton/ha in first season 2015/2016 (Fig.2). Also, the same treatment stated the highest number of grains per spike 64.78 in the 2nd season.

The treatment of recommended dose mineral nitrogen fertilization with bio-fertilizer Minia azoten recorded the highest spike length 12.11 cm in second season, highest grain yield per ha 7.84 ton in 2015/2016 season and the highest weight of grains per spike in the two seasons 23.59 gm. Abd El-Razek and El-Sheshtawy (2013) found that application each of Microbin and N rate of 180 kg/ha were recorded the highest yield. Al-Shamma and Al-Shahwany (2014) showed that the combination of biofertilizer and 100% NP significantly affected on some agronomic traits and yield components, plant height, number of tillers/plant and dry weight and all these results affected positively on biological yield, spike length, no. of spikes/m^2, 1000 grains weight and grain yield.

Save 20% from the recommended mineral nitrogen fertilization with adding Minia azoten bio-fertilizer (80%MN+biofertilizer) resulted in the highest grain yield per ha 7.67 ton and the highest harvest index 33.76 % in the second season 2016/2017 (Fig.2). Moreover, the same treatment recorded the highest 1000 grain weight 39.60 gm in the first growing season 2015/2016. This indicated that Minia azoten bio-fertilizer caused increase in grain yield/ha, harvest index and 1000 grain weight with save 20 percentage from mineral nitrogen fertilization. Badran (2011) concluded that bacterial inoculation of wheat seeds with bio-N fertilizer Cerealin, fertilized with 200 kg mineral N/ha during, could be suggested to reduce the environmental pollution and

compensate about 20% of plant requirements of mineral nitrogen fertilization and maximize grain yield of Giza 168 wheat cultivar.

Treatment of 80% MN + bio fertilizer gave the highest spikes/plant 5.30 and no. of spikelets per spike 16.00 in 1st and 2nd season, respectively. Also, 80%+bio gave the highest 1000GW 37.80 gm in second season 2016/2017. Abd El-Lattief (2012) found that the bio-fertilizers (double-inoculation of *Azotobacter* and *Azospirillum*) of efficient strains could save 25 or 50 % of the recommended dose of mineral N.

Treatment 60%MN+Minia azoten bio fertilizer recorded the highest no. of spikes/plant 5.30 and no. of spikelets/spike 16.00 in first season. Moreover, it was recorded highest 1000-grain weight 37.80 gm in second season 2016/2017. Taha *et al* (2016) showed that application of biofertilizers in combination with mineral fertilizers (NPK) significantly increased plant height, no. of spikes/plant, no. of spikeletes/spike, spike length and dry weight/plant. This resulted in an increase in grain yield during two seasons, respectively by the combined treatment of Butassine N+75% NPK.

Application 40%MN with Minia azoten bio-fertilizer resulted in highest plant height 88.33 cm and harvest index 32.25% in the first season 2015/2016. Abd El-Lattief (2012**)** found that fertilization treatments significantly affected plant height, spike length, spikelets/spike, grain weight /spike, 1000-grain weight and yield and harvest index. The highest values of such traits were obtained in treatment 75%MN + *Azotobacter* and *Azospirillum* biofertilizer. However, 50%MN + with *Azotobacter* and *Azospirillum* biofertilizer resulted in higher values for the above-mentioned traits comparing with 100%MN and uninoculated seeds.

Treatment 20%MN with Minia azoten recorded the highest spike length 11.89 cm and grains/spike 68.56 in the first season. And gave the highest plant height 83.89 cm, biological yield/ha 29.82 ton and spikelets/spike 17.11 in the 2nd season.

Means of the studied traits of varieties – fertilization interaction in the two seasons are shown in Table 6.

Sids 4 with treatment 100%MN+biofertilizr Minia azoten recorded the highest plant height 95.67 cm and highest harvest index 39.87% in 2015/2016 season. While Giza 168 with the same treatment gave the highest PH 90.00 cm and HI 41.72% in the second season 2016/2017. Sids 13 and Sids 4 with 20%MN+bio fertilizer gave the same plant height for Giza 168 with 100%MN+bio fertilizer (90.00 cm).

Sids 4 gave the highest spike length with 20%MN+bio fertilizer (13.33 cm) in 1st season, and with 60%MN+bio fertilizer (13.67 cm) in 2nd season.

Respect to biological yield, Sids 13 with only mineral nitrogen fertilization gave the highest BY (35.91 ton/ha) in first season. While, Sids 4 with only Mina azoten bio-fertilizer stated the highest BY 35.12 ton/ha in 2nd season.

Table 5. Mean of the studied traits of fertilization treatments in the first 2015/2016 and second 2016/2017growing seasons.

Trait	Season	Bio	MN	100%MN +Bio	80%MN +Bio	60%MN +Bio	40%MN +Bio	20%MN +Bio	LSD 0.05	LSD 0.01
PH cm.	S1	66.67	66.67	76.44	79.44	62.78	88.33	75.00	11.77	14.92
	S2	57.78	75.56	72.33	77.78	73.33	72.22	83.89	14.17	18.94
SL cm.	S1	10.00	10.00	9.67	9.11	11.78	11.00	11.89	1.48	1.97
	S2	8.11	11.22	12.11	11.11	10.00	9.33	9.11	1.93	2.52
BY ton/ha	S1	25.20	26.22	26.16	25.08	25.11	15.86	23.94	8.50	11.6
	S2	28.80	23.73	21.19	21.10	25.84	29.27	29.82	4.86	5.43
GY ton/ha	S1	5.94	6.82	7.84	7.05	6.91	6.99	5.85	5.13	6.86
	S2	6.88	6.50	6.44	7.67	6.88	7.20	6.17	5.16	6.9
HI %	S1	25.53	28.36	31.35	28.42	27.32	32.25	24.67	4.96	6.64
	S2	24.31	24.67	32.18	33.76	29.54	25.34	23.74	5.37	7.18
NS/P	S1	5.28	4.72	4.34	4.83	5.30	4.49	4.28	0.54	0.68
	S2	6.44	5.67	5.28	5.03	5.38	5.99	5.92	0.80	1.06
NSPT/S	S1	15.11	14.44	14.22	14.67	16.00	15.33	15.33	3.03	4.05
	S2	15.56	14.89	14.44	15.11	17.11	16.00	17.11	2.32	3.1
NG/S	S1	57.00	59.00	47.22	49.67	53.44	50.33	68.56	6.48	9.33
	S2	60.33	64.78	53.89	58.56	57.66	48.34	52.78	7.18	9.59
WG/S gm.	S1	23.22	23.48	23.59	22.23	22.00	21.74	22.84	1.40	1.87
	S2	20.68	22.68	23.59	23.19	21.92	23.26	23.50	1.17	1.57
1000GWgm.	S1	38.60	36.90	38.00	39.60	36.40	38.20	35.30	2.24	2.99
	S2	36.80	37.30	34.80	35.80	37.80	35.60	36.40	3.11	4.16

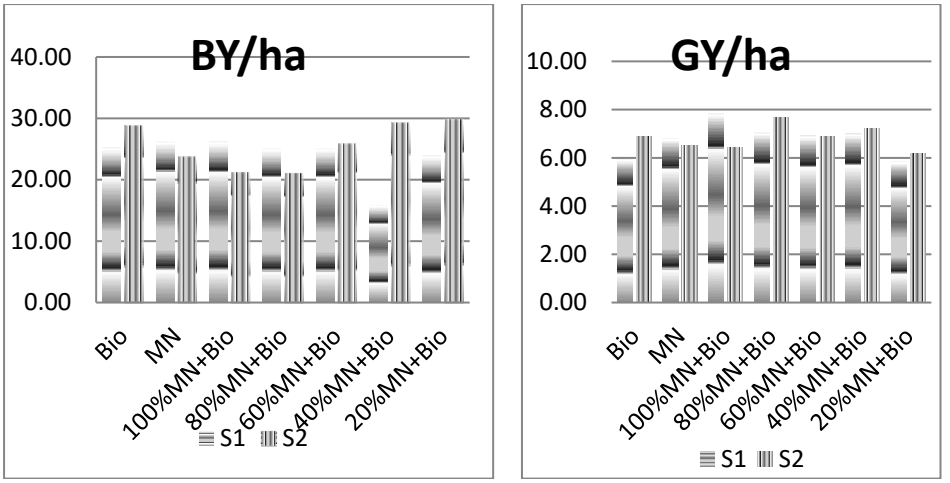

Fig.2. Biological yield and grain yield affected by seven fertilization treatments in the first (S1) and second (S2) seasons.

Regarding grain yield per ha, Sids 13 with 80%MN+Minia azoten bio fertilizer recorded the highest grain yield per ha (12.48 ton) in the first season 2015/2016. Giza 168 with the same treatment gave the highest grain yield (10.58 ton/ha) in the second season 2016/2017 (Fig.3). Abd El-Razek and El-Sheshtawy (2013) observed that the highest grain yield/ha was found with interaction between Microbin x Gemmeza 9. Rate of 180 kg N /ha and Microbin using wheat variety Gemmeza 9 could be recommended for favourable wheat production under local environmental conditions.

Sids 4 gave the highest spikes/plant (6.50) with treatment 20%MN+bio fertilizer in 1st season and the highest spikes/plant (7.50) with only bio-fertilizer in second season. In first season, Sids 4 with 60%MN+bio fertilizer stated the highest no. of spikelets/spike 18.00, While, in the second season Sids 13 gave the best spikelets/spike 18.67 with 20%MN+Minia azoten bio fertilizer. Respect to no. of grains per spike, in 1st season 2015/2016 Sids 4 with only bio-fertilizer recorded the highest NG/S 76.00. In 2nd 2016/2016 Sids 4 with each of only mineral nitrogen and treatment 80% MN+bio fertilizer gave the same highest value 72.67 grain.

Sids 13 with only bio-fertilizer Minia azoten gave the highest weight of grains per spike 26.23 in first season. While, in the second season 2016/2017 Sids 4 with 100%MN+bio fertilizer stated the best WG/S 26.00 gm.

Sids 4 with recommended mineral nitrogen gave the highest 1000 grain weight 43.70 gm in 1st season 2015/2016, while with 60%MN+bio fertilizer it gave highest 1000GW 46.00 gm in 2nd season 2016/2016. Al-Naqeeb *et al* (2018) showed that Ibaa99 cultivar, three times of EM-1 bio fertilizer spraying and their interaction gave the highest averages of grain yield for both seasons.

Table 6. Mean of traits of varieties and fertilization interaction in first 2015/2016 and second 2016/2017 season.

Trait	Season	Variety	Bio	MN	100%MN +Bio	80%MN +Bio	60%MN +Bio	40%MN +Bio	20%MN +Bio	LSD 0.05	LSD 0.01
PH cm.	S1	Giza168	60.00	50.00	43.67	86.67	58.33	78.33	81.67	19.34	25.85
		Sids13	65.00	66.67	90.00	66.67	55.00	95.00	55.00		
		Sids4	75.00	83.33	95.67	85.00	75.00	91.67	88.33		
	S2	Giza168	63.33	78.33	90.00	70.00	68.33	73.33	71.67	24.56	32.81
		Sids13	50.00	61.67	62.00	75.00	80.00	85.00	90.00		
		Sids4	60.00	86.67	65.00	88.33	71.67	58.33	90.00		
SL cm.	S1	Giza168	8.00	9.00	8.00	9.00	11.33	12.33	12.33	2.56	3.4
		Sids13	9.00	12.00	10.00	10.00	12.67	9.00	10.00		
		Sids4	13.00	9.00	11.00	8.33	11.33	11.67	13.33		
	S2	Giza168	9.33	10.67	10.33	9.67	7.33	9.00	7.00	3.35	4.47
		Sids13	7.00	10.00	12.67	12.33	9.00	10.00	9.67		
		Sids4	8.00	13.00	13.33	11.33	13.67	9.00	10.67		
BY ton/ha	S1	Giza168	24.23	19.93	33.89	13.17	21.60	21.42	24.76	14.72	19.68
		Sids13	19.31	35.91	25.20	35.47	24.06	5.27	14.93		
		Sids4	32.05	22.83	19.40	26.60	29.68	20.89	32.13		
	S2	Giza168	24.41	18.61	15.80	21.51	23.70	31.26	31.87	7.64	9.41
		Sids13	26.87	24.23	19.75	17.65	32.31	32.40	30.82		
		Sids4	35.12	28.36	28.01	24.14	21.51	24.14	26.78		
GY ton/ha	S1	Giza168	7.20	7.90	8.34	4.04	5.44	6.85	6.32	8.89	11.86
		Sids13	4.92	5.88	7.46	10.36	6.58	6.50	2.72		
		Sids4	5.71	6.67	7.73	6.76	8.69	7.64	8.52		
	S2	Giza168	6.58	7.20	6.58	8.78	5.71	6.67	6.14	8.94	11.96
		Sids13	7.46	7.02	6.14	5.97	6.58	7.90	6.58		
		Sids4	6.58	5.27	6.58	8.25	8.34	7.02	5.79		
HI %	S1	Giza168	29.67	39.57	24.57	30.20	25.30	32.17	25.57	8.60	11.49
		Sids13	29.00	16.40	29.60	29.70	27.27	28.00	21.93		
		Sids4	17.93	29.10	39.87	25.37	29.40	36.57	26.50		
	S2	Giza168	26.91	38.71	41.72	41.03	23.79	21.40	19.45	9.31	12.44
		Sids13	27.57	16.90	31.13	32.43	27.41	23.36	24.90		
		Sids4	18.46	18.41	23.69	27.83	37.43	31.26	26.88		

Continue Table 6. Mean of traits of varieties and fertilization interaction in first 2015/2016 and second 2016/2017 season.

Trait	Season	Variety	Bio	MN	100%MN +Bio	80%MN +Bio	60%MN +Bio	40%MN +Bio	20%MN +Bio	LSD 0.05	LSD 0.01
NS/P	S1	Giza168	5.50	5.10	4.83	4.50	6.00	3.50	3.33	0.88	1.17
		Sids13	4.33	2.90	3.70	4.90	5.17	3.73	3.00		
		Sids4	6.00	6.17	4.50	5.10	4.73	6.23	6.50		
	S2	Giza168	5.33	5.00	4.83	4.33	4.87	5.10	5.00	1.38	1.84
		Sids13	6.50	5.00	4.17	4.43	4.83	6.17	5.50		
		Sids4	7.50	7.00	6.83	6.33	6.43	6.70	7.27		
NSPT/S	S1	Giza168	14.00	15.33	14.67	14.67	14.67	16.00	14.00	5.25	7.02
		Sids13	17.33	14.00	10.67	15.33	15.33	16.00	16.67		
		Sids4	14.00	14.00	17.33	14.00	18.00	14.00	15.33		
	S2	Giza168	14.00	14.67	14.00	12.67	18.00	14.67	14.67	4.02	5.38
		Sids13	16.00	14.67	14.00	15.33	15.33	15.33	18.67		
		Sids4	16.67	15.33	15.33	17.33	18.00	18.00	18.00		
NG/S	S1	Giza168	40.00	41.67	41.67	59.00	50.00	55.00	75.67	12.08	16.15
		Sids13	55.00	65.33	40.00	45.00	55.33	41.00	55.33		
		Sids4	76.00	70.00	60.00	45.00	55.00	55.00	74.67		
	S2	Giza168	48.33	56.67	50.00	53.33	53.33	36.67	37.00	12.43	16.61
		Sids13	61.67	65.00	46.67	49.67	53.33	51.67	56.33		
		Sids4	71.00	72.67	65.00	72.67	66.33	56.67	65.00		
WG/S gm.	S1	Giza168	22.23	23.17	23.10	21.33	21.27	19.17	21.93	2.42	3.23
		Sids13	26.23	21.33	24.90	24.90	20.43	21.73	24.43		
		Sids4	21.20	25.93	22.77	20.47	24.30	24.33	22.17		
	S2	Giza168	19.33	23.00	22.03	19.50	18.00	23.10	22.27	5.03	2.71
		Sids13	20.97	19.50	22.13	23.67	23.17	23.50	21.93		
		Sids4	21.73	25.53	26.60	26.40	24.60	23.17	26.30		
1000GW gm.	S1	Giza168	40.90	34.70	39.70	32.70	33.00	32.70	33.70	3.88	5.18
		Sids13	32.00	32.30	32.30	42.30	34.00	38.70	31.70		
		Sids4	43.00	43.70	42.00	43.70	42.30	43.30	40.70		
	S2	Giza168	32.30	32.00	32.00	32.30	33.30	32.70	33.00	5.39	7.21
		Sids13	35.30	36.30	33.80	32.30	34.00	35.30	31.70		
		Sids4	42.70	43.67	38.70	42.70	46.00	38.70	44.70		

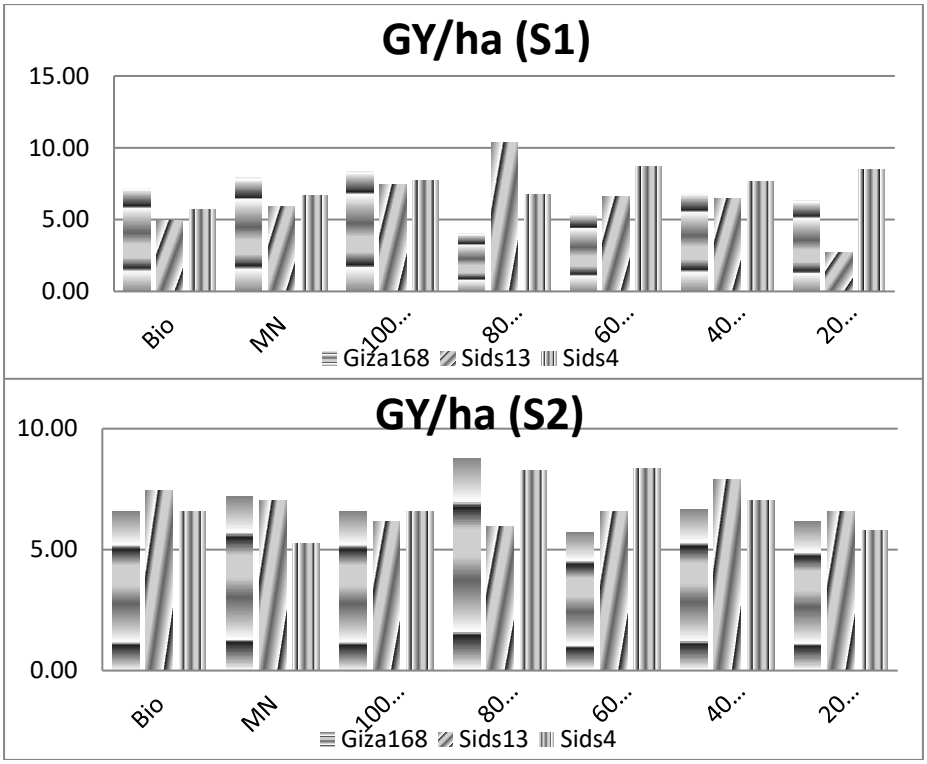

Fig.3. Grain yield affected by varieties-fertilization interaction in the first (S1) and second (S2) seasons.

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تأثير دمج التسميد النيتروجيني المعدنى والحيوى على بعض الصفات الزراعية وصفات المحصول ومكوناته فى قمح الخبز

حسن محمد فؤاد؛ ابو بكر عبد الوهاب طنطاوى؛ منصور عبد المجيد سالم؛ داليا عبد المنعم عبد الوهاب

قسم المحاصيل – كلية الزراعة – جامعة المنيا – المنيا – مصر

الهدف من هذه الدراسة هو تقدير تأثير ثلاث اصناف من قمح الخبز وسبعة معاملات من التسميد االنيتروجينى المعدنى والحيوى على بعض الصفات الزراعية وصفات المحصول ومكوناته لقمح الخبز ، والتصميم التجريبى المستخدم هو القطع المنشقة مرة واحدة حيث وزعت الثلاث اصناف وهى (جيزة 168 و سدس 13 وسدس 4) فى القطع الرئيسية بينما وزعت السبعة معاملات تسميد وهى (سماد حيوى وسماد معدنى و 100%معدنى+حيوى و 80%معدنى + حيوى و 60%معدنى+حيوى و 40% معدنى+حيوى و 20%معدنى + حيوى) فى القطع المنشقة خلال موسمين زراعيين شتويين متتاليين 2016/2015 و 2017/2016 وتمت الزراعة فى 28 نوفمبر فى كل موسم في المزرعة التعليمية بكلية الزراعة بجامعة المنيا – مصر وأظهرت نتائج متوسط مربعات (التباين) للأصناف ومعاملات التسميد والتفاعل بينهم وجود اختلافات معنوية فى معظم الصفات تحت الدراسة فى موسمين الزراعة ، وسجل الصنف سدس 4 والصنف سدس 13 اعلى محصول حبوب 7.39 طن/هكتار فى الموسم الاول و 6.84 طن/هكتار في الموسم الثاني على التوالي ، وقد نتج عن المعاملة 80 % من التسميد النيتروجينى المعدنى + السماد الحيوي منيا ازوتين اعلى كمية محصول حبوب بمقدار 7.67 طن/هكتار واعلى دليل حصاد 33.76 % في الموسم الثانى ، وهذا يوضح ان السماد الحيوى منيا ازوتين قد سبب زيادة فى محصول الحبوب/نبات ودليل الحصاد مع توفير 20 % من السماد النيتروجينى المعدنى ، وقد سجل الصنف سدس 13 مع المعاملة 80 % سماد نيتروجينى معدنى + السماد الحيوى منيا ازوتين اعلى كمية محصول حبوب/نبات بمقدار 10.36طن/هكتار فى الموسم الاول بينما سجل الصنف جيزة 168 مع نفس المعاملة اعلى محصول حبوب/نبات 8.78 طن/هكتار في الموسم الثاني.