Research Journal of Agriculture and Biological Sciences, 7(1): 105-114, 2011
ISSN ISSN 1819-544X
This is a refereed journal and all articles are professionally screened and reviewed

ORIGINAL ARTICLES

Integrated Effect Of Organic And Biofertilizers On Wheat Productivity In New Reclaimed Sandy Soil

Ahmed, M.A. Amal, G. Ahmed; Magda, H. Mohamed and M.M. Tawfik

Field Crops Research Department National Research Centre, Dokki, Cairo, Egypt.

ABSTRACT

The management of soil organic matter is critical to maintain a sustainable productive organic farming system. They possess many desirable soil properties and exert beneficial effect on the soil physical, chemical and biological characteristics. In this regard, two field experiments were carried out at the Research and Production Station, National Research centre, AL-Emam Malek village, Nubaria District AL- Behaira Governorate, Egypt, 2008/2009 and 2009/2010 winter seasons**.** This work included eighteen treatments which were the combination of three rates of organic fertilizer (5, 10 and 20 m^3/fed. chicken manure) and three biofertilizer treatments (Azotobacter, yeast and Azotobacter + yeast) on growth and yield of two wheat cultivars (Giza168 and Gemmiza10). Data indicated that Gemmiza-10 cultivar significantly surpassed Giza-168 in all growth characters in both samples at 80 and 120 days from sowing i.e. plant height cm, number of spikes / m^2, weight of spikes g/$m^{2,}$ dry weight of shoots (tillers +leaves) g/$m^{2,}$ plant total dry weight g/m^2 and flag leaf area cm. as well as yield and yield attributes i.e. plant height (cm), number of spikes/m^2, weight of spikes g/m^2, grain index, grain yield (g/m^2), straw yield (g/m^2), biological yield (g/m^2) and grain yield ton/fed, straw yield ton/fed, biological yield ton/fed and harvest index. Organic fertilization significantly increased various growth and yield as well as yield components, 20 m^3/fed. produced the highest values of the previous characters. Biofertilizers inoculation significantly increased most growth and yield parameters, yeast had superiority on Azotobacter. Moreover**,** mixed inoculums, generally, had more favorable effect on the majority of studied parameters than single inoculants. Significant differences were recorded between interactions of cultivars and organic fertilizer, cultivars and biofertilizers as well as organic and biofertilizer for most of the studied characters. As for the interaction effect between cultivars, organic and biofertilization, the highest dry matter accumulation in shoot system and spikes and the highest yield and yield components recorded in Gemmiza10 cultivar fertilized with 20 m^3 /fad. and inoculated with yeast and Azotobacter.

Key wards: organic fertilizer, Azotobacter, yeast, wheat cultivars, sandy soil.

Introduction

Egypt vitally needs sustained agricultural development to cope with the social and economic obligations that are the normal consequences of the continued high rates of population growth. This urgent need requires continuous scientifically based implementation of effective agricultural practices. 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. Wheat cultivars production is one of the most important factors which play a major role in increases wheat production and contribute in food problem solves. Wheat cultivars differed in vegetative growth, grain, straw and biological yields and its components owing to varietals differences (Zaki *et al.,* 2004; Abdel–Ati and Zaki 2006; Suzan 2007 and Zeidan *et al.,* 2009). Increasing cultivation in new reclaimed desert lands became a vital subject, these soils characterized with poor fertility, low water holding capacity, high leaching and alkaline pH. The use of organic fertilizer in such soil showed a good means in that concern. Numerous studies have shown a substantial increase in growth and yield of wheat plant in reclaimed desert lands (Shoman *et al.,* 2006; Badr *et al.,* 2009; Sary *et al.,* 2009 and Wali Asal, 2010).

Organic agriculture is a holistic production management system which promotes and enhances agroecosystem, health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions and locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system. Organic agriculture is a system that relies on ecosystem management rather than external agricultural inputs (Samman *et al*., 2008). Organic farming has emerged as an important priority area globally in view of the growing demand for safe and healthy food and long term sustainability and concerns on environmental pollution

Corresponding Author: Ahmed, M.A. Amal, Field Crops Research Department National Research Centre, Dokki, Cairo, Egypt.
E-mail's: amalgalal2011@yahoo.com

associated with indiscriminate use of agrochemicals. Though the use of chemical inputs in agriculture is inevitable to meet the growing demand for food in world, there are opportunities in selected crops and niche areas where organic production can be encouraged to tape the domestic export market(Karmakar *et al*., 2007).

Use of soil microorganisms which can either fix atmospheric nitrogen, solubilize phosphate, synthesis of growth promoting substances or by enhancing the decomposition of plant residues to release vital nutrients and increase humic content of soils, will be environmentally begin approach for nutrient management and ecosystem function(Wu *et al.,* 2005) Application of biofertilizer is considered today to limit the use of mineral fertilizers and 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 inoculation of wheat with Azotobacter chroococcum or yeast. (Tawfik and Gomaa 2005, Abbasdokht 2008, Badr *et al.,* 2009 and Bahrani *et al.,* 2010). In this field experiments we study the integrated effect of biofertilizers in combination with organic fertilizers on growth, yield and its components of two wheat cultivars in newly cultivated sandy soil.

Materials And Methods

Two field experiments were carried out at the Research and Production Station, National Research centre, AL-Emam Malek village, Nubaria District AL- Behaira Governorate, Egypt, 2008/2009 and 2009/2010 winter seasons to study effect organic and bio-fertilization on growth, yield and its components of two wheat cultivars in newly cultivated sandy soil. The experimental soil was analyzed according to the method described by (Chapman and Pratt 1979). Soil texture was sandy and having the following characteristics: Sand 91.2%, silt 3.70 %, clay 5.1% PH 7.3 organic matter 0.3 %, $CaCO_3$ 1.4 %, EC 0.3 ds/m, soluble N 8.1 ppm, available P 3.2 ppm and available K 20.0 ppm . A number of soil microorganisms, i.e. *Azotobacter chroococcum* and yeast (*candida trpoicalis*), isolated and identified by Gomaa (1995), was used as bio- fertilizers either single or in combination to form the various biotreatments. Each experiment included eighteen treatments which were the combination of two wheat cultivars (Giza168 and Gemmiza10), three FYM fertilizers, i.e.(5, 10 and 20 m^3/fed.) and three biofertilizers, .i.e.(Azotobacter, yeast and Azotobacter + yeast). The treatments were arranged in split split-plot design with three replications where, wheat cultivars were distributed in the main plots, mean while, organic fertilizer were allocated in sub plots and bio-fertilizers were occupied in the sub- sub plots. The plot area was 3x3.5 meter (1/400 fed.), seeded at the rate of 60 kg/fed in the two seasons and inoculated with the respective bio-fertilizers that added as liquid form directly on the plants using 20 L sprayers. Organic fertilizer (FYM) treatments in the form of the Chicken manure had the following chemical composition:- organic matter 49.2-51.5%, organic carbon 29-29.4%, C/N ratio 14-14.08, pH 7.45-7.75, EC 2.2 mmhos/cm^2 , N 2.01-2.15%, P 112-124 ppm, K 101-115 ppm in both seasons. Wheat cultivars were planted on 14^{th} and 16^{th} November in 2008 and 2009 seasons, respectively. The normal agronomic practices of growing wheat were practiced till harvest as recommended. Samples of one square mater were taken at random from the middle area of each plot from the three replicates at 80 and 120 days from sowing to measure some growth characters i.e. plant height cm, number of spikes / m^2, weight of spikes g/$m^{2,}$ dry weight of shoots (tillers +leaves) g/$m^{2,}$ plant total dry weight g/m^2 and flag leaf area cm. At harvest one square meter was taken at random from the middle area of each plot from three replicates to determine: plant height (cm), number of spikes/m^2, weight of spikes g/m^2, grain index, grain yield (g/m^2), straw yield (g/m^2), biological yield (g/m^2) as well as grain yield ton/fed, straw yield ton/fed, biological yield ton/fed and harvest index. All date were subjected to statistical analysis according to Snedecor and Cochran (1990). The combined analysis was conducted for the data of both seasons according to the method of Steel and Torrie (1980). The least significant differences (LSD at 5%) used to compare the treatments means.

Results And Discussion

1- Growth characters.

Data presented in Table (1) show varietal differences between both Giza 168 and Gemmiza 10 in some growth characters at 80 and 120 days after sowing**.** However, Gemmiza-10 cultivar significantly surpassed Giza-168 in all the studied characters except dry weight of shoot and flag leaf area (cm^2). These differences between wheat cultivars may be due to genetical differences between genotypes concerning partition of dry matter (Abd El-Gawad *et al.,* 1987). The results of varietal differences in growth parameters obtained in this study are in agreement with those obtained by (Zaki *et al.,* 2007 and Suzan 2007).

It is clear also from Table (1) that application of organic fertilizer increase most growth characters i.e. plant height, number of spikes/m^2, dry weight of spikes (g/m^2), dry weight of shoot (g/m^2), dry weight of plant (g/m^2)

and flag leaf area (cm^2) at 80 and 120 days after sowing. The highest increases in the characters mentioned before were obtained by organic fertilization at 20 m^3/fed. and the least values were observed with 5 m^3/fed.. This trend could be explained on a basis that maintaining sufficient available nutrients during the growth period could be achieved through organic materials application rather than through the mineral fertilization. These results are agreed with those obtained by Tawfik and Gomaa (2005) who reported that application of FYM increased the growth, yield and yield components of wheat plants. Abdel–Ati and Zaki (2006) added that plant height and dry weights (g) increased significantly by the application of FYM at 20 m^3/fed. Furthermore, Table (1) show that all the previous growth characters were significantly affected by inoculation of wheat grain with Azotobacter, yeast and Azotobacter+ yeast. These results were in harmony with those obtained by Zaki *et al.,* (2007) who indicated that biofertilizer inoculation with (Azospirillum, yeast and their interaction) produced significant increment in all growth characters. However, application of yeast greatly increased most growth characters of wheat plants compared to application of Azotobacter although yeast did not fix nitrogen but produce growth promoting substances (El-Kholy *et al.,* 2007). This might be due to the reason that organic materials inoculated with yeast are degraded through this fermentation process (slow decomposition) and thus reduce the nutrient and energy losses from organic materials caused by naturally occurring oxidative process--quick decomposition (Higa and Kinjo, 1991). Similar results obtained by Wali Asal (2010) who indicated that yeast have greater efficiency on growth characters of wheat plants. The same table also showed that dual inoculation with Azotobacter and yeast was superior to single ones. These results are in agreement with those of Mahdi *et al.,* (2010). Such enhancing effect of the dual application of Azotobacter + yeast may be attributed to the associative action of microorganisms especially when choose and applied in right way. The applications of biofertilizers in agriculture are suggested as a sustainable way of increasing crop yields and economize their production as well (Wali Asal, 2010). Bio-fertilization is very safe for human, animal and environment to get lower pollution and saving fertilization cost. In addition, their application in soil improves soil biota and minimizes the sole use of chemical fertilizers (Sabashini *et al.,* 2007).

The interaction between varietal differences and organic fertilizer caused a significant effect on plant height, number of spikes/ m^2, dry weight of spikes(g/ m^2) and dry weight of shoot (g/m^2), dry weight of plant (g /m^2) and flag leaf area (cm^2) at 80 and 120 days after sowing (Table 2). Gemmiza10 fertilized with 20 m^3/fed. organic fertilizer recorded the highest values of all previous characters at 80 and 120 days after sowing, while the lowest values of these characters were recorded in Giza 168 fertilized with 5 m^3/fed. organic fertilizer. Similar results were obtained by Hosam El-Din (2007).

Table (2) also shows a significant interaction between varietal differences and biofertilizer on all growth characters at 80 and 120 days after sowing. Generally the maximum increase was obtained in Gemmiza10 cultivar under dual inoculation with Azotobacter + yeast. These results were confirmed with that obtained by Shoman *et al.,* (2006) and Zaki *et al.,* (2007) who reported that the interaction between wheat cultivars and biofertilizer significantly affect growth characters. Moreover, it has been reported that biofertilizers not only provides nitrogen, but also produce varieties of growth-promoting substances, among them indole acetic acid, gibberellins and vitamins B (Wu *et al*., 2005). In addition, Jarak *et al*., (2006) stated that, *Azotobacter* sp. can also produce antifungal compounds to fight against many plant pathogens and increase growth leading to improved crop stands.

The effect of interaction between organic fertilizer and biofertilizer on plant height, number of spikes/m^2, dry weight of spikes (g/m^2) and dry weight of shoot (g /m^2), dry weight of plant (g/m^2) and flag leaf area (cm^2) at 80 and 120 days after sowing were significant Table (2). Similar results were obtained by Javaid *et al*., (2002) who reported that Azotobacter and yeast application significantly enhanced shoot biomass in FYM amended soil. Such pronouncing effect of organic and biofertilizers in increasing growth was recorged by many investigators (Mahdi *et al*., 2010). In this concern, Saber (1994) stated that this increment might be due to the availability of soil microorganisms to convert the unavailable forms of nutrients elements to available forms by generating of carbon dioxide from bio-fertilizers. Obtained results might be due to the stimulation effect between organic FYM and bio-fertilizer ioculation on improving the physical properties of the soil, increasing soil fertility and increasing the availability of many nutrients element to plant uptake, which in turn on improving the growth of wheat plants.

Data presented in Figure (1, 2, 3, 4, 5) indicated that the interaction between cultivars, organic fertilizer and biofertilizer were significant in all growth characters at 80 and 120 days after sowing. Gemmiza10 cultivar inoculated with (Azotobacter + yeast) and fertilized with 20 m^3/fed. chicken manure gave the highest values of all studies growth characters. These results were in good agreement with those obtained by Hosam El-Din (2007) who reported that the interaction between wheat cultivars, biofertilizer inculcation and farmyard manure were significant in all growth characters under study.

Res. J. Agric. & Biol. Sci., 7(1): 105-114, 2011

Table 1: Effect of cultivars, organic fertilizer, and biofertilizer on growth characters of wheat plants at 80 and 120days after sowing (Average of 2008-2009 and 2009-2010 seasons)

Characters / Treatments	Plant height cm		Number of spikes /m^2		Weight of spikes g/m^2		Dry weight of shoots g/m^2		Dry weight of plant g/m^2		Flag leaf area cm^2	
	80 days	120 days	80 days	120 days	80 days	120 days	80 days	120 days	80 days	120 days	80 days	120 days
Cultivars												
Giza168	62.57	88.92	390.84	419.38	576.11	645.70	612.40	665.06	1188.50	1310.77	47.73	39.45
Gemmiza10	79.87	103.00	398.19	423.01	665.98	771.56	704.26	775.42	1370.80	1548.51	50.52	41.82
L.D.S at 5% level	11.20	6.21	5.22	3.33	38.10	56.10	66.31	44.27	51.00	82.30	2.22	1.07
Organic fertilizer												
5 m^3/fed	65.69	89.06	359.74	389.45	599.42	667.29	627.07	679.07	1227.32	1346.36	44.93	36.63
10 m^3/fed	70.89	95.77	398.74	415.75	615.79	687.14	656.06	703.15	1271.85	1392.61	47.98	38.26
20 m^3/fed	77.07	103.04	425.08	458.40	647.93	771.47	691.86	778.50	1339.79	1549.95	54.47	47.01
L.D.S at 5% level	4.07	2.37	1.50	14.80	10.02	35.81	16.45	1.23	45.20	41.59	2.71	1.70
Biofertilizer												
Azotobacter (A)	64.57	88.28	371.40	402.48	605.12	681.12	639.67	694.77	1245.63	1378.22	45.83	37.58
Yeast (Y)	71.07	95.37	396.57	421.69	620.59	707.86	657.74	718.51	1278.33	1426.39	49.19	40.65
A+Y	78.02	104.22	415.58	439.42	637.42	736.92	677.59	747.43	1315.01	1484.31	52.36	43.66
L.D.S at 5% level	4.00	3.01	21.00	8.20	9.00	12.16	13.91	21.01	28.21	50.32	1.08	2.06

Table 2: Effect of interaction between cultivars and organic fertilizer, cultivars and biofertilizer and organic fertilizer and biofertilizer on growth characters of wheat plants at 80 and 120 days after sowing (Average of 2008-2009 and 2009-2010 seasons).

Characters Treatments		Plant height		Number of spikes		Weight of spikes		Dry weight of shoots		Dry weight of plants		Flag leaf area	
		cm		/m^2		g/m^2		g/m^2		g/m^2			
		80 days	120 days	80 days	120 days	80 days	120 days	80 days	120 days	80 days	120 days	80 days	120 days
Cultivars x Organic fertilizer													
Giza168	5 m^3/fed.	56.22	80.57	344.08	384.67	552.77	595.47	590.40	614.63	1143.17	1210.10	43.82	34.81
	10 m^3/fed.	62.62	88.01	399.75	418.01	568.80	613.84	612.08	643.14	1180.88	1256.97	47.17	39.02
	20 m^3/fed.	68.86	98.17	428.70	455.46	606.76	727.81	634.70	737.40	1241.46	1465.24	52.20	44.50
Gemmiza10	5 m^3/fed.	75.16	97.55	375.40	394.22	646.07	739.11	663.73	743.51	1311.47	1482.62	46.03	38.45
	10 m^3/fed.	79.16	103.54	397.72	413.49	662.78	760.44	700.04	763.16	1362.81	1528.24	48.79	37.49
	20 m^3/fed.	85.28	107.90	421.45	461.33	689.11	815.14	749.02	819.59	1438.13	1634.67	56.73	49.51
L.D.S at 5% level		2.82	1.05	2.10	2.03	1.10	3.00	12.10	6.35	31.11	15.06	2.30	1.00
Cultivars x Biofertilizer													
	Azotobacter (A)	57.95	80.38	366.44	397.79	553.13	614.81	586.74	636.77	1139.87	1251.57	44.20	36.36
GIza168	Yeast (Y)	62.24	88.20	394.75	423.25	574.42	644.87	615.03	664.14	1189.45	1309.04	47.78	39.46
	A+Y	67.52	98.16	411.33	437.10	600.78	677.44	635.42	694.27	1236.19	1371.70	51.21	42.51
	Azotobacter (A)	71.18	96.18	376.36	407.17	657.11	747.44	692.60	752.77	1351.38	1504.87	47.45	38.80
Gemmiza10	Yeast (Y)	79.90	102.53	398.39	420.14	666.77	770.85	700.44	772.89	1367.21	1543.74	50.60	41.84
	A+Y	88.52	110.28	419.82	441.74	674.07	796.40	719.75	800.60	1393.82	1596.91	53.50	44.81
L.D.S at 5% level		2.15	3.16	12.28	1.00	2.15	1.33	2.11	19.53	16.11	13.10	1.04	1.20
Organic fertilizer x Biofertilizer													
5 m^3/fed.	Azotobacter (A)	56.76	81.22	338.42	370.24	586.06	646.11	610.11	659.00	1198.66	1305.11	41.67	34.14
	Yeast (Y)	66.22	88.73	362.65	391.51	599.60	666.16	628.05	679.31	1227.65	1345.47	44.56	37.11
	A+Y	74.10	97.24	378.15	406.61	612.60	689.60	643.05	698.91	1255.65	1388.51	48.56	38.65
10 m^3/fed.	Azotobacter (A)	64.21	88.46	373.64	394.14	600.65	666.10	638.00	678.23	1238.65	1351.33	44.10	33.92
	Yeast(Y)	69.73	96.12	400.07	412.50	615.55	682.71	655.05	702.63	1270.60	1385.33	48.61	38.18
	A+Y	78.73	102.75	422.50	440.61	631.17	712.61	675.13	728.59	1306.30	1441.16	51.24	42.68
20 m^3/fed.	Azotobacter (A)	72.73	95.18	402.16	443.07	628.67	731.16	670.91	747.08	1299.57	1478.24	51.72	44.70
	Yeast (Y)	77.26	101.25	427.00	461.08	646.63	774.71	690.11	773.61	1336.74	1548.37	54.41	46.66
	A+Y	81.24	112.69	446.08	471.06	668.50	808.56	714.58	814.80	1383.08	1623.26	57.27	49.66
L.D.S at 5% level		2.16	1.10	3.00	10.10	5.06	6.12	3.18	7.11	9.15	3.22	0.62	1.60

2-Yield and yield components.

Data presented in Table (3) indicated that the different between both cultivars in yield and yield components i.e. plant height (cm), number of spikes/m^2, weight of spikes (g/m^2) grain, straw and biological yields (g/m^2) as well as grain, straw and biological yield (ton/fed.) were significant expect that of 100 grain weight (g) and harvest index. These differences may be due to the genetic differences between two cultivars. These results are in concert with those obtained by (Zaki *et al.*, 2004, Abdel–Ati and Zaki, 2006 and Zaki *et al.,* 2007) who reported that grain, straw and biological yields and its components were significantly differed owing to varietial differences.

It is clear from Table (3) that yield and yield components significantly increased by increasing rate of organic fertilizer. Similar results were obtained by Shoman *et al*., (2006) and Badr *et al.,* (2009) who found that the differences among the four rates organic fertilizer (zero, 10, 20, 30 m^3/fed. were significant. They added that, addition of 30 m^3/fed. produced the highest values of number of spikes/m^2, weight of spikes (g /m^2) as well as grain, straw and biological yields (ton/fed.).

With respect to response of yield and its components to biofetilizer, table (3) show that biofertilization either with Azotobacter or yeast single or combined had a significant positive effect on plant height(cm), number and weight of spikes/m^2 as well as grain, straw and biological yields (g/m^2 or ton/fed.) expect100-grain weight and harvest index. This increment of yield and its components may be due to the positive effect of biofertilization which play important role in assimilation processes of wheat plants which reflected on enhancing these characters (Mahdi *et al.,* 2010). Moreover, the relative positive effect of bio-fertilizer treatment on yield criteria may be attributed to their N_2-fixing activity and the production of plant growth promoting substances such as IAA, gibberellins and cytokinine-like substances (Wu *et al.,* 2005). These results were in harmony with those obtained by Tawfik and Gomaa (2005), Suzan (2007) and Zaki *et al.,* (2007). Data of harvest index were insignificant.

Table 3: Effect of cultivars, organic fertilizer, and biofertilizer on yield and its components of wheat plants (Average of 2008-2009 and 2009-2010 seasons).

Characters / Treatments	Plant height cm	Number of spikes /m^2	Weight of spikes g/m^2	100-grain weight (g)	Grain yield g/m^2	Straw yield g/m^2	Biological yield g/m^2	Grain yield ton/fed	Straw yield ton/fed	Biological yield ton/fed	Harvest index
Cultivars											
Giza 168	94.72	507.87	586.99	2.51	411.26	1320.09	1731.33	1.65	5.28	6.93	23.72
Gimmeza 10	101.37	516.93	701.05	2.79	449.25	1421.08	1859.24	1.80	5.68	7.48	23.93
L.D.S at 5% level	4.21	6.17	52.16	N.S	72.13	37.11	20.16	0.03	0.20	0.30	N.S
Organic fertilizer											
5 m^3/fed.	90.99	447.23	598.17	2.39	394.58	1302.78	1680.70	1.58	5.21	6.79	23.25
10 m^3/fed.	96.71	520.89	636.00	2.60	426.02	1367.30	1793.27	1.70	5.47	7.17	23.74
20 m^3/fed.	106.45	569.09	697.89	2.98	470.18	1441.68	1911.89	1.88	5.77	7.65	24.49
L.D.S at 5% level	5.07	12.18	38.07	N.S	24.74	62.30	89.16	0.01	0.20	0.30	N.S
Biofertilizer											
Azotobacter (A)	89.49	495.29	619.14	2.44	406.90	1344.07	1734.34	1.63	5.38	7.00	23.20
Yeast (Y)	99.55	516.23	648.66	2.68	434.06	1373.65	1807.71	1.74	5.49	7.23	23.91
A+Y	105.10	525.69	664.26	2.84	449.81	1394.05	1843.81	1.80	5.58	7.38	24.37
L.D.S at 5% level	3.21	7.16	28.16	N.S	8.16	14.05	22.18	0.02	0.10	0.16	N.S

Data presented in Table (4) show that the effect of interaction between varietal differences and organic fertilizer on yield and its components were significant expect the results of 100 grain weight and harvest index. Gemmiza 10 fertilized with 20 m^3/fed. organic fertilizer gave the highest values of yield and its components. Results are in a harmony with those obtained by Shoman *et al.,* (2006) and Badr *et al.,* (2009).

Concerning the effect of interaction between cultivars and biofertilizer on yield and its components, data in table (4) showed significant differences between treatments except, weight of 100 grain and harvest index. The highest increases of these characters were obtained in Gemmiza 10 cultivar inoculated with Azotobacter + yeast. Similar results were obtained by (Arafa *et al.,* 2009).

Table 4: Effect of interaction between cultivars and organic fertilizer, cultivars and biofertilizer and organic fertilizer and biofertilizer on yield and its components of wheat plants (Average of 2008-2009 and 2009-2010 seasons)

Characters / Treatments		Plant height (cm)	Number of spikes /m^2	Weight of spikes g/m^2	100-grain weight (g)	Grain yield g/m^2	Straw yield g/m^2	Biological yield g/m^2	Grain yield ton/fed	Straw yield ton/fed	Biological yield ton/fed	Harvest index
Cultivars x Organic fertilizer												
Giza 168	5 m^3/fed.	89.16	448.41	561.43	2.35	383.00	1252.67	1635.69	1.53	5.01	6.54	23.41
	10 m^3/fed.	93.53	512.04	574.77	2.46	407.87	1316.07	1723.85	1.63	5.26	6.90	23.64
	20 m^3/fed.	101.47	563.17	624.78	2.73	442.92	1391.54	1834.45	1.77	5.57	7.34	24.12
Gemmiza 10	5 m^3/fed.	92.81	446.04	634.91	2.42	406.15	1352.88	1725.70	1.63	5.41	7.04	23.09
	10 m^3/fed.	99.88	529.75	697.24	2.73	444.17	1418.53	1862.70	1.78	5.67	7.45	23.84
	20 m^3/fed.	111.43	575.00	771.00	3.22	497.43	1491.84	1989.33	1.99	5.97	7.96	24.86
L.D.S at 5% level		3.02	2.11	6.23	N.S	4.52	31.16	19.18	0.03	0.12	0.21	N.S
Cultivars x Biofertilizer												
Giza 168	Azotobacter (A)	85.13	489.50	560.74	2.28	379.89	1293.06	1672.96	1.52	5.17	6.69	22.71
	Yeast (Y)	96.87	512.74	595.48	2.55	416.90	1323.07	1739.97	1.67	5.29	6.96	23.94
	A+Y	102.16	521.39	604.75	2.71	437.00	1344.15	1781.06	1.75	5.38	7.12	24.51
Gemmiza 10	Azotobacter (A)	93.86	501.07	677.54	2.60	433.91	1395.07	1795.71	1.74	5.58	7.32	23.69
	Yeast (Y)	102.22	519.72	701.84	2.80	451.22	1424.24	1875.46	1.81	5.70	7.50	23.88
	A+Y	108.03	530.00	723.76	2.97	462.62	1443.94	1906.56	1.85	5.78	7.63	24.22
L.D.S at 5% level		1.21	3.22	11.12	N.S	2.02	6.13	15.13	0.01	0.13	0.06	N.S
Organic fertilizer x Biofertilizer												
50 Kg/Fed.	Azotobacter (A)	82.66	430.65	569.22	2.21	377.07	1267.05	1594.14	1.51	5.07	6.58	22.94
	Yeast (Y)	92.63	450.54	606.14	2.39	397.08	1312.61	1709.68	1.59	5.25	6.84	23.23
	A+Y	97.67	460.50	619.14	2.56	409.58	1328.69	1738.27	1.64	5.31	6.95	23.58
100 Kg/Fed.	Azotobacter (A)	88.68	498.61	609.71	2.39	402.73	1343.58	1746.31	1.61	5.37	6.99	23.04
	Yeast (Y)	98.75	527.08	641.25	2.64	429.84	1363.08	1792.92	1.72	5.45	7.17	23.97
	A+Y	102.69	537.00	657.06	2.76	445.49	1395.24	1840.60	1.78	5.58	7.36	24.21
200 Kg/Fed.	Azotobacter (A)	97.15	556.61	678.50	2.73	440.90	1421.58	1862.57	1.76	5.69	7.45	23.63
	Yeast (Y)	107.26	571.08	698.59	3.00	475.27	1445.28	1920.54	1.90	5.78	7.68	24.54
	A+Y	114.93	579.58	716.58	3.21	494.36	1458.21	1952.57	1.98	5.83	7.81	25.31
L.D.S at 5% level		2.03	6.16	2.13	N.S	3.61	7.17	5.23	0.04	0.03	0.12	N.S

Regarding the interaction effect of organic fertilizer and biofertilizer on yield and its components, the same table show that association of organic and biofertilizer led to a significant increase in plant height(cm), number and weight of spikes/m^2 as well as grain, straw and biological yields (g/m^{2}or ton/fed.). It can be concluded that biofertilizers in combination with organic fertilizers may increase availability and uptake of nutrients for wheat plants. These results were in the same line with those obtained by Shoman *et al.,* (2006) who showed that yield and its components were significantly affected by interaction between organic fertilizer and biofertilizer expect weight of 100 grain, they added that the highest values of these characters obtained by using 40 m^3 /fed. organic manure and inculcation with Azospirillum. Moreover, Metin *et al*.,(2010) added that soil microbial population *viz.* Actinomycetes, Bacteria, Fungi and BGA increased due to the application of organic amendments which further influenced the soil dehydrogenase and phosphatase enzyme activities). Obtained results might be due to the stimulation effect between organic FYM and bio-fertilizer inoculation on improving the physical properties of the soil, increasing soil fertility and increasing the availability of many nutrients element to plant uptake, which in turn on improving the yield and its components of wheat plants.

Res. J. Agric. & Biol. Sci., 7(1): 105-114, 2011

Data presented in Figure (1, 2, 3, 6, 7) indicated that the interaction between cultivars, organic fertilizer and biofertilizer were significant in yield and its components except, weight of 100 - grain and harvest index.. Gemmiza10 cultivar treated with (Azotobacter + yeast) and fertilized with 20 m^3/fed. organic fertilizer gave the highest values for all yield and yield components. These results are in harmony with those obtained by Shoman *et al.,* (2006), Badr *et al.,* (2009) and Wali Asal (2010)

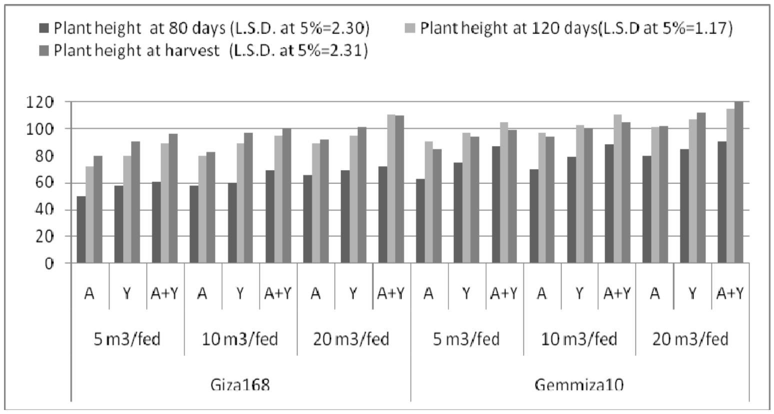

Fig. 1: Effect of interaction between cultivars, organic fertilizer and biofertilizer on plant height (cm) at 80, 120 days and harvest

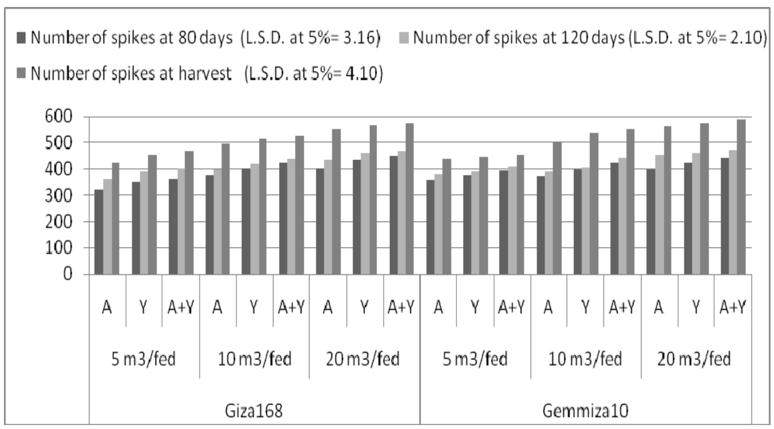

Fig. 2: Effect of interaction between cultivars, organic fertilizer and biofertilizer on number of spikes at 80, 120days and harvest

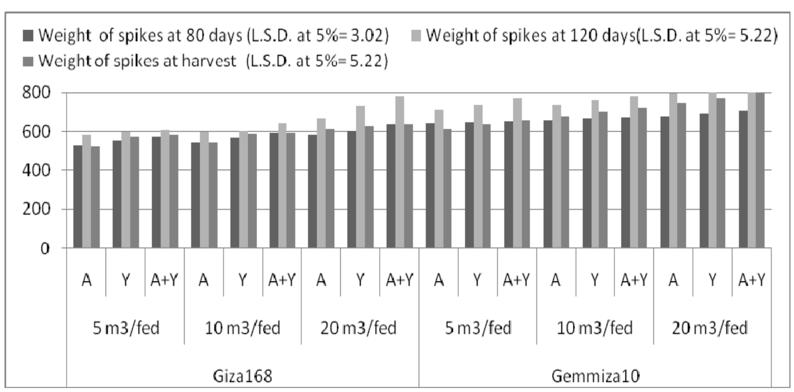

Fig. 3: Effect of interaction between cultivars, organic fertilizer and biofertilizeron weight of spikes (g/m^2) at 80, 120 days and harvest

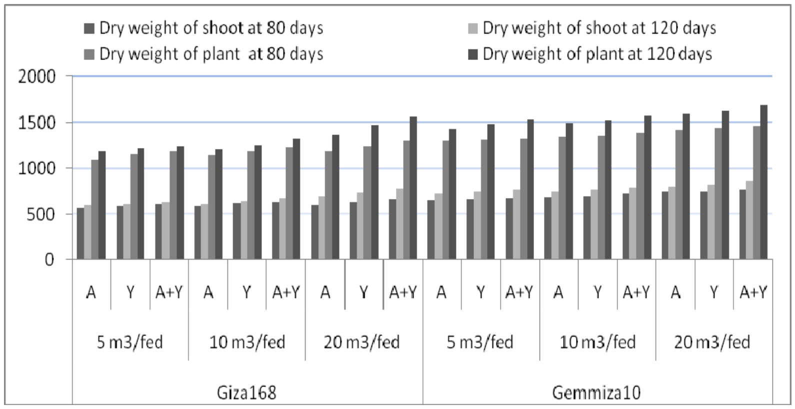

Fig. 4: Effect of interaction between cultivars, organic fertilizer and biofertilizer on dry weight of shoot and whole plant (g/m^2) at 80, 120 days and harvest.

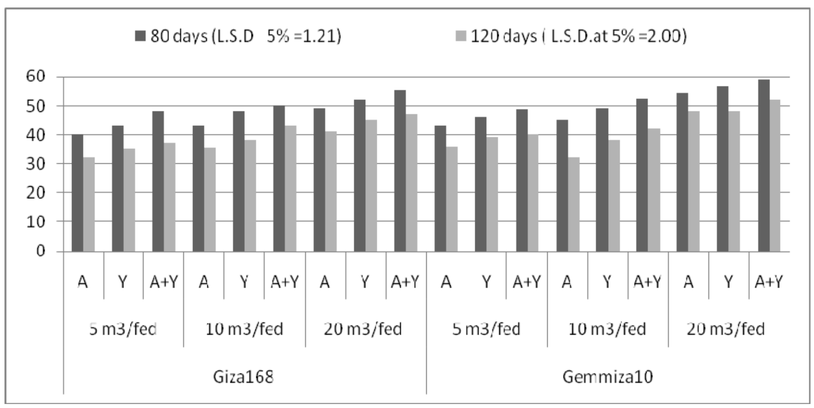

Fig. 5: Effect of interaction between cultivars, organic fertilizer and biofertilizer on flag leaf area (cm^2) at 80, 120 days after sowing .

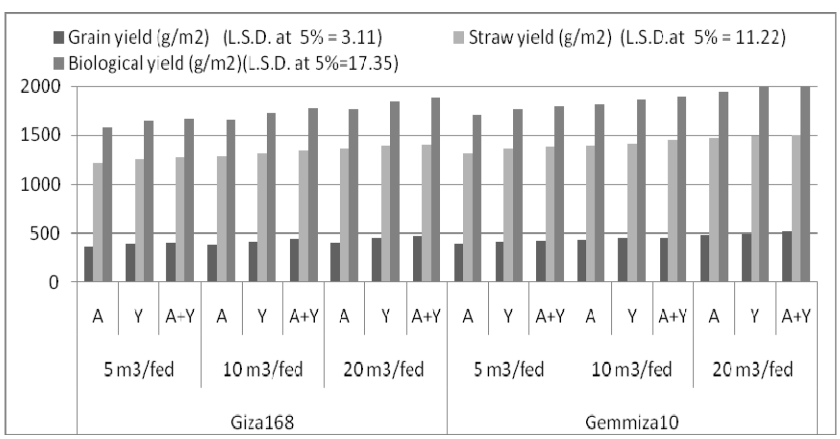

Fig. 6: Effect of interaction between cultivars, organic fertilizer and biofertilizer On grain, straw and biological yields (g/m^2)

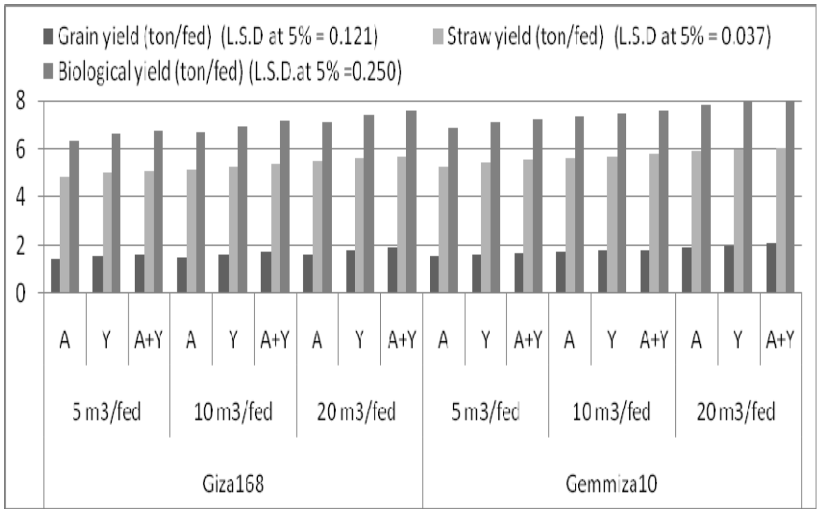

Fig. 7: Effect of interaction between cultivars, organic fertilizer and biofertilizer On grain, straw and biological yields (ton/fed.)

Conclosion:

Biofertilizers application in agriculture will have greater impact on organic agriculture and also on the control of environmental pollution, soil health improvement and reduction in input use. So, we recommend using a mixture of selected effective microorganisms active in nitrogen fixation, hormonal production and enzyme production in combination with FYM in a cumulative manner in agriculture production. Use of chicken manure in combination with *Azotobacter chroococcum* and yeast (*candida trpoicalis*) can meet the nutrient requirement of sustainable wheat production under desert soil conditions. Such results confirm that higher skill and accuracy are required for the appropriate management of organic and biofertilizers to reduce their potential disadvantages in comparison to the mineral forms. However, plant breeder would have to develop varieties, which respond to the integrated use of FYM and biofertilizer inoculation to reduce the dose of mineral nitrogenous fertilizers needed.

Reference

Abbasdokht, H., 2008. The study of Azotobacter chroococcum inoculation on yield and post harvest quality of wheat. International Meeting on Soil Land Management and Agroclimatology, Turkey, 885-889.

Abdel-Ati, A.A. and K.I. Zaki, 2006. Productivity of some wheat cultivars in calcareous soils under organic farming and rainfed conditions with special references to plant disease. J. Agric. Sci. Mansoura Univ., 31(4): 1875-1889.

Abd El-Gawad, A.A., K.A. El-Shouny, S.A. Saleh and M.A. Ahmed, 1987. Partition and migration of dry matter in newly cultivated wheat varieties. Egypt. J. Agron., 12(1-2): 1-16.

Arafa, Rawhia A.M. AbdEl-Ghany, F. Bouthaina Sidkey, M. Nagwa and ElShazly, M. Mona, 2009. The Beneficial Use of Biofertilizers on Growth and yield of Wheat Plants Grown on Sandy Soil with or Without Nitrogen fertilization .Egyptian J. of biotechnology, 32: 127-146.

Badr, Elham, A., O.M. Ibrahim and M.F. El-Kramany, 2009. Interaction effect of biological and organic fertilizers on yield and yield components of two wheat cultivars. Egypt .J. Agron., 31(1): 17-27.

Bahrani, A.J. Pourreza and M. Hagh Joo, 2010. Response of Winter Wheat to Co-Inoculation with Azotobacter and Arbescular Mycorrhizal Fungi (AMF) under Different Sources of Nitrogen Fertilizer. American-Eurasian J. Agric. & Environ. Sci., 8 (1): 95-103

Chapman, H.D. and P.F. Pratt, 1978. Methods of Analysis for Soils, Plants and Water. Univ. California, Div. Agric. Sci. Prical Publication, 4030: 12-19.

El-Kholy, M.H., M.N.A. Omar and Z. Saleh, Sh. 2007. Growth response of wheat crop to microbial inoculation and yeast strain under different mineral phosphorus fertilizer levels at North Eastern Delta of Egypt .J. Agric. Sci. Mansoura Univ., 32(2):1513-1520.

Gomaa, A.M., 1995. Response of certain vegetable crops to bio-fertilization. Ph. D. Thesis, Fac. Agric. Cairo Univ., Egypt.

Higa, T. and S. Kinjo, 1991. Effect of lactic acid fermentation bacteria on plant growth and soil humus formation. *In*: J.F. Parr, S.B. Hornick and C.E. Whitman (ed.) Proc. 1st. Intl. Conf. on Kysuei Nature Fanning. Oct. 17-21, 1989, Khan Kaen, Thailand. pp: 140-147.

Hosam El-Din, A.T.S., 2007. Productivity of some wheat varieties by using bio and organic fertilization in new valley. M. Sc. Thesis, Fac. of Agric. Ain Shams. Univ., Egypt.

Jarak, M., R. Protić, S. Janković and J Čolo, 2006. Response of wheat to Azotobacter – Actinomycetes inoculation and nitrogen fertilizer. Romanian Agric. Res., 23: 37-41.

Javaid, A., A. Tehmina and R. Bajwa, 2002. EM and VAM technology in Pakistan XII: growth, nodulation and VA mycorrhizal response of *Phaseolus vulgaris* L. to long-term EM application. Pakistan Journal of Phytopathology, 14 (1): 57-61.

Karmakar, S., C. Lague, J. Agnew and H. Landry, 2007. Integrated decision support system (DSS) for manure management. A review and perspective Computers and Electronics in Agriculture., 57: 190-201

Mahdi, S., G.I. Hassan, S.A. Samoon, H.A. Rather, A.D. Showkat, 2010. Bio-fertilizer in organic agriculture. J. Phytol., 2(10): 42-54.

Metin, T.A., G.B. Medine, C.C. Ramazan, O.F. Taskin and D. Sahin, 2010. The effect of PGPR strain on wheat yield and quality parameters. Proceeding of World Congress of Soil Science, Soil Solutions for a Changing World.1 – 6 August 2010, Brisbane, Australia.

Sabashini H.D., S. Malarvannan and P. Kumar, 2007. Effect of biofertilizers on yield of rice cultivars in Pondicherry, India. Asian Journal of Agriculture Research, 1(3): 146-150.

Saber, M.S.M., 1994. Bio-organic farming systems for sustainable agriculture. Inter-Islamic Network on Genetic Engineering and Biotechnology, INOGE Publ. 3, Cairo, Egypt.

Samman, S., J.W.Y. Chow, M.J. Foster, Z.I. Ahmad, J.L. Phuyal and P. Petocz, 2008. Fatty acid composition of edible oils derived from certified organic and conventionalagricultural methods. Food Chemistry, 109: 670-674.

Sary, G.A., H.M. El-Naggar, M.O. Kabesh, M.F. El-kramany and Gehan, Sh. H. Bakhoum, 2009. Effect of Bio-organic Fertilization and Some Weed Control Treatments on Yield and Yield Components of Wheat. World Journal of Agricultural Sciences, 5(1): 55-62.

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.

Shoman, H.A., A.M. Abo-Shtaia, K.A. El-Shouny and Abd M.A. El-Gawad, 2006. Effect of biological and organic fertilization on yield and its components of two wheat cultivars under Al-Wady Al Gadeed conditions. Alex. .J. Agrci. Res., 51: 49-65.

Snedecor, G.W. and W.G. Cochran, 1990. Statistical Methods 8th Ed, Iowa State Univ., Press, Ames, Iowa, USA.

Steel, R.G.D. and J.H. Torrie, 1980. Principles and procedures of statistics. Mc Crow-Hill Book Co.,Inc., New York, Toronto, London.

Suzan, A.K.I., 2007. Effect of auxin levels and phosphorous bio-fertilization on wheat yield and its components. M. Sc. Thesis, Fac. of Agric. Alex. Univ., Egypt.

Res. J. Agric. & Biol. Sci., 7(1): 105-114, 2011

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

Wali Asal, M.A., 2010. The combined Effect of mineral organic and bio-fertilizers on the productivity and quality of some wheat cultivars. Ph.D. Thesis, Fac. of Agric. Alex. Univ., Egypt.

Wu, S.C., Z.H. Cao, Z.G. Li and K.C. Cheung, 2005. Effect of biofertilizer containing N-fixer, P and K solubilizers and AM fungi on maize growth: a greenhouse trial. Geoderma.,125: 155- 166.

Zaki, M., M.A.Nabila, Ahmed and M.S. Hassanein, 2004. Growth and yield of some wheat cultivars irrigated with saline water in newly cultivated land as affected by nitrogen fertilization. Annals of Agric. Sci., Moshtoher, 42(2): 515-525.

Zaki, M., M.S. Nabila, Hassanein and K.M. Gamal El-Din, 2007. Growth and yield of some wheat cultivars irrigated with saline water in newly cultivated land as affected by biofertilization. J. of Applied Sci., 1121-1126.

Zeidan, E.M., Abd I.M. El-Hameed, A.H. Bassiouny and A.A. Waly, 2009. Effect of irrigation intervals, nitrogen and organic fertilization on yield, yield attributes and crude protein content of some wheat cultivars under newly reclaimed saline soil condition.4th Conference on Recent Technologies in Agriculture.