RESPONSE OF ONION PLANTS TO BIO AND MINERAL FERTILIZATION UNDER SANDY SOIL CONDITIONS

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ABSTRACT

This work was carried out during the two successive winter seasons of 2005/2006 and 2006/2007 at El-Khattara Exp. Farm, Fac. Agric., Zagazig Univ., Sharkia Governorate, Egypt, to study the effect of biofertilizers and NPK mineral fertilizers on the growth rate, total uptake of N, P and K, and yield of onion plants, under sandy soil conditions.

Fertilization of onion plants with some biofertilizers mixture; i.e., Rhizobacterine + Phosphorein + Potassumag at rate of 1.5 kg per feddan caused a significant effect on growth rate, total nutrients uptake (N, P and K), and the yield and its components expressed as average bulb weight, exportable, marketable and total yield, but did not affect both neck and bulb diameter and bulbing ratio.

Application of N, P and K mineral fertilizers caused gradual and consistent increase in the growth rate except bulbing ratio, dry weight per plant, total nutrients uptake (N, P and K), as well as yield and its component.The maximum values in this respect were obtained via application of the relatively high levels of NPK mineral fertilizers; i.e., 100 kg N + 60 kg P_2O_5 + 100 kg K_2O per feddan or by application of 80 kg N + 40 kg P_2O_5 + 80 kg K_2O per feddan, without significant differences between them in most cases.

The interaction treatments between biofertilizers mixture and application of N, P and K mineral fertilizers at a rate of 100 kg N + 60 kg P_2O_5 + 100 kg K_2O per feddan or by application of 80 kg N+ 40kg P_2O_5 + 80 kg K_2O per feddan caused a significant increase in average bulb weight and total yield without significant differences between them.

Keywords: Onion, biofertilizers, mineral fertilizers, growth, total Uptake, yield and its components.

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INTRODUCTION

Onion (*Allium cepa* L.) is one of the oldest and most important vegetable crops grown in Egypt for local consumption and exportation.

Increasing production is one of the national aims in Egyptian Agriculture. In this connection, onion production suffered from serious problems that are mostly due to using excess mineral fertilizers causes environmental pollution, and contaminate the under ground water (Fisher and Richter, 1984).

Nowadays, attention was focused on the use of organic and biofertilizers instead of chemical ones to produce clean vegetable crops. Moreover, biofertilizers and organic fertilizer encourage plant growth through improving soil conditions which leads to higher yield with good quality (Borin *et al*., 1987). Also, biofertilizers which can be defined as preparations containing live cells of efficient strains of nitrogen fixing, phosphate and potassium solubizing bacteria could be used with a relatively low amounts of chemical fertilizers instead of chemical fertilizers alone. Furthermore, biofertilizers increased the availability of nutrients in form which can be easily assimilated by plants (Subba Rao, 1984). In this regard, it is very important to increase the productivity of onion yield per unit area under sandy soil conditions. Many investigators concluded that application of biofertilizers caused a marked effect on the growth rate, total nutrients uptake, and productivity (Ruban, 2007).

Application of NPK mineral fertilizers exerted a significant effect on the growth rate and productivity of onion under sandy soil conditions (El-Tantway and El-Beik, 2009).

Thus, the possibility of supplying bio and chemical fertilizers to onion plants under sandy soil conditions is undoubtedly of great important to reduce the amount of added mineral fertilizer alone to onion plants.

Therefore, the purpose of the present work was to study the possibility of supplementation and/or decreasing the amount of major mineral fertilizers (N, P and K) by using biofertilizers in the production of onion plants under sandy soil conditions.

MATERIALS AND METHODS

This work was carried out during the two successive winter seasons of 2005/2006 and 2006/2007 at El-Khattara Experimental Farm, Faculty of Agriculture, Zagazig University, Sharkia governorate, Egypt, to study the effect of biofertilizers and NPK mineral fertilizers on the growth, plant nutritional status and yield and its components of onion plants .The experimental soil was sandy in texture and chemical properties were: Organic matter 0.30 and 0.34%; total N 0.08 and 0.06%; total P 0.008 and 0.009%; total K 0.05 and 0.05%; pH 8.00 and 7.88 and E.C. 2.18 and 1.71 dsm^{-1} in the first and second seasons, respectively.

The experiment included eight treatments which were combination between biofertilizer treatments (without and with biofertilizers) and four rates of NPK mineral fertilizers as follows:

Biofertilizers Treatments

1. Control (without biofertilizers)
2. Biofertilizers mixture of (Rhizobacterine, Phosphorein and Potassumag) at rate of 1.5 kg each /feddan.

Rates of NPK Mineral Fertilizers

1. Control (without NPK)
2. 60 N + 20 P_2O_5 + 60 K_2O (kg/fed.)
3. 80 N + 40 P_2O_5 + 80 K_2O (kg/fed.)
4. 100 N + 60 P_2O_5 + 100 K_2O (kg/fed.)

These treatments were arranged in a split plots design with four replications. Biofertilizers were randomly arranged in the main plots, while the rates of NPK mineral fertilizers were randomly distributed in sub plots. The area of sub plot was 9.6 m^2. and it contained four ridges (four dripper irrigation lines), with 4 m length and 60 cm width.

Seeds of onion cv. Giza 20 were sown in nursery on October 15th and 30th and transplanted at 10 cm apart on both sides of the dripper lines on January 5th and 25th in the first and second seasons, respectively.

Biofertilizers mixture of (Rhizobactrine contains of *Azotobacter* and *Azospirillium*, phosphorein contains of *Bacillus megatherium* and potassumag contains of *Bacillus circulans*)

mixed with sand and peatmoss, added at 10 cm depth beside the plant at 10 days from transplanting, covered with sand and irrigated. The source of these biofertilizers was [*](GOAEF). Ammonium sulphate (20.50%N), calcium super phosphate (16-18% P_2O_5) and potassium sulphate (48-52% K_2O) were used as sources of N, P and K mineral fertilizers, respectively.

All the amounts of phosphorus fertilizer and one fourth of N+K mineral fertilizers were added with 25 m^3 farmyard manure/feddan during soil preparation. The rest amount of N and K were divided into five equal portions and added as soil application every two weeks beginning at 30 days after transplanting. Drip irrigation system was used and the discharge of the drippers were two liters / hour at 1bar.

At 75 days after transplanting, a random sample of five plants was taken from each sub plot, plant growth traits and yield and its components were recorded and total nitrogen, phosphorus and potassium in different plant parts were determined according to the methods described by Bremner and Mulvaney (1982), Olsen and Sommers (1982), and Jackson (1970), respectively.

Statistical Analysis

The data were subjected to proper statistical analysis of variance according to Snedecor and Cochran (1980) and means separation were done according to Duncan (1958).

RESULTS AND DISCUSSION

Plant Growth Measurements

Morphological characters

Effect of biofertilizers mixture

Table 1 shows that application of some biofertilizers mixture significantly increased plant height, number of leaves per plant, and bulb diameter in both seasons of study, but did not affect neck diameter and bulbing ratio as compared with the control treatment.

Similar results were found by Ruban (2007) with plant height, Mahmoud and El-Hefny (1999) in growth parameters, except neck diameter and bulbing ratio.

The beneficial effects of biofertilizers on growth of onion

[*] (GOAEF) General Organization for Agricultural Equalization Foundation, Ministry of Agriculture, Egypt.

Table 1. Effect of some biofertilizers mixture , different rates of NPK mineral fertilizers and their interactions on the vegetative growth characters of onion plants at 75 days after transplanting during 2005/2006 and 2006/2007 seasons

Treatments		Vegetative growth characters									
*Bifertilizers mixture	Rates of X N + P_2O_5 + K_2O (kg /fed.)	Plant height (cm)	Number of leaves/plant	Diameter (cm)		Bulbing ratio	Plant height (cm)	Number of leaves/plant	Diameter (cm)		Bulbing ratio
				Neck	Bulb				Neck	Bulb	
		2005/2006 season					2006/2007 season				
Without biofertilizers mixture	0 + 0 + 0	40.10 a	5.95 a	0.87 a	1.44 a	0.60 a	43.33 a	7.69 a	1.30 a	2.37 a	0.56 a
	60+20+60	57.41 a	8.13 a	1.37 a	2.34 a	0.59 a	52.00 a	8.44 a	1.72 a	3.34 a	0.52 a
	80+40+80	60.55 a	8.12a	1.43 a	2.46 a	0.58 a	55.80 a	9.20 a	1.90 a	3.71 a	0.51 a
	100+60+100	60.82 a	8.45a	1.52 a	2.54 a	0.60 a	59.65 a	9.25 a	1.94 a	3.95 a	0.50 a
Mean		54.72 B	7.66 B	1.30 A	2.19 B	0.59 A	52.70 B	8.64 B	1.71 A	3.3 4 B	0.52 A
With biofertilizers mixture	0 + 0 + 0	41.16 a	6.00 a	0.94 a	1.53 a	0.62 a	46.93 a	8.75 a	1.49 a	2.84 a	0.53 a
	60+20+60	61.68 a	8.54 a	1.41 a	2.50 a	0.57 a	55.85 a	9.09 a	1.79 a	3.52 a	0.51 a
	80+40+80	63.33 a	8.86 a	1.50 a	2.62 a	0.57 a	58.28 a	9.33 a	1.92 a	4.04 a	0.48 a
	100+60+100	63.83 a	8.90 a	1.59 a	2.69 a	0.59 a	60.63 a	9.75 a	1.96 a	4.15 a	0.48 a
Mean		57.50A	8.07 A	1.36 A	2.33 A	0.59 A	55.42 A	9.23 A	1.79 A	3.64 A	0.50 A
Mean values of NPK rates (kg /fed.)	0 + 0 + 0	40.63 B	5.98 B	0.91C	1.48 D	0.61 A	45.13 C	8.22 B	1.40 C	2.61C	0.54 A
	60+20+60	59.55 A	8.34 A	1.39 B	2.42 C	0.58 A	53.93 B	8.76 AB	1.75 B	3.43 B	0.52 A
	80+40+80	61.94 A	8.49 A	1.47 B	2.54 B	0.58 A	57.04 AB	9.27A	1.91 A	3.88 A	0.50 A
	100+60+100	62.32 A	8.67 A	1.56 A	2.61 A	0.59 A	60.14 A	9.50 A	1.95 A	4.04 A	0.49 A

*With biofertilizers = mixture of 1.5 kg phosphorein + 1.5 kg Rhizobactrine + 1.5 kg potassumag per feddan.

Means having same alphabetical letter(s) within each column did not significantly differ according to Duncan's multiple range test at 0.05 level .

Capital letters are for main effects, while small litters for interaction means.

plants might be attributed of N_2-fixation, mobilizing to some macro and micro elements (Saber, 1993) and produce plant growth substances (Noel *et al*., 1996). Adding mixture of microorganisms encouraged each other to be of more effect.

Effect of NPK mineral fertilizers

Table 1 show that NPK at a rate of 100 kg N + 60 kg P_2O_5 + 100 kg K_2O and 80 kg N + 40 kg P_2O_5 + 80 kg K_2O / feddan increased plant growth, but it did not affect bulbing ratio .Similar results were found by Deho *et al*. (2002).

The balance between NPK may be of good effect on plant growth.

Effect of the interaction

Table 1 show that, all interaction treatments did not show any significant effect on the vegetative growth characters of onion plants in both seasons of study.

Dry Weight

Effect of biofertilizers mixture

Data in Table 2 show that fertilizing onion plants with mixture of some biofertilizers significantly increased the dry weight bulb, leaves and whole plant, as compared with the control treatment, whereas it did not affect the dry weight of roots. Thus, application of biofertilizers to onion plants grown under the conditions of sandy soil promoted the plant in building metabolites.

These results may be attributed to the effect of biofertilizers on the fresh weight of onion plants.

Effect of NPK mineral fertilizers

Results in Table 2 show that there was a progressive, consistent and significant increase in the dry weight of different parts of onion plants; i.e., roots, bulb and leaves, as well as whole plant dry weight by increasing the application of NPK mineral fertilizers up to the relatively highest used rate, which being the most favorable and effective treatment in this respect, followed by application of 80 kg N + 40kg P_2O_5 +80 kg K_2O /feddan.

In this connection, the increase in photosynthetic capacity with application of NPK fertilizers to which the number of leaves per plant could be a reliable index might be contributed much for the superiority in the dry weight of onion plants fertilized by a rate of 100 kg N + 60kg P_2O_5 +100 kg K_2O per Feddan.

The favourable effect of NPK mineral fertilizers on the dry weight of onion plants was in harmony with the results reported

Table 2. Effect of some biofertilizers mixture, different rates of NPK mineral fertilizers and their interactions on the dry weight of onion plants at 75 days after transplanting during 2005/2006 and 2006/2007 seasons

Treatments			Dry weight / plant (g.)							
* Biofertilizers mixture	X	Rates of $N + P_2O_5 + K_2O$ (kg /fed.)	Roots	Bulb	Leaves	Whole plant	Roots	Bulb	Leaves	Whole plant
			2005/2006 season				2006/2007 season			
Without biofertilizers mixture		0 + 0 + 0	0.14 a	0.57 a	1.14 a	1.85 a	0.10 a	1.80a	2.01 a	3.91 a
		60+20+60	0.17 a	1.28 a	2.94 a	4.39 a	0.12 a	3.65 a	2.93 a	6.70 a
		80+40+80	0.18 a	1.30 a	2.99 a	4.47 a	0.13 a	3.82 a	3.89 a	7.84 a
		100+60+100	0.23 a	1.44 a	3.20 a	4.87 a	0.14 a	4.38 a	4.35 a	8.88 a
Mean			0.18 A	1.15 B	2.57 B	3.89 B	0.12 A	3.41 B	3.30 B	6.83 B
With biofertilizers mixture		0 + 0 + 0	0.14 a	0.65 a	1.28 a	2.07 a	0.08 a	2.53 a	2.54 a	5.15 a
		60+20+60	0.19 a	1.46 a	3.19 a	4.85 a	0.14 a	3.80 a	3.82 a	7.76 a
		80+40+80	0.21 a	1.61 a	3.47 a	5.29 a	0.14 a	4.60 a	4.22 a	8.96 a
		100+60+100	0.26 a	1.79 a	4.36 a	6.41 a	0.17 a	5.06 a	4.95 a	10.18 a
Mean			0.20 A	1.38 A	3.07 A	4.65 A	0.13 A	4.00 A	3.88 A	8.01 A
Mean values of NPK rates (kg /fed.)		0 + 0 + 0	0.14 C	0.61B	1.21 C	1.96 C	0.09 C	2.16 C	2.28 C	4.53 D
		60+20+60	0.18 B	1.37 A	3.07 B	4.62 B	0.13 B	3.73 B	3.38 B	7.23 C
		80+40+80	0.19 B	1.46 A	3.23 B	4.88 B	0.14 B	4.21 AB	4.06 A	8.40 B
		100+60+100	0.25 A	1.62 A	3.78 A	5.64 A	0.16 A	4.72 A	4.65 A	9.53 A

*With biofertilizers= mixture of 1.5 kg phosphorein + 1.5 kg Rhizobactrine +1.5kg potassumag per feddan.

Means having same alphabetical letter(s) within each column did not significantly differ according to Duncan's multiple range test at 0.05 level. Capital letters are for main effects, while small litters for interaction means.

by El-Tantawy and El-Beik (2009) in sandy soil who reported that application of high dose of nitrogen increased dry weight of onion plant.

Effect of the interaction

The interaction between the two factors did not reflect any significant effect (Table 2) in this regard

Total N, P and K Uptake Content

Effect of biofertilizers mixture

Data in Table 3 show that application of biofertilizers mixture exerted a marked and significant effect in increasing the total uptake of nitrogen, phosphorus and potassium in the tissues of onion plants, as compared with the control treatment.

The promoting effect of biofertilizers mixture application on the uptake of nitrogen, phosphorus and potassium may be due to its effect on mobilizing nutrients and to accurate microbial processes, which helped in availability of metals and increased level of extractable minerals. In this regard, El-Karmany *et al*. (2000) came to similar conclusion. Also to their effects on the dry matter accumulation (Table 2).

Effect of NPK mineral fertilizers

Data in Table 3 indicate that the maximum values of NPK total uptake were more distinct via application of the relatively high level (100 kg N + 60 kg P_2O_5 + 100 kg K_2O per feddan), followed by application of 80 kg N + 40 kg P_2O_5 + 80 kg K_2O/feddan, without significant differences between them.

From the previously mentioned results it could be suggested that the increase in the total uptake of N, P and K in the tissues of onion plants, as a result of increasing the level of N, P and K mineral fertilizers might be attributed to the stimulating effect on the absorbing efficiency of the plant, dry matter (Table 2) and the high content of these nutrients in the soil media and to the balance between these elements in the soil.

These results are in agreement with those reported by Oukal (1999) who indicated that application of the high level of NPK fertilizers recorded the maximum values of total N, P and K uptake by onion plant.

Effect of the interaction

With respect to the effect of the interaction, it is quite clear from

Table 3. Effect of some biofertilizers mixture, different rates of NPK mineral fertilizers and their interactions on total uptake of onion plant at 75 days after transplanting during 2005/2006 and 2006 / 2007 seasons

Treatments		Total uptake (mg / plant)					
*Bifertilizers mixture X	Rates of $N + P_2O_5 + K_2O$ (kg /fed.)	N	P	K	N	P	K
		2005 / 2006 season			2006 / 2007 season		
Without biofertilizers mixture	0 + 0 + 0	57.89 a	6.32 a	68.61 a	95.66 a	12.09 a	99.83 a
	60+20+60	131.47 a	15.93 a	162.23 a	155.63 a	23.98 a	162.49 a
	80+40+80	139.89 a	16.46 a	173.21 a	183.18 a	31.24 a	205.56 a
	100+60+100	157.82 a	19.16 a	196.61 a	212.76 a	32.77 a	232.07 a
Mean		121.77 B	14.47 B	150.16 B	161.81 B	25.02 B	174.99 B
With biofertilizers mixture	0 + 0 + 0	65.39 a	7.47 a	80.65 a	126.21 a	18.10 a	133.24 a
	60+20+60	144.87 a	20.84 a	181.88 a	178.85 a	31.53 a	184.43 a
	80+40+80	165.92 a	22.17 a	208.95 a	204.23 a	29.71 a	215.90 a
	100+60+100	214.85 a	24.90 a	234.99 a	229.77 a	33.18 a	247.82 a
Mean		147.75 A	18.84 A	176.62 A	184.76 A	28.13 A	195.35 A
Mean values of NPK rates (kg /fed.)	0 + 0 + 0	61.64 C	6.89 B	74.63 C	110.94 D	15.75 C	116.54 D
	60+20+60	138.17 B	18.38 A	172.05 B	167.24 C	27.75 B	173.46 C
	80+40+80	152.90 B	19.32 A	191.08 AB	193.70 B	30.48 AB	210.73 B
	100+60+100	186.34 A	22.03 A	215.80 A	221.26 A	32.97 A	239.94 A

*With biofertilizers = mixture of 1.5 kg phosphorein + 1.5 kg Rhizobactrine + 1.5 kg potassumag per feddan.

Means having same alphabetical letter(s) within each column did not significantly differ according to Duncan's multiple range test at 0.05 level

Capital letters are for main effects, while small litters for interaction means.

the obtained results in Table 3 that, all the interaction treatments between the two factors of study; i.e., application of biofertilizers and N, P_2O_5 and K_2O mineral fertilizers did not reflect any significant effect on the total uptake of N, P and K of onion plant in the two seasons of study.

Yield and its Components

Effect of biofertilizers mixture

It is evident from data in Table 4 that application of biofertilizers mixture significantly increased average bulb weight, exportable, marketable and total bulb yield. In this connection, the total yield of onion bulbs treated with biofertilizers mixture was increased by 11.38% and 9.28% over the control treatment, in the first and second seasons, respectively.

These results were similarly of that reported by El-Kalla *et al*. (1997) and Yadav *et al*. (2005) who found that biofertilizers application increased marketable yield and average bulb weight of onion plant.

The superiority in total bulbs yield by application of biofertilizers mixture dialectally owing to the increase in average bulb weight (Table 4) and also this might be due to the favourable effect of such treatment on vegetative growth (Table 1), dry weight of onion plant (Table 2) and total nutrients uptake (Table 3), which may be increased the efficiency of photosynthetic capacity and in turn resulted in more accumulation of stored food in onion bulbs.

Effect of NPK mineral fertilizers

It is quite clear from the presented data in Table 4 that there was a consistent and progressive increase in average bulb weight, exportable, marketable and total yield of onion bulb by increasing application of N, P and K mineral fertilizers up to the highest rate i.e., 100 kg N + 60 kg P_2O_5 + 100 kg K_2O per feddan which being the most effective and favourable treatment, followed by application of 80 kg N + 40 kg P_2O_5 + 80 kg K_2O per feddan.

The total yield of onion bulbs was increased over the control treatment by 68.41%, 62.38% and 45.72% (average of the two seasons of study) by application of 100 kg N + 60 P_2O_5 +100 kg K_2O, 80 kg N + 40 kg P_2O_5 + 80 kg K_2O and 60 kg N + 20 kg P_2O_5 + 60 kg K_2O per feddan , respectively.

Table 4. Effect of some biofertilizers mixture, different rates of NPK mineral fertilizers and their interactions on the yield and its components of onion plants at harvest time during 2005/2006 and 2006 / 2007 seasons

Treatments		Yield and its components									
* Biofertilizers mixture	X Rates of $N + P_2o_5 + K_2O$ (kg /fed.)	Average bulb weight (g)	Yield (Ton /Feddan)			Relative Yield (%)	Average bulb weight (g)	Yield (Ton /Feddan)			Relative yield (%)
			Exportable	Marketable	Total			Exportable	Marketable	Total	
		2005 / 2006 seasons					2006 / 2007 seasons				
Without biofertilizers mixture	0 + 0 + 0	45.60 d	3.30 f	5.88 d	6.10 d	100.00	54.77 e	4.35 e	6.85 e	7.33 f	100.00
	60+20+60	66.71 c	7.34 e	8.96 c	8.95 c	146.55	83.35 c	9.68 c	11.09 c	11.09 d	151.36
	80+40+80	72.32 bc	7.96 de	9.70 bc	9.69 bc	158.68	95.26 ab	11.30 b	12.73 b	12.73 b	173.77
	100+60+100	72.25 bc	9.53 ab	9.71 bc	9.71 bc	159.18	95.46 ab	11.33 b	12.81 b	12.81 b	174.72
Mean		64.22 B	7.03 B	8.56 B	8.61 B	100.00	82.21 B	9.16 B	10.87 B	10.99B	100.00
With biofertilizers mixture	0 + 0 + 0	47.04 d	3.52 f	6.42 d	6.44 d	105.40	65.32 d	6.72 d	8.77 d	8.77 e	119.39
	60+20+60	73.21 bc	8.40 cd	9.83 bc	9.82 b	160.81	87.62 bc	9.64 c	11.70 c	11.70 c	159.69
	80+40+80	77.06 b	9.05 bc	10.33 b	10.33 b	169.34	102.25 a	12.34 a	13.80 a	13.80 a	188.38
	100+60+100	87.30 a	10.06 a	11.78 a	11.79 a	193.11	102.67 a	12.73 a	13.76 a	13.76 a	187.84
Mean		71.15 A	7.76 A	9.59 A	9.59 A	111.38	89.46 A	10.35 A	12.00 A	12.00 A	109.28
Mean values of NPK rates (kg /fed.)	0 + 0 + 0	46.32 D	3.41 D	6.15 D	6.27 D	100.00	60.04 C	5.53 C	7.81 C	8.03 C	100.00
	60+20+60	69.96 C	7.87 C	9.40 C	9.38 C	149.61	85.48 B	9.66 B	11.39 B	11.39 B	141.84
	80+40+80	74.69 B	8.50 B	10.02 B	10.01 B	159.64	98.76 A	11.82 A	13.26 A	13.26A	165.13
	100+60+100	79.77 A	9.80 A	10.75 A	10.75 A	171.45	99.06 A	12.03 A	13.28 A	13.28 A	165.37

*With biofertilizers = mixture of 1.5 kg phosphorein + 1.5 kg Rhizobactrine + 1.5 kg potassumag per feddan. Means having same alphabetical letter(s) within each column did not significantly differ according to Duncan's multiple range test at 0.05 level . Capital letters are for main effects, while small litters for interaction means.

The superiority in onion bulbs yield and its components by application of the relatively highest rate of N, P and K mineral fertilizers may be due to consequent of promoting vegetative growth rate and dry weight of onion plant (Tables 1 and 2) which resulted in an increase in metabolites synthesized and stored in leaves shoats.

These results were in accordance with those found by El-Tantway and El-Beik (2009) who found that application of high dose of nitrogen increased total, marketable and exportable onion yield.

Effect of the Interaction

It is quite clear from data in Table 4 that the maximum increments of average bulb weight, exportable, marketable and total yield (ton/fed.) were more achieved by the interaction between biofertilizers mixture and application of NPK mineral fertilizers at a rate of 100 kg N + 60 kg P_2O_5 + 100 kg K_2O / feddan, which came in the first rank, followed by the interaction between biofertilizers mixture and application of 80 kg N +40 P_2O_5 +80 kg K_2O / feddan, which being the second one, without significant differences between them in most cases.

In this respect, it can be suggested that such treatments significantly increased the total yield of onion bulbs through their superior effect on plant growth rate, dry weight of onion plant and partially to their promoting effect on total nutrient uptake .Similar results were also reported by Santhi *et al*. (2005) and Massoud *et al*. (2009).

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استجابة نباتات البصل للتسميد الحيوى والمعدنى تحت ظروف الأرض الرملية

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أجرى هذا العمل خلال الموسمين الشتويين لعامي ٢٠٠٥/٢٠٠٦ ، ٢٠٠٦/ ٢٠٠٧ فى مزرعة التجارب الزراعية بالخطارة ، كلية الزراعة – جامعة الزقازيق – محافظة الشرقية. مصر، وذلك لدراسة تأثير الأسمدة الحيوية، والتسميد المعدني (النيتروجيني، والفوسفاتي، والبوتاسي) علي معدل نمو النباتات، والامتصاص الكلى من العناصر الغذائية (النيتروجين، الفوسفور، البوتاسيوم) والمحصول ومكوناته لنباتات البصل النامية في الأرض الرملية.

أدى تسميد نباتات البصل بمخلوط الأسمدة الحيوية (١.٥ كجم ريزو بكتيرين ، ١.٥كجم فوسفورين، ١.٥كجم بوتاسيوماج / فدان) إلى حدوث تأثيراً معنوياً في معدل النمو، والامتصاص الكلى للنيتروجين والفوسفور والبوتاسيوم، علاوة علي المحصول الكلى ومكوناته للبصل معبراً عنها بمتوسط وزن البصلة، والمحصول الصالح للتصدير والصالح للتسويق ، بالمقارنة بمعاملة عدم إضافة الأسمدة الحيوية (الكنترول)، وكانت هذه النتائج حقيقة مؤكده في موسمي الدراسة. ومن ناحية أخرى، لم يظهر للمعاملة بالأسمدة الحيوية اى تأثير معنوى على كل من قطر العنق ومعامل التبصيل.

أدى التسميد المعدني (النيتروجين، الفوسفور، البوتاسيوم) إلى حدوث زيادة تدريجية ومتلازمة في معدل نمو النباتات (فيما عدا معامل التبصيل)، والوزن الجاف للنبات والامتصاص الكلى لعناصر (النيتروجين والفوسفور والبوتاسيوم)، وكذلك المحصول الكلي ومكوناته، وكانت أقصي قيم في هذا الخصوص اكثر وضوحاً من خلال إضافة أعلي معدل للتسميد النيتروجيني والفوسفاتي والبوتاسي وهو ١٠٠ كجم ن+ ٦٠ كجم فو٢أ٥ + ١٠٠ كجم بو٢أ للفدان، يليه إضافة ٨٠ كجم ن +٤٠ كجم فو٢أ٥ + ٨٠ كجم بو٢أ للفدان، علي الترتيب، مع عدم وجود فروق معنوية بينهما.

أدت معاملة التفاعل بين الأسمدة الحيوية وإضافة السماد المعدني بمعدل ١٠٠ كجم ن+ ٦٠ كجم فو٢أ٥ + ١٠٠ كجم بو٢أ للفدان يليه إضافة ٨٠ كجم ن +٤٠ كجم فو٢أ٥ + ٨٠ كجم بو٢أ للفدان علي الترتيب إلى حدوث زيادة معنوية في متوسط وزن البصلة، والمحصول الكى ومكوناته، مع عدم وجود اختلافات معنوية بين هذين المعدلين من الأسمدة.