Zagazig J. Agric. Res., Vol. 45 No. (6B) 2018 2269-2280

Plant Production Science

http:/www.journals.zu.edu.eg/journalDisplay.aspx?Journalld=1&queryType=Master

INFLUENCE OF MINERAL, BIOLOGICAL AND ORGANIC NITROGEN FERTILIZER REGIMES ON TWO BREAD WHEAT CULTIVARS UNDER SANDY SOIL CONDITIONS

Yasser A. M. Khalifa[1*], K.A.O. Al-Aref[1], E.A. Abd El-Lattief[2] and M.V. Youssif[1]

1. Agron. Dept., Fac. Agric., Al-Azhar Univ., Assuit Branch, Egypt

2. Agron. Dept., Fac. Agric., South Valley Univ., Egypt

Received: 23/10/2018 ; Accepted: 13/11/2018

ABSTRACT: This research was carried out on a sandy loam soil during two consecutive seasons of 2011/2012 and 2012/2013 in the Experimental Farm of the Faculty of Agriculture, South Valley University at Qena, Egypt. The recommended N (mineral), FMC "Filter Mud Cake" and bio-fertilizer (*Azotobacter chroococcum* and *Azospirillum lipoferum*) were applied alone and in various combinations among them on two bread wheat cultivars (*Triticum aestivum*) Giza-168 and Sids-12 to study their effects on total chlorophyll content, spike length, 1000-grain weight, grain, straw and biological yields/fad., and protein percentage. The experiment was arranged in a split plot based on randomized complete block design with four replications. The results showed that the application of Bio and FMC in combination with nitrogen fertilization T_{11} (50% mineral N +50% N as FMC +N Bio) and T_{12} (25% mineral N +75% N as FMC +N Bio) significantly increased all characters studied: *i.e.* Spike length, 1000-grain weight, grain, straw and biological yields (ton/fad.) in both seasons.

Key words: Wheat, bio-organic fertilizer, filter mud cack, grain, biological yield.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is the most important cereal crop in Egypt, increasing wheat production is an essential national target to fill the gap between production and consumption. Egypt's wheat production estimated at 9 million tons in 2016 (**FAOSTAT, 2016**).

The high cost of chemical nitrogenous fertilizers and the low purchasing power of most of the farmers are restricting the use of these fertilizers in proper amounts and hampering crop production. Besides, a substantial amount of the Urea-N is lost through different mechanisms including ammonia volatilization, denitrification and leaching losses, causing environmental pollution problems.

In Egypt, a tremendous mass of filter mud as by products obtained from the clarification of cane juice in sugar industries. These waste residues present a problem for disposal; therefore, it was through useful to use residues as an organic source sugar cane filter mud contains a considerable amount of plant nutrients, mainly nitrogen (**Arafat *et al.*, 1997**).

Sugar cane filter mud is a good source of available N when applied to soil and its application cane reduce the amount of fertilizer nitrogen required for optimum crop yield and play a role in decreasing the pollution effect of excessive N mineral fertilizer in soil (**Arafat *et al.*, 1997** and **Yassen *et al.*, 2002**), The use of organic fertilization had a positive effect on wheat where led to increased plant height, biological and grain yields (**Abd El-Lattief, 2008; Abejehu, 2009; Ozturk *et al.*, 2012; Esmailpour *et al.*, 2013; Youssef *et al.*, 2013; Zahoor, 2014**).

Application of bio-fertilizer is considered today to limit the use of mineral fertilizers and

* **Corresponding author: Tel. :** +2001005803883
E-mail address: yaasserbeet@yahoo.com

supports an effective tool for desert development under less polluted environments, decreasing agricultural costs, maximizing crop yield due to providing them with an available nutritive elements and growth promoting substances (**Metin *et al*., 2010**). Soil microorganisms are important components in the natural soil sub-ecosystem because not only can they contribute to nutrient availability in the soil, but also bind soil particles into stable aggregates, which improve soil structure and reduce erosion potential (**Shetty *et al.*, 1994**). Many authors have shown the positive effect of bio-fertilizers (*Azotobacter* and *Azospirillum*) on wheat (**Ahmed *et al.*, 2011; Abd El-Lattief, 2012; Esmailpour *et al*., 2013; Mohamed *et al*., 2013; Taher *et al*., 2013**).

The objectives of this study are to evaluate the importance of bio-organic fertilization in improving growth and productivity of two bread wheat cultivars under sandy soil conditions and in reducing environmental pollution *via* lowering mineral fertilizers application.

MATERIALS AND METHODS

Two field experiments were carried out at the Experimental Farm, Faculty of Agriculture, South Valley University, Qena Governorate, Egypt, during the two winter seasons 2011/2012 and 2012/2013 to study the effect of mineral nitrogen, bio-fertilization (*Azotobacter chroococcum* + *Azospirillum lipoferum*) and filter mud cake (FMC) on total chlorophyll (SPAD unit), yield and its components and protein percentage of two bread wheat cultivars (Giza-168 and sids-12) under sandy soil conditions. The physical and chemical analyses for the experimental sites in the two growing seasons 2011/2012 and 2012/2013 are presented in Table 1, according to (**Chapman and Pratt, 1978**).

Sowing date was on 27th November in both seasons. Seeding rate was 80 kg/fad. The experiment included twelve treatments, as follows: T1-100% mineral N (recommended), T2- 100% N as Filter Mud Cake "FMC", T3- N Bio (*Azotobacter chroococcum* + *Azospirillum lipoferum*), T4- 75% mineral N +25% N as FMC, T5- 50% mineral N +50% N as FMC, T6- 25% mineral N +75% N as FMC, T7- 75% mineral N + N Bio (*Azotobacter chroococcum* + *Azospirillum lipoferum*), T8- 50% mineral N + N Bio (*Azotobacter chroococcum* + *Azospirillum lipoferum*), T9- 25% mineral N + N Bio (*Azotobacter chroococcum* + *Azospirillum lipoferum*), T10- 75% mineral N +25% N as FMC +N Bio, T11- 50% mineral N +50% N as FMC +N Bio and T12- 25% mineral N +75% N as FMC +N Bio.

The experiment was carried out in a randomized complete block design (RCBD), the treatments were arranged in split-plot design with four replications, where cultivars put in main plots and fertilization treatments were in sub-plots; the area of the experimental unit was 6 m^2 (2m x 3m).

For Mineral nitrogen (at a rate of 90 kg N): different mineral nitrogen rates were added in the form of urea (46.5%) in three doses, where the first one was added before the first irrigation, the second dose was added before second irrigation, while the third dose was added before the third irrigation.

Regarding biofertilizer treatments, the grains were inoculated by biofertilizer (*Azotobacter chroococcum* + *Azospirillum lipoferum*) which obtained from Biofertilizers Production Unit of Faculty of Agriculture, South Valley University, where inoculation was done before sowing directly.

Filter Mud Cake is sugarcane residues produced in the Sugarcane Factory at Nag Hamadi, Qena, Egypt, chemical properties of filter mud cake were, 0.76%, 0.51% and 0.23% for nitrogen, phosphorus and potassium, respectively. Where was added during seedbed preparation by rates of 100% (as recommended ratio of nitrogen in mineral fertilizers) = 11.842 ton/fad., 75% (as recommended ratio of nitrogen in mineral fertilizers) = 8.881 ton/fad., 50% (as recommended ratio of nitrogen in mineral fertilizers) =5.921 ton/fad., and 25% (as recommended ratio of nitrogen in mineral fertilizers) =2.960 ton/fad.

Data Recorded

10 leaves were taken at random from each plot from the four replicates at 60, 75, 90 and 105 days from sowing to measure total chlorophyll content, where was measured by using a chlorophyll meter (Model SPAD 502, Minolta Japan), according to **Ozturk (2012)**.

Table 1. The physical and chemical analyses of soil field experiments

Season	Physical analysis				
	Sand (%)	Silt (%)	Clay (%)	Soil texture	
2011/2012	81.92	8.00	10.08	Sandy loam	
2012/2013	79.75	9.15	11.10	Sandy loam	

	Chemical analysis					
	pH	EC (dSm^{-1})	$CaCO_3$ (%)	Total N (%)	Available P (ppm)	Available K (ppm)
2011/2012	8.2	2.5	10.2	1.19	2.4	144
2012/2013	8.16	2.5	9.8	1.31	2.64	261

Ten spikes were taken randomly from each plot from four replications to determine yield and its components *i.e.,* Spike length (cm), 1000-grain weight (g) was estimated for each plot. Meanwhile, grain, straw and biological yields/ fad., were estimated by harvest one m^2/plot. Also, grain protein content on dry matter basis was determined by the Kjeldahl method according to **AOAC (1990)**.

Statistical Analysis

Data analysis was performed using the SAS software (version 9.1, SAS Institute). Mean separation of data was carried out using least significant difference LSD test at 5% probability levels as reported by **Gomez and Gomez (1984)**.

RESULTS AND DISCUSSION

Total Chlorophyll Content (SPAD Unit)

As shown from results in Table 2 cultivars had a significant effect on total chlorophyll content after 75 days from sowing in the first season and after 60, 75 days in the second season where Sids12 surpassed Giza 168 in all growth stages in both seasons, this difference may be due to the genetic behavior combination with environment factors which was suitable for Sides-12 cultivar than Giza-168. Similar trend of results were obtained by **Ahmed *et al.* (2011), Hasanpour *et al.* (2012) and Zaki *et al.* (2012)**.

Application of filter mud cake especially mixed treatment with nitrogen mineral T_4 "75% mineral N +25% N as FMC" (50.57), resulted in a significant increase in chlorophyll content of wheat leaves at 60 days after sowing (DAS) during the second season (Table 3). Also, adding nitrogen alone T_1 (100% mineral N) gave significant increase in chlorophyll content of wheat leaves (52.59) at age 75 DAS in the second season

A promotion effect of organic fertilizers on chlorophyll contents might be attributed to the fact that N is a constituent of chlorophyll molecule. Moreover, nitrogen is the main constituent of all amino acids in proteins and lipids that acting as a structural compounds of the chloroplast. Similar results were obtained by **Ozturk *et al.* (2012), Namvar and Khandan (2013) and Rajasekaran *et al.* (2015)**.

The effect of interaction between fertilizers and cultivars on total chlorophyll content at 60, 75, 90 and 105 DAS were not significant in both seasons.

Spike Length (cm)

Means of wheat spike length in cm for Giza-168 and Sids-12 cultivars as affected by nitrogen, biofertilizer and filter mud cake rates as interactions in 2011/2012 and 2012/2013 season are presented in Table 4.

Spike length was significantly affected by cultivars in 2011/2012 season only, where spike length of Giza-168 was longer than Sids-12 cultivars, this may be due to differences in their genetic makeup and their reaction to the environments condition prevailing during it growth. These results are in agreement with those reported by **Arafat *et al.* (1997), Abejehu (2009) and Ahmed *et al.* (2011)**.

Table 2. Impact of mineral, organic and biological nitrogen fertilizers and its combinations on total chlorophyll content (SPAD unit) of two bread wheat cultivars during 2011/2012 season

Main effects and combinations	At 60 days after sowing			At 75 days after sowing			At 90 days after sowing			At 105 days after sowing		
	Giza-168	Sids-12	Mean	Giza-168	Sids-12	Mean	Giza-168	Sids-12	Mean	Giza-168	Sids-12	Mean
T1-100% mineral N(Rcom)	37.43	37.69	37.56	44.33	48.43	46.38	46.27	49.86	48.06	46.10	45.30	45.70
T2- 100% N as FMC "Filter Mud Cake"	26.66	42.38	34.52	45.98	45.15	45.57	40.10	49.09	44.59	41.72	46.29	44.00
T3- N Bio	24.33	39.34	31.83	40.31	50.51	45.41	41.27	67.01	54.14	37.95	45.50	41.73
T4- 75% mineral N +25% N as FMC	35.55	42.37	38.96	42.39	47.56	44.97	46.58	54.11	50.34	46.45	52.60	49.53
T5- 50% mineral N +50% N as FMC	37.01	38.74	37.87	42.70	48.10	45.40	46.45	49.16	47.80	46.10	49.19	47.37
T6- 25% mineral N +75% N as FMC	31.49	42.20	36.85	43.47	49.30	46.38	42.47	49.88	46.17	41.49	47.97	44.73
T7- 75% mineral N + N Bio	32.25	37.82	35.03	41.17	43.91	42.54	44.02	49.01	46.51	44.35	48.16	45.25
T8- 50% mineral N + N Bio	28.83	37.04	32.93	39.79	42.10	40.94	43.80	46.70	45.25	41.37	41.59	41.78
T9- 25% mineral N + N Bio	31.73	32.10	31.91	40.25	48.32	44.28	43.63	48.88	46.26	39.64	41.38	40.51
T10- 75% mineral N +25% N as FMC +N Bio	38.38	41.97	40.18	39.33	48.44	43.89	44.98	48.21	46.59	44.53	46.18	45.35
T11- 50% mineral N +50% N as FMC +N Bio	52.75	44.82	48.88	42.04	45.89	43.96	42.83	48.48	45.65	47.26	45.49	46.37
T12- 25% mineral N +75% N as FMC +N Bio	37.64	39.88	38.76	42.76	47.38	45.07	44.05	46.62	45.34	44.61	46.08	45.33
Mean	34.50	39.70		42.04	47.09		43.87	50.58		43.51	٤٦,٣١	
L S D at $_{0.05}$ for:												
Cultivars (C)		NS			5.51 (*)			NS			NS	
Treatment (T)		NS			NS			NS			4.16 (*)	
T x C		NS			NS			NS			NS	

Table 3. Impact of mineral, organic and biological nitrogen fertilizers and its combinations on total chlorophyll content (SPAD unit) of two bread wheat cultivars during 2012/2013 season

Main effects and combinations	At 60 days after sowing			At 75 days after sowing			At 90 days after sowing			At 105 days after sowing		
	Giza-168	Sids-12	Mean	Giza-168	Sids-12	Mean	Giza-168	Sids-12	Mean	Giza-168	Sids-12	Mean
T1-100% mineral N(Rcom)	46.43	52.43	49.43	48.53	59.66	52.59	45.96	49.92	47.94	11.94	8.32	10.13
T2- 100% N as FMC "Filter Mud Cake"	41.29	51.48	46.37	39.02	49.27	44.14	46.14	44.63	45.38	12.09	4.98	8.53
T3- N Bio	42.87	47.71	45.29	39.47	54.95	47.21	44.95	45.88	45.41	11.29	6.41	8.85
T4- 75% mineral N +25% N as FMC	48.56	52.59	50.57	49.65	51.68	50.66	49.68	45.40	47.54	9.29	7.82	8.55
T5- 50% mineral N +50% N as FMC	46.24	51.76	48.99	48.90	51.98	50.44	47.54	48.96	48.25	6.89	8.07	7.48
T6- 25% mineral N +75% N as FMC	46.41	51.03	48.72	43.19	50.19	46.69	45.82	34.53	40.17	13.44	4.92	9.18
T7- 75% mineral N + N Bio	47.48	53.56	50.52	48.60	54.92	51.76	51.42	41.65	46.53	19.41	5.56	12.50
T8- 50% mineral N + N Bio	45.90	53.92	49.91	49.86	53.48	51.67	41.54	42.52	42.03	9.44	5.16	7.30
T9- 25% mineral N + N Bio	43.07	53.21	48.14	46.48	49.50	47.99	41.49	42.42	41.95	8.21	5.20	6.70
T10- 75% mineral N +25% N as FMC +N Bio	47.21	51.86	49.53	49.35	50.74	50.04	49.61	50.26	49.93	6.37	5.79	6.08
T11- 50% mineral N +50% N as FMC +N Bio	48.47	51.45	49.96	48.59	53.29	50.94	48.33	52.42	50.37	7.59	10.40	8.99
T12- 25% mineral N +75% N as FMC +N Bio	45.47	50.20	47.84	44.13	51.39	47.76	47.11	47.74	47.42	12.39	5.30	8.85
Mean	45.78	51.76		46.31	52.33		46.63	45.52		10.70	6.49	
L S D at $_{0.05}$ for:-												
Cultivars (C)		3.01 (*)			2.89(*)			NS			NS	
Treatment (T)		2.02 (*)			4.41 (*)			NS			NS	
TxC		NS			NS			NS			NS	

Table 4. Impact of mineral, organic and biological nitrogen fertilizers and its combinations on spike length (cm) of two wheat cultivars during 2011/2012 and 2012/2013 seasons

Main effects and combinations	2011/2012			2012/2013		
	Giza-168	Sids-12	Mean	Giza-168	Sids-12	Mean
T1-100% mineral N(Rcom)	15.71	14.45	15.08	15.24	15.58	15.41
T2- 100% N as FMC "Filter Mud Cake"	15.90	15.83	15.86	14.90	15.30	15.10
T3- N Bio	15.30	14.25	14.77	14.49	14.65	14.57
T4- 75% mineral N +25% N as FMC	17.69	16.67	17.18	15.03	15.37	15.20
T5- 50% mineral N +50% N as FMC	17.33	16.30	16.81	15.59	15.52	15.55
T6- 25% mineral N +75% N as FMC	16.79	15.72	16.25	15.08	14.70	14.89
T7- 75% mineral N + N Bio	15.41	15.48	15.45	15.25	15.01	15.13
T8- 50% mineral N + N Bio	15.81	15.45	15.63	14.54	15.13	14.83
T9- 25% mineral N + N Bio	16.27	14.87	15.57	14.83	14.85	14.84
T10- 75% mineral N +25% N as FMC +N Bio	17.29	15.81	16.55	15.90	15.16	15.53
T11- 50% mineral N +50% N as FMC +N Bio	17.72	15.73	16.72	15.85	15.65	15.75
T12- 25% mineral N +75% N as FMC +N Bio	16.97	16.32	16.64	15.43	15.10	15.27
Mean	16.51	15.57		15.17	15.17	
L S D at $_{0.05}$ for:-						
Cultivars (C)	0.187 (*)			NS		
Treatment (T)	0.345 (*)			0.281 (*)		
TxC	0.489 (*)			NS		

Results in Table 4 show the significant effect of fertilization treatments on spike length in both seasons. The treatments T_4 and T_{11} resulted in the greatest values in spike length (17.18 and 15.75 cm) in both seasons, respectively, this may be due to the role of bio and organic fertilization in enhancement of physical and chemical soil properties and additional amount of nitrogen made available by biological fixation of nitrogen by organism, this nitrogen help in improve growth and increase photosynthesis rate resulting in the accumulation of more dry matter by crop. These results are in the same trend with those obtained by **Rekhi *et al.* (2000)** while the treatments T_1 and T_3 produced the lowest values in spike length (15.08 and 14.57 cm) in both seasons, respectively.

The applications of filter mud cake (FMC) to wheat plants exert a significant influence on spike length in both seasons. This meliorating effect of (FMC) may be due to the fact that (FMC) increased the nutrients availability and consequently, increased the activity of merestimats tissues of spike length. These results are in accordance with those obtained by **Andres *et al.* (2009), Abd-Elmonem (2011), Ahmed *et al.* (2011) and Zahoor (2014)**. Also, the spike length was significantly affected by all possible interactions between varieties and treatments in 2011/2012 seasons only, whereas, the longest spikes (17.69 cm) were obtained due sowing wheat cultivar Giza-168 and applying T_4 fertilization regime, while the shortest spikes (14.25 cm) were obtained due to sowing wheat cultivars Sids-12 under T_3 fertilization regime.

1000-grain Weight (g)

The effect of nitrogen, biofertilizer and filter mud cake on 1000-grain weight was significant (Table 5) in both cultivars where 1000-grain weight of Sids-12 was higher than Giza-168 cultivars in both seasons, this may be due to differences in their genetic makeup and their reaction to the environments condition prevailing during it growth. These results are in agreement with those reported by **Arafat *et al.* (1997), Abd El-Lattief (2008), Abd- Elmonem (2011) and Zahoor (2014)**.

In Table 5 the maximum 1000-grain weight of 46.76 g was observed by using T_2 and the minimum 1000-grain weight of 40.93 g was found due to using T_{12} in 2011/2012 season while the maximum 1000-grain weight was 43.11 g by T_{12} and the minimum 1000-grain weight of 37.02 g was found due to using T_7 in 2012/2013 season.

Table 5. Impact of mineral, organic and biological nitrogen fertilizers and its combinations on 1000-grain weight (g) of two wheat cultivars during 2011/2012 and 2012/2013 seasons

Main effects and combinations	2011/2012			2012/2013		
	Giza-168	Sids-12	Mean	Giza-168	Sids-12	Mean
T1-100% mineral N(Rcom)	41.34	40.52	40.93	36.94	41.35	39.15
T2- 100% N as FMC "Filter Mud Cake"	45.51	48.01	46.76	40.03	42.14	41.09
T3- N Bio	42.40	44.25	43.32	41.63	42.86	42.24
T4- 75% mineral N +25% N as FMC	45.91	43.63	44.77	42.49	40.35	41.42
T5- 50% mineral N +50% N as FMC	46.60	44.14	45.37	40.09	42.80	41.44
T6- 25% mineral N +75% N as FMC	41.70	45.97	43.83	37.99	40.13	38.06
T7- 75% mineral N + N Bio	41.84	45.06	43.45	39.04	35.00	37.02
T8- 50% mineral N + N Bio	41.38	44.01	42.69	40.18	38.26	39.22
T9- 25% mineral N + N Bio	42.62	45.50	44.06	39.35	43.23	41.29
T10- 75% mineral N +25% N as FMC +N Bio	41.66	44.69	43.18	40.15	39.35	39.75
T11- 50% mineral N +50% N as FMC +N Bio	42.86	45.68	44.27	35.78	44.19	39.98
T12- 25% mineral N +75% N as FMC +N Bio	42.86	46.18	44.52	41.60	44.63	43.11
Mean	43.05	44.80		39.60	41.19	
L S D at $_{0.05}$ for:						
Cultivars (C)	0.106 (*)			0.106 (*)		
Treatment (T)	0.124 (*)			0.142 (*)		
TxC	0.044 (*)			0.050 (*)		

This may be due to microorganism through decomposition of organic matter which cane play very significant role in making available nutrients for plants. These results agree with finding by **Mekki and Ahmed (2005**)

The applications of filter mud cake (FMC) to wheat plants exert a significant influence on 1000-grain weight in both seasons. The effect of this application (FMC) may be due to the fact that (FMC) increased the nutrients availability and consequently increase photosynthesis rate resulting in the accumulation of more dry matter by crop this will reflected on 1000-grain weight. This results are agree with those obtained by **Andres *et al.* (2009)**, **Abd-Elmonem (2011)**, **Ahmed *et al.* (2011)** and **Zahoor (2014)**.

The results in Table 5 reveal that 1000-grain weight was significantly affected by all possible interactions between the varieties and treatments in both seasons, where interaction between T_2 × Sids-12 and T_{12} recorded the highest values (48.01 and 44.63g) in the first and second seasons, respectively.

Grain Yield (ton/fad.)

From Table 6 it is obvious that, tested two bread wheat cultivars showed significant differences for grain yield (ton/fad.) in 2011/ 2012 season only. Sids-12 cultivar resulted in the highest value (1.07 ton/fad.) in 1st season. These results may be due to the differences between the two tested cultivars in growth habit and response of each one to environmental condition during the growing seasons, which was controlled by genetic factors. This reflects on growth characteristics, consequently yield components and grain yield (ton/fad.). The previous results are in accordance with these reported by **Arafat *et al.* (1997), Abd El-Lattief (2008), Mohamed *et al.* (2013) and Taher *et al.* (2013)**.

The results in Table 6 show that grain yield (ton/fad.) was significant affected by the application of bio fertilizer and FMC with nitrogen fertilizer rates to wheat plants in both seasons. The treatments T_{12} and T_{11} were the highest values in grain yield (1.31 and 1.29 ton/fad.) in both seasons, respectively. This means that wheat plants positively responded to nitrogen fertilizer, this increase in grain yield/fad., might be due to the improvement of some yield attributes such as the spike length and 1000-grain weight, which in turn increase in the grain yield/ plant, consequently grain yield/fad. These results are in harmony with those reported by **Yassen *et al.* (2002), Ahmed *et al.* (2011), Abed-Elmonem (2011), Abd El-lattief (2012) and Youssef *et al.* (2013)**.

Results in Table 6 show the influences of FMC applicant on grain yield/fad., in both seasons. In general, grain yield/fad., gradually increased by increasing FMC rate. The wheat plants supplied with 75% N as FMC and 50% N as FMC in the treatments T_{12} and T_{11} produced high yields(1.31 and 1.29 ton/fad.) in the 2011/2012 and 2012/2013 seasons, respectively. The increase in grain yield/fad., as result of FMC application, may be due to the increase of 1000-grain weight. This is due to stimulation effect on plant growth of treated plants and increases the ability of such plant to form more metabolites required for building more plant organs. These results are in line with those obtained by **Arafat *et al.* (1997), Abd El-Lattief (2008), Ahmed *et al.* (2011) and Zahoor (2014)**.

The results in Table 6 reveal that grain yield/fad. was significantly affected by all possible interactions between wheat cultivars and fertilization regimes in both seasons, where Sids-12 cultivar produced the highest grain yield under T_{11} fertilization regime in both seasons (1.42 and 1.48 ton/fad.).

Straw Yield (ton/fad.)

Results presented in Table 7 indicate that the two bread wheat cultivars *i.e.,* Giza-168 and Sids-12 significantly differed in straw yield (ton/fad.) through the two growing seasons, where, Sids-12 cultivar had a higher value of straw yield (2.53 ton/fad.) then Giza-168 cv. in 2011/2012 season, while Giza-168 cv. had a higher value (2.37 ton/fad) than Sids-12 cultivar in 2012/2013 season. The variance among wheat cvs., in these traits may be due to their gene make-up. These results are in agreement with those mentioned by **Arafat (1997), Yassen *et al.* (2002) and Youssef *et al.* (2013)**.

It is clear from the results in Table 7 that applications of nitrogen, FMC and biofertilizer to wheat plants exert a significant influence on straw yield (ton/fad.) in both seasons. In general, the highest values were obtained when FMC was applied at rate of T_{11}, while the lowest value of straw yield (1.93 ton/fad.) was found in T_3 in both seasons. This increase could due to more availability of nutrients with used FMC which encourages elongation and cell division leading to an overall increase in straw yield. These results are in line with those obtained by **Arafat *et al.* (1997), Abd El-Lattief (2008), Abd-Elmonem (2011) and Zahoor (2014)**.

The interaction effect between cultivars and all treatments were significant in the two seasons. The treatment T_{11} recorded the highest value (3.34 ton/fad.) under wheat cultivar Giza-168.

Biological Yield (ton/fad.)

Results presented in Table 8 indicate that both wheat cultivars *i.e.,* Giza-168 and Sids-12 significantly differed in biological yield (ton/ fad.) in both seasons, where, Sids-12 cv. had a higher value of biological yield (3.57 ton/fad.) than Giza-168 cv. in 2011/2012 season, while Giza-168 cultivar had a higher value (3.46 ton/fad.) than Sids-12 cv. in 2012/2013 season. The variance among wheat cvs. in biological yield may be due to reaction to the environments condition prevailing during it growth. These results are in agreement with those mentioned by **Arafat (1994)**, **Yassen *et al.* (2002)** and **Youssef *et al.* (2013)**.

It is clear from these results in Table 8 that applications of nitrogen, FMC and biofertilizer to wheat plants exert a significant influence on biological yield (ton/fad.) in both seasons. In general, the highest values (4.50 and 3.97 ton/fad.) were obtained when fertilization regime of T11 was applied in 2011/2012 and 2012/2013 seasons, respectively, while the lowest value of Biological yield (2.57 and 2.82 ton/fad.) were found in T3 in the first and second seasons, respectively.

Table 6. Impact of mineral, organic and biological nitrogen fertilizers and its combinations on grain yield (ton/fad.) of two wheat cultivars during 2011/2012 and 2012/2013 seasons

Main effects and combinations	2011/2012			2012/2013		
	Giza-168	Sids-12	Mean	Giza-168	Sids-12	Mean
T1-100% mineral N(Rcom)	0.64	0.92	0.78	1.07	1.13	1.10
T2- 100% N as FMC "Filter Mud Cake"	0.62	0.91	0.77	0.74	1.10	0.92
T3- N Bio	0.69	0.63	0.66	0.70	1.07	0.89
T4- 75% mineral N +25% N as FMC	0.93	1.12	1.02	1.14	1.09	1.11
T5- 50% mineral N +50% N as FMC	1.30	0.57	0.93	1.23	1.00	1.12
T6- 25% mineral N +75% N as FMC	0.95	0.77	0.86	1.22	0.94	1.08
T7- 75% mineral N + N Bio	0.64	1.16	0.90	1.38	0.77	1.07
T8- 50% mineral N + N Bio	0.59	1.05	0.82	1.10	0.88	0.99
T9- 25% mineral N + N Bio	0.92	0.94	0.93	1.07	0.99	1.03
T10- 75% mineral N +25% N as FMC +N Bio	1.08	1.47	1.28	1.13	1.13	1.13
T11- 50% mineral N +50% N as FMC +N Bio	1.15	1.42	1.28	1.10	1.48	1.29
T12- 25% mineral N +75% N as FMC +N Bio	1.31	1.31	1.31	1.23	1.28	1.25
Mean	0.90	1.02		1.09	1.07	
L S D at $_{0.05}$ for:						
Cultivars (C)	0.083 (*)			NS		
Treatment (T)	0.078 (*)			0.097 (*)		
TxC	0.109 (*)			0.134 (*)		

Table 7. Impact of mineral, organic and biological nitrogen fertilizers and its combinations on straw yield (ton/fad.) of two wheat cultivars during 2011/2012 and 2012/2013 seasons

Main effects and combinations	2011/2012			2012/2013		
	Giza-168	Sids-12	Mean	Giza-168	Sids-12	Mean
T1-100% mineral N(Rcom)	2.20	2.32	2.26	2.73	2.76	2.75
T2- 100% N as FMC "Filter Mud Cake"	2.08	2.31	2.20	2.09	2.14	2.12
T3- N Bio	1.92	1.95	1.93	1.61	2.26	1.93
T4- 75% mineral N +25% N as FMC	3.03	2.89	2.96	2.53	2.45	2.49
T5- 50% mineral N +50% N as FMC	2.90	2.90	2.90	2.43	2.40	2.41
T6- 25% mineral N +75% N as FMC	2.94	2.18	2.56	2.50	2.23	2.36
T7- 75% mineral N + N Bio	1.64	2.53	2.08	2.63	2.06	2.34
T8- 50% mineral N + N Bio	2.00	2.29	2.15	2.37	1.95	2.16
T9- 25% mineral N + N Bio	2.21	2.12	2.17	2.27	1.89	2.08
T10- 75% mineral N +25% N as FMC +N Bio	2.76	3.34	3.05	2.46	2.45	2.45
T11- 50% mineral N +50% N as FMC +N Bio	3.34	3.10	3.22	2.56	2.81	2.68
T12- 25% mineral N +75% N as FMC +N Bio	2.59	2.43	2.51	2.25	2.26	2.25
Mean	2.47	2.53		2.37	2.30	
L S D at $_{0.05}$ for:						
Cultivars (C)	0.037 (*)			0.018 (*)		
Treatment (T)	0.047 (*)			0.038 (*)		
TxC	0.063 (*)			0.045 (*)		

This increase could due to of more availability of nutrients with used FMC which encourages elongation and cell division leading to an overall increase in Biological yield. These results are in line with those obtained by **Arafat *et al.* (1997), Abd El-Lattief (2008), Abd-Elmonem (2011) and Zahoor (2014)**.

Protein (%)

The obtained results in Table 9 reveal that application of mineral nitrogen, biofertilizer and filter mud cake on two wheat cultivars significantly influenced protein percentage in grains. However, Giza-168 had higher protein (%) than Sides-12 (10.19 and 9.77) in first and second seasons, respectively.

Results in Table 9 show that fertilization treatments significantly affected protein (%) in both seasons, where the application of biofertilizer (T_3) significantly increased protein (%) in first season. On the other hand, in the second season fertilization regimes T_8 "50% mineral N + N Bio", T_{11}"50% mineral N +50% N as FMC +N Bio" the highest value in protein (%). This due to microorganisms able to enhance the availability of different nutrients including N, these results are in agreement with those achieved by **Tawfik and Gomaa (2005), Abbasdokht (2008), Metin *et al.* (2010), Abd El-Razak and El-Sheshtawy (2013)** and **Namvar and khandan (2013)**.

The interaction effects between cultivars and all fertilization treatments were significant in both seasons. Where the treatments T_9 "25% mineral N + N Bio"× Giza-168 as well as T_{11} "50% mineral N +50% N as FMC +N Bio""× Giza-168 recorded the highest values (10.94 and 9.46, respectively) in the first and second seasons.

Table 8. Impact of mineral, organic and biological nitrogen fertilizers and its combinations on biological yield (ton/fad.) of two wheat cultivars during 2011/2012 and 2012/2013 seasons

Main effects and combinations	2011/2012			2012/2013		
	Giza-168	Sids-12	Mean	Giza-168	Sids-12	Mean
T1-100% mineral N(Rcom)	2.82	3.21	3.02	3.80	3.89	3.84
T2- 100% N as FMC "Filter Mud Cake"	2.73	3.22	2.97	2.83	3.24	3.04
T3- N Bio	2.61	2.52	2.57	2.31	3.33	2.82
T4- 75% mineral N +25% N as FMC	3.93	4.00	3.97	3.66	3.54	3.60
T5- 50% mineral N +50% N as FMC	4.19	3.46	3.83	3.66	3.40	3.53
T6- 25% mineral N +75% N as FMC	3.90	2.97	3.43	3.72	3.17	3.45
T7- 75% mineral N + N Bio	2.28	3.69	2.98	4.00	2.83	3.42
T8- 50% mineral N + N Bio	2.59	3.35	2.97	3.47	2.82	3.14
T9- 25% mineral N + N Bio	3.13	3.31	3.22	3.33	2.88	3.11
T10- 75% mineral N +25% N as FMC +N Bio	3.84	4.81	4.33	3.59	3.58	3.59
T11- 50% mineral N +50% N as FMC +N Bio	4.49	4.51	4.50	3.65	4.29	3.97
T12- 25% mineral N +75% N as FMC +N Bio	3.90	3.73	3.82	3.48	3.54	3.51
Mean	3.37	3.57		3.46	3.38	
L S D at $_{0.05}$ for:						
Cultivars (C)		0.052 (*)			0.022 (*)	
Treatment (T)		0.108 (*)			0.051 (*)	
TxC		0.155 (*)			0.077 (*)	

Table 9. Impact of mineral, organic and biological nitrogen fertilizers and its combinations on protein (%) of two wheat cultivars during 2011/2012 and 2012/2013 seasons

Main effects and combinations	2011/2012			2012/2013		
	Giza-168	Sids-12	Mean	Giza-168	Sids-12	Mean
T1-100% mineral N(Rcom)	10.11	9.04	9.57	9.78	9.63	9.70
T2- 100% N as FMC "Filter Mud Cake"	9.92	9.92	9.92	9.63	9.63	9.63
T3- N Bio	10.46	10.07	10.26	9.63	9.63	9.63
T4- 75% mineral N +25% N as FMC	10.48	9.63	10.05	9.93	9.63	9.78
T5- 50% mineral N +50% N as FMC	9.96	9.92	9.94	9.77	9.63	9.70
T6- 25% mineral N +75% N as FMC	10.04	9.48	9.76	9.75	9.47	9.61
T7- 75% mineral N + N Bio	10.25	9.52	9.89	9.78	9.63	9.70
T8- 50% mineral N + N Bio	9.75	10.07	9.91	9.77	9.93	9.85
T9- 25% mineral N + N Bio	10.94	9.49	10.21	9.63	9.63	9.63
T10- 75% mineral N +25% N as FMC +N Bio	10.52	9.23	9.87	9.92	9.24	9.58
T11- 50% mineral N +50% N as FMC +N Bio	10.35	9.67	10.01	9.96	9.74	9.85
T12- 25% mineral N +75% N as FMC +N Bio	9.48	10.50	9.99	9.74	9.74	9.74
Mean	10.19	9.71		9.77	9.63	
L S D at $_{0.05}$ for:						
Cultivars (C)		0.0٧٤ (*)			0.0٥٤ (*)	
Treatment (T)		0.١٢٦ (*)			0.0٥٤ (*)	
TxC		0.١٧٩ (*)			0.0٧٦ (*)	

REFERENCES

Abbasdokht, H. (2008). The study of *Azotobacter chroococcum* inoculation on yield and post harvest quality of wheat. Int. Meeting on Soil Land Manag. and Agroclimatol., Turkey, 885-889.

Abd El-Lattief, E.A. (2012). Improving bread wheat productivity and reduce use of mineral nitrogen by inoculation with *Azotobacter* and *Azosspirillum* under arid environment in Upper Egypt. Int. Conf. Appl. Life Sci., (ICALS2012) Turkey.

Abd El-Lattief, E.A. (2008). Increasing bread wheat (*Triticum aestivum*, L.) productivity and profitability in the newly reclaimed lands through the integrated use of mineral, organic and bio-fertilizer. Alex. J. Agric. Res., 53 : 47-54.

Abd-Elmonem, A.M.A. (2011). Influence of some agricultural treatments on yield, yield components and chemical composition of sunflower seeds under Assiut condition. Ph.D. Thesis, Fac. Agric., Al-Azhar Univ., Assuit Branch.

Abd El-Razek, U.A. and A.A. El-Sheshtawy (2013). Response of some wheat varieties to bio and mineral nitrogen fertilizers. Asian J. Crop Sci., 5 (2): 200-208.

Abejehu, G. (2009). Effect of filter cake and mineral fertilizers on yield of plantcane in the sugarcane plantations of Ethiopia.proc. Ethiop. Suger. Ind. Bienn. Conf., 1: 126-136.

Ahmed, A.M.A., G. Ahmed, M.H. Mohamed and M.M. Tawfik (2011). Integrated effect of organic and biofertilizers on wheat productivity in new reclaimed sandy soil. Res. J. Agric. and Biol. Sci., 7 (1): 105-114.

Andres, N.D., A. Latro´nico and I.E. Garcı´a de Salamone (2009). Inoculation of wheat with *Azospirillum brasilense* and *Pseudomonas fluorescens*: Impact on the production and culturable rhizosphere microflora. Europ. J. Soil Biol., 45: 44 – 51.

AOAC (1990). Official Methods of Analysis. 15th Ed. Association of Official Analytical Chemists, Inc., Virginia, USA.

Arafat, S.M., H. El-Aila and A. Algli (1997). Utilization of sugar cane filter mud to minimize nitrogen fertilizers for sorghum growth. J. Agric. Sci., Mansoura Univ., 22 (4): 1267 -1276.

Chapman, D.H. and R.F. Pratt (1978). Methods of Analysis for Soils, Plants and Waters. Div. Agric. Sci. Univ. California USA, 16-38.

Esmailpour, A., M. Hassanzadehdelouei and A. Madani (2013). Impact of livestock manure, nitrogen and biofertilizer (*Azotobacter*) on yield and yield components of wheat (*Triticun aestivum* L.). Cercetari Agron. in Moldova, 154 (2): 5-15.

FAOSTAT (2016). Food and Agriculture Organization of the United Nations. http://faostat.fao.org/

Gomez, K.A. and A.A. Gomez (1984). Statistical Procedures for Agricultural Research. John Wiley and Sons Inc., Singapore, 1-680.

Hasanpour, J., M. Panahi, K. Arabsalmani and M. Karimizadeh (2012). Effects of late-season water stress on seed quality and growth indices of durum wheat at different seed densities. Int. J. Agric. Sci., 2 (8): 702-716.

Mekki, B.B. and A.G. Ahmed (2005). growth, yield and seed quality of soybean (*Glycine max* L.) as affected by organic, biofertilizer and yeast application. Res. J. Agric. and Bio. Sci., 1 (4): 320-324.

Metin, T.A., G.B. Medine, C.C. Ramazan, O.F. Taskin and D. Sahin (2010). The effect of plant growth promoting rhizobacter strain on wheat yield and quality parameters. Proceeding of World Congress of Soil Science, Soil Solutions for a Changing World, Brisbane, Australia.

Mohamed, A.Y., M.M. Elsayed and I.I. Sadek (2013). Impact of organic manure, bio-fertilizer and irrigation intervals on wheat growth and grain yield. Ame.-Eurasian J. Agric. and Environ. Sci., 13(11): 1488-1496.

Namvar, A. and T. Khandan (2013). Response of wheat to mineral nitrogen fertilizer and biofertilizer (*Azotobacter* sp. and *Azospirillum* sp.) inoculation under different levels of weed interference. Ekologija, 59 (2): 85–94.

Ozturk, A., S. Bulut, N. Yildiz and M.M. Karaoglu (2012). Effects of organic manures and non-chemical weed control on wheat: I-Plant growth and grain yield. J. Agric. Sci., 18: 9-20.

Rajasekaran, S., P. Sundaramoorthy and K.S. Ganesh (2015). Effect of FYM, N, P fertilizers and biofertilizers on germination and growth of paddy (*Oryza sativa*, L.). Int. Letters of Nat. Sci., 8 : 59-65.

Rekhi, R.S., D.K. Benbi and B. Singh (2000). Effect of fertilizers an organic manure on crop yields and soil properties in rice-wheat cropping system. In: Abrol, I.P., Bronson, K.F., Duxbury, J.M., Gupta, R.K. (Eds.), Long-term Soil Fertility Experiments in Rice-Wheat Cropping Systems. Rice-Wheat Consortium Paper Series 6. Rice-Wheat Consortium for the Indo-Ganetic Plains, New Delhi, India, 1-6.

Shetty, K.G., M.K. Banks, B.A. Hetrick and A.P. Schwab (1994). Biological characterization of a southeast Kansas mining site. Water Air Soil Pollut., 78: 169-177.

Taher, E.B., A. Faramarzi, M.H. Ansari and H.A. Rahmani (2013). Study of the effects of the plant growth promoting bacteria on the yield and yield components of the wheat under the rain fad and irrigated conditions. Int. J. Agron. and Plant Prod., 4 (6): 1343-1350.

Tawfik, M.M. and A.M. Gomaa (2005). Effect of organic and biofertilizers on the growth and yield of wheat plants. Egypt. J. Agric. Res., 2 (2): 711-725.

Yassen, A.A., S.M. Arafat and S.M. Zaghloul (2002). Maximizing use of vinasse and filter mudas by-products of sugar cane on wheat production. J. Agric. Sci. Mansoura Univ., 27 (11): 7865-7873.

Youssef, A.M., M.M. El-Sayed and I.I. Sadek (2013). Impact of organic manure, bio-fertilizer and irrigation intervals on wheat growth and grain yield. American-Eurasian J. Agric. Environ. Sci., 13(11): 1488-1496.

Zahoor, L. (2014). Influence of integrated use of chemical and organic fertilizers on yield and yield components of wheat. Int. J. Agric. and Crop Sci., 7 (1): 21-25.

Zaki, N.M., M.A. Gomaa, F.I. Radwan, M.S. Hassanein and A.M. Wali (2012). Effect of mineral organic and bio-fertilizer on yield, yield components and chemical composition of some wheat cultivars J. Appl. Sci., Res., 8 (1): 174-191.

تأثير معدلات السماد النيتروجيني المعدني والحيوي والعضوي على صنفين من قمح الخبز تحت ظروف الأراضي الرملية

ياســر عبدالصبور محمد خليفة[١] - خلف عبدالمجيد عمر العـــارف[١]
عصام الدين عبدالهادى عبداللطيف[٢] - محمود فكتور يوسف[١]

١- قسم المحاصيل - كلية الزراعة - جامعة الأزهر فرع أسيوط - مصر

٢- قسم المحاصيل - كلية الزراعة - جامعة جنوب الوادي - مصر

أجرى هذا البحث على صنفين من قمح الخبز (جيزة ١٦٨ وسدس ١٢) بالمزرعة البحثية لكلية الزراعة جامعة جنوب الوادى بقنا، مصر وكانت التربة رملية حديثة الاستصلاح وتم استخدام الكميات الموصى بها من التسميد النيتروجيني في صوره المتعددة من الأسمدة المعدنية والحيوية والعضوية (طينة المرشحات) بصورة مفردة وبجميع التوليفات المختلفة فيما بينها وتم دراسة تأثيراتها عل المحتوى الكلى من الكلوروفيل، طول السنبلة ووزن الألف حبة وكل من محصول الحبوب ومحصول القش والمحصول البيولوجي/فدان والنسبة المئوية للبروتين، كان التصميم المستخدم في التجربة هو تصميم القطع المنشقة مرة واحدة في قطاعات كاملة العشوائية في أربع مكررات، وأظهرت النتائج أن إضافة الأسمدة الحيوية وطينة المرشحات (FMC) في تركيبة مع التسميد النيتروجيني للمعاملة الحادية عشر (٥٠% نيتروجين معدني + ٥٠% من النيتروجين في صورة طينة المرشحات والسماد الحيوي) أو المعاملة الثانية عشر (٢٥% نيتروجين معدني + ٧٥% من النيتروجين في صورة طينة المرشحات والسماد الحيوي) أدت إلى زيادة معنوية في الصفات التي تم دراستها مثل طول السنبلة، وزن الألف حبة، محصول الحبوب، محصول القش والمحصول البيولوجي (طن/فدان) في كلا الموسمين.

المحكمـــــون:

١- أ.د. مصطفي محمـــد إبراهيـم	أستاذ المحاصيل – كلية الزراعة – جامعة أسيوط.
٢- أ.د. اسماعيل محمد عبد الحميد	أستاذ المحاصيل – كلية الزراعة – جامعة الزقازيق.