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PRODUCTIVITY AND QUALITY OF TWO ONION CULTIVARS UNDER ORGANIC, SLOW RELEASE AND MINERAL FERTILIZERS

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ABSTRACT

There is a recent tendency to use organic and slow release fertilizers in crops as a natural and safe substance. Two field experiments were carried out during winter seasons of 2008/09 and 2009/10 at Sakha Agricultural Research Station, Kafr El-Sheikh Governorate, Egypt, to compare the effect of different sources of nitrogen fertilizer: 6 tons compost/fed, 8 tons compost/fed, 10 tons compost/fed, 30 kg N/fed, as Enciabein (Enc., a commercial trade name of slow release N fertilizer), 60 kg N (Enc.)/fed, 90 kg N (Enc.)/fed and 90 kg N/fed as ammonium nitrate on growth, yield, quality, macroelements contents and storability of onion bulb cultivars (Giza 20 and Giza Red).

The results showed that Giza Red onion cultivar had the highest means of vegetative growth i.e.(plant height, No. of leaves/plant, bulb diameter, neck diameter, bulb fresh weight and plant fresh and dry weight at 90 and 120 days after transplanting , marketable and total bulbs yield/fed, average bulb weight and bulb diameter compared with cv. Giza 20.

Application of 90 kg N/fed as mineral source produced the highest and significant values of plant height, number of leaves, neck diameter, bulb diameter, bulb fresh weight, plant fresh weight and plant dry weight. Application of 30 kg (Enc. /fed) or 6 t/fed compost resulted in the highest and significant dry matter content of bulbs.

Giza Red cv. produced the highest and significant bulb fresh weight, plant fresh and dry weight, number of leaves, neck diameter, bulb diameter, bulb fresh weight, plant dry weight, marketable yield/fed, total yield/fed and average bulb weight under the application of 90 kg N/fed as mineral source, but it gave the lowest culls yield/fed. Meanwhile, application of 30 kg N (Enciabien) or application of 6 t/fed compost significantly increased bulbs dry matter content.

Giza Red cv. with 90 kg N/fed (mineral) produced highest and significant marketable yield, total yield and average bulb weight, but it significantly decreased culls yield/fed. On the other hand, Giza 20 cv. with 30 kg N (Enciabien) produced highest and significant total soluble and dry matter content.Giza 20 cv. had the lower and significant P-content with the best of storability after 180 days storage period.

Keywords: Onion, *Allium cepa* L., N-sources, slow release N, mineral nitrogen fertilizer and compost

INTRODUCTION

Onion (*Allium cepa* L.) is an important crop in Egypt. It is consumed at its young green stage or after its full maturity when it is harvested in form of a dry bulb. It is growing extensively during winter season in Egypt, occupying the third crop after tomato and potato in area (115295 feddans) in 2010 season and production (1563300 tons) with an average of 13.56 t/fed, as mentioned by the yearly book of Economics and Statistics of the Agric. Ministry, in Egypt.

Over use of mineral fertilizers causes environmental pollution due to the excessive accumulation and leaching of harmful elements to the ground water (Ju *et al*., 2007). Therefore, N fertilization in vegetable fields has to be taken into account not only farming economics but also the environment and human health (Schenk, 2006).

Application of Enciabein as a slow release N fertilizer was superior than other fast release N fertilizers with regard to growth and yield (El-Dawwey *et al*., 1998; Zeidan and El-Karamany, 2001 and Ahmed *et al*., 2009). Moreover, Geries (2007) found no valuable effect was observed due to frequency of application with Enciabein. Organic manures can serve as alternative to mineral fertilizers as reported by Naeem *et al*., (2006) for improving soil structure (Dauda *et al.*, 2008). Many investigators studied the role of organic manures as stimulating the plant growth, yield of onion (El-Sheekh and Hegazy (1998), Mahmoud *et al*. (2000), Rizk *et al*. (2002), Ahmad (2004), Geries (2007) and Shaheen *et al*. (2007). On the other hand, mineral nitrogen fertilizer is found essential and plays important role on the bulb formation, consequently affect onion yield. Herison *et al.,* (1993) found that higher nitrogen application produced larger onion plants at transplanting and larger bulbs at harvest. Khan *et al.,* (2002) reported that application of 100 kg N/ha produced the highest bulbs yield. Ghaffoor *et al.(*2003) concluded that application of 150 kg/ha gave highest number of leaves/plant, bulb diameter, marketable yield ,culls percentage and total yield.

The main objective of this investigation was to compare the effect of different levels of organic (compost) and slow release fertilizers, in addition, mineral fertilizer and their effect on growth, yield, quality and storability of two onion cultivars.

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MATERIALS AND METHODS

Onion was grown in a clay soil at the Experimental Farm of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate, Egypt, in 2008/09 and 2009/2010 seasons. The preceding crop was rice in both seasons. Chemical analysis of soil samples, which taken to 30 cm depth before transplanting are presented in Table (1). Organic fertilizer, which used in both seasons, is analyzed as shown in Table (2). The experimental soil was fertilized with 45 kg P_2O_5/fed in the form of calcium superphosphate (15.5% P_2O_5) during soil preparation.

Table 1: Chemical analysis of the experimental soil (0-30 cm depth) in 2008/09 and 2009/10 seasons.

Season	pH (1:2.5)	EC (mmhos/ cm^3)	$CaCO_3$ %	ON %	Available (ppm)			DTPA extract (ppm)		
					N	P	K	Zn	Mn	Fe
2008/09	8.2	2.90	2.58	1.14	24.12	6.31	309.6	0.97	10.0	9.43
2009/010	8.2	2.73	3.07	0.96	19.80	7.11	293.16	1.55	12.0	6.12

Table 2: Total macro and micro elements content, C/N ratio and bulk density (kg) of one m^3 compost in 2008/09 and 2009/010 seasons.

Season	N	P	K	Ca	Mg	Fe	Mn	Zn	C/N ratio	Bulk density kg /m^3
	As % of dry matter					(ppm)				
2008/09	1.38	1.39	1.83	5.76	0.70	4278	348	214	14.89	590
2009/010	1.74	1.50	2.21	6.22	0.83	5781	397	222	11.21	550

Seed of two tested cultivars (Giza 20 and Giza Red) were sown in the nursery on October 5th in both seasons. Transplanting took place on December 18th and 23rd in the two seasons, respectively.

A split plot design with four replications was used. The main plots were assigned to onion cultivars i.e. Giza 20 and Giza Red and the sub-plot was occupied by N-fertilizer sources as follows:

N_1) 6 t compost (comp.)/fed.
N_2) 8 t compost/fed.
N_3) 10 t compost/fed.
N_4) 30 kg N/fed, as Enciabein (commercial trade name of slow release N fertilizer 40% N) (Enc.).
N_5) 60 kg N (Enciabein)/fed.
N_6) 90 kg N (Enciabein)/fed.
N_7) 90 kg N/fed, as ammonium nitrate (33.5% N, mineral).

The plot area was 10.5 m^2 (3.5 m length and 3 m width) included five ridges with 60 cm apart between ridges. Uniformed seedlings were transplanted on the two sides of ridges 7-10 cm apart. Compost and Enciabein were added during soil preparation and ammonium nitrate was added in two equal doses, the first was applied after thirty days from transplanting and the second was given thirty days later. Other cultural practices for growing onion were conducted as recommended.

Studied characters:

A. Plant growth measurements:

A representative samples, each consisted five plants were randomly taken from 2nd row of each plot at 90 and 120 days after transplanting (DAT) to estimated plant height (cm), No. of leaves/plant, bulb and neck diameter (cm), bulbing ratio (neck diameter, cm/bulb diameter, cm) as disscribed by (Mann, 1952), bulb fresh weight (g) as well as fresh and dry weights of whole plant (according to the methods described by A.O.A.C., 1975).

B. Total bulbs yield and quality:

At harvest, all the remaining bulbs were uprooted and bulbs yield of onion expressed as average bulb weight (g), marketable bulbs yield (t/fed), culls bulb weight (t/fed) and total bulbs yield (t/fed). In the same time, samples of 5 bulbs from each plot were taken randomly for recording the bulb quality properties, i.e., bulb diameter (cm), total soluble solids (TSS%) and dry matter content.

C. Macro elements content:

At harvest, onion bulb samples from each plot were randomly selected for elemental analysis. Bulb tissues were oven dried at 70°C for 72 hours. N, P and K elements were determined according to the methods described by Pregl (1945), Trough and Mayer (1939) and Brown and Lilleland (1946), respectively.

D. Storability:

After curing, random samples (each of 10 kg) were taken from every treatment, stored at normal room conditions and weight loss percentage was recorded after every 60 days (3 storage periods).

Statistical analysis:

Combined analysis of variance was carried out for the two seasons according to Gomez and Gomez (1984). Treatment means were compared by Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

A. Plant growth measurements:

The combined analysis show that onion cultivars had a significant influence on plant growth characters as expressed by plant height, No. of leaves/plant, bulb diameter, neck diameter, bulb fresh weight as well as fresh and dry weights of onion plant at all sampling as shown in Tables (3 and 4). Giza Red had the highest values of these traits compared with Giza 20. These results might be attributed to genetic variation between the onion cultivars in respect to these characters. The differences between onion cultivars in respect to these traits were reported by El-Damarany and Obiadalla-Ali (2005), Gamie and Yaso (2007), Yaso (2007) and Marey and Morsy (2010).

Concerning N-fertilizer source, combined data in Tables (3 and 4) reveal a positive effect of 90 kg N (Mineral)/fed on plant height, No. of leaves/plant, bulb diameter, neck diameter, bulb fresh weight as well as fresh and dry weights of onion plant.

Table 3: Means of plant height, No. of leaves/plant, bulb diameter and neck diameter at 90 and 120 DAT as affected by onion cultivar and N-fertilizer source in combined analysis over 2008/09 and 2009/10 seasons.

Factor	Plant height (cm)		No. of leaves/plant		Bulb diameter (cm)		Neck diameter (cm)	
	Days after transplanting							
	90	120	90	120	90	120	90	120
Cultivars(c):								
C_1- Giza 20	60.66 b	70.76 b	7.21 b	7.80 b	2.36 b	4.64 b	1.46 b	1.51 b
C_2- Giza Red	65.93 a	74.36 a	7.64 a	8.66 a	2.74 a	5.12 a	1.75 a	1.75 a
F-test	**	**	**	**	**	**	**	**
N-fertilizer source (N):								
N_1 6 t comp./fed	60.46 d	68.79 c	6.99 de	7.74 e	2.29 cd	4.68 d	1.53 cd	1.55 b
N_2 8 t comp./fed	62.52 cd	71.60 b	7.06 de	8.00 de	2.44 cd	4.70 d	1.52 cd	1.62 ab
N_3 10 t comp./fed	64.83 bc	73.30 b	7.63 bc	8.59 bc	2.57 bc	4.99 bc	1.63 bc	1.69 a
N_4 30 kg N(Enc.)/fed	56.26 e	67.12 c	6.75 e	7.05 f	2.20 d	4.36 e	1.36 d	1.38 c
N_5 60 kgN (Enc.)/fed	63.46 c	72.12 b	7.29 cd	8.22 cd	2.55 bc	4.81 cd	1.57 bc	1.67 ab
N_6 90 kgN (Enc.)/fed	66.53 ab	76.58 a	7.84 b	8.78 b	2.78 ab	5.13 b	1.73 b	1.75 a
N_7 90 kgN (Min.)/fed	69.00 a	78.39 a	8.43 a	9.26 a	3.03 a	5.48 a	1.91 a	1.75 a
F-test	**	**	**	**	**	**	**	**
Interaction (C x N)	*	NS	NS	NS	NS	NS	NS	NS

***, ** and NS indicated P<0.05, P<0.01 and not significant, respectively. Means within the same column for each factor designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test**

While application of 30 kg N (Enc.)/fed followed by 6 tons compost/fed were inferior as compared to all treatments at 90 and 120 DAT. However, N-fertilizer source revealed non significant differences in bulbing ratio. Such favorable effect of mineral nitrogen on plant growth might be resulted from quick uptake of nitrogen in roots zone, which resulted in more vegetative growth. These results are in agreement with the findings of Rizk *et*

al. (2002), Karam (2005), Yaso *et al*. (2007), Serana *et al*. (2010) and Shaheen *et al*. (2010).

The interaction between cultivar and N-fertilizer source significantly affected Plant height at 90 DAT, plant dry weight at 120 DAT, bulb fresh weight and plant fresh weight at all sampling dates. Moreover, the results in Table (5) show that the maximum values of plant height, bulb fresh weight and plant fresh weight were recorded with application of mineral fertilizer (90 kg N/fed) to Giza Red, whereas highest plant dry weight with Giza 20 onion cultivar under the application of 90 kg N/fed as mineral source

Table 4: Means of bulbing ratio, bulb fresh weight, plant fresh weight and plant dry weight at 90 and 120 DAT as affected by onion cultivar and N-fertilizer source in combined analysis over 2008/09 and 2009/10 seasons.

Factor	Bulbing ratio		Bulb fresh weight (g)		Plant fresh weight (g)		Plant dry weight (g)	
	Days after transplanting							
	90	120	90	120	90	120	90	120
Cultivars(c):								
C_1- Giza 20	0.62	0.33	47.36 b	90.57 b	107.35 b	162.14 b	8.53 a	17.34 a
C_2- Giza Red	0.65	0.34	54.66 a	100.57 a	125.61 a	184.47 a	6.58 b	15.10 b
F-test	NS	NS	**	**	**	**	**	**
N-fertilizer source (N)								
N_1 6 t comp./fed	0.68	0.34	39.48 e	80.99 f	100.22 f	152.65 f	6.20 d	14.56 c
N_2 8 t comp./fed	0.63	0.35	45.71 d	90.99 e	107.56 e	166.69 e	6.69 cd	15.25 d
N_3 10 t comp./fed	0.64	0.34	50.06 c	103.58 c	115.25 c	177.69 c	8.23 b	16.95 c
N_4 30 kg N(Enc.)/fed	0.63	0.32	35.70 f	70.00 g	88.96 g	138.16 g	5.56 e	13.79 f
N_5 60 kg N(Enc.)/fed	0.63	0.35	47.99 cd	95.15 d	111.19 d	172.20 d	7.04 c	15.86 d
N_6 90 kg N(Enc.)/fed	0.62	0.34	64.84 b	108.55 b	133.89 b	194.95 b	9.35 a	18.02 b
N_7 90 kg N(Min.)/fed	0.63	0.34	73.30 a	120.99 a	159.30 a	210.80 a	9.78 a	19.11 a
F-test	NS	NS	**	**	**	**	**	**
Interaction (C x N)	NS	NS	**	**	**	**	NS	**

***, ** and NS indicated P<0.05, P<0.01 and not significant, respectively. Means within the same column for each factor designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test.**

The interaction between cultivar and N-fertilizer source significantly affected Plant height at 90 DAT, plant dry weight at 120 DAT, bulb fresh weight and plant fresh weight at all sampling dates. Moreover, the results in Table (5) show that the maximum values of plant height, bulb fresh weight and plant fresh weight were recorded with application of mineral fertilizer (90 kg N/fed) to Giza Red, whereas highest plant dry weight with Giza 20 onion cultivar under the application of 90 kg N/fed as mineral source

B. Total bulbs yield and quality:

Results concerning total bulbs yield and quality i.e. average bulb weight (g), marketable bulbs yield, culls yield, total bulbs yield (t/fed), bulb diameter (cm), TSS and dry matter content are given in Table (6). Onion cultivars differently and significantly affected bulbs yield and quality except culls yield/fed. The highest values of all studied characteristics resulted from cv. Giza Red as compared to cv. Giza 20. The inverse was true in TSS and dry matter content. The significant differences between studied onion cultivars may be due to their significant performance in some other traits such as plant height, No. of leaves/plant, bulb diameter, neck diameter, bulb fresh weight as well as fresh and dry weights of onion plant that were discussed

previously. Genotypic differences in onion yield and quality were reported by many investigators such as El-Damarany and Obiadalla-Ali (2005); Yaso (2007) and Marey and Morsy (2010).

Table 5: Plant height at 90 DAT, bulb and plant fresh weight at90 and 120 DAT and plant dry weight at 120 DAT as affected by the interaction between onion cultivar and N-fertilizer source in combined analysis over 2008/09 and 2009/10 seasons.

Cultivar	N-fertilizer source						
	6 t comp./fed	8 t comp./fed	10 t comp./fed	30 kg N(Enc.)/fed	60 kg N(Enc.)/fed	90 kg N(Enc.)/fed	90 kg N(Min.)/fed
Plant height (cm) at 90 DAT							
Giza 20	59.10 ef	61.24 def	62.10 def	54.16 g	61.49 def	62.96 de	63.54 d
Giza Red	61.81 def	63.79 cd	67.56 bc	58.37 f	65.43 cd	70.09 b	74.46 a
Bulb fresh weight (g) at 90 DAT							
Giza 20	36.44 i	45.57 fg	49.64 e	32.02 j	48.87 ef	57.34 d	61.64 c
Giza Red	42.52 gh	45.85 fg	50.48 e	39.38 hi	47.10 ef	72.34 b	84.96 a
Bulb fresh weight (g) at 120 DAT							
Giza 20	75.09 g	89.22 ef	98.31 d	66.45 h	91.10 e	100.20 d	113.64 b
Giza Red	86.50 f	92.77 e	108.84 c	73.55 g	99.20 d	116.89 b	128.35 a
Plant fresh weight (g) at 90 DAT							
Giza 20	96.18 h	99.46 gh	109.16 f	81.41 i	102.31 g	123.88 d	139.05 c
Giza Red	104.26 g	115.65 e	121.35 d	96.52 h	120.06 de	143.89 b	177.56 a
Plant fresh weight (g) at 120 DAT							
Giza 20	141.99 j	157.72 h	171.00 f	121.46 k	161.99 gh	180.08 e	195.73 c
Giza Red	163.31 g	175.67 ef	184.38 d	149.85 i	182.40 d	209.82 b	225.87 a
Plant dry weight (g) at 120 DAT							
Giza 20	15.26 g	16.49 f	18.41 bc	14.34 h	17.43 de	19.18 b	20.24 a
Giza Red	13.85 hi	14.00 hi	15.48 g	13.25 i	14.28 h	16.87 ef	17.99 cd

Means designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test.

Regarding N-fertilizer source, it was exhibited a significant effect on bulb yield and its components as well as bulb quality. Nitrogen fertilizer in the form of mineral (ammonium nitrate) at 90 kg N/fed resulted in the highest values of bulb weight, marketable yield/fed, total yield and bulb diameter, while it gave the lowest values of culls yield/fed, TSS and dry matter content as compared with applying 90 kg N (Enc.)/fed and other treatments. Such effect of mineral nitrogen was possibly due to its immediate availability and quick absorption from the roots zone both of that are associated with better growth and weight of whole onion bulb, which promoted bulb yield, consequently, decreased the TSS and dry matter content. Serana *et al*. (2010) found that application of inorganic fertilizers gave a higher yield than organic manure alone. This effect was in conformity with the results obtained by Rizk *et al*. (2002), Karam (2005), Geries (2007) and Shaheen *et al*. (2010). Results presented in Table (6) show that the interaction effect between onion cultivar and fertilizer source (organic and inorganic fertilizers) was significant on bulbs yield and quality, except of bulb diameter and dry matter content. The data of Table (7) show that, maximum average of bulb weight, marketable yield/fed and total bulbs yield/fed were obtained with application of mineral fertilizers at the rate of 90 kg N/fed to Giza Red onion cultivar. While 30 kg N (Enc.)/fed with Giza Red onion cultivar gave the maximum weight of culls yield/fed. Data also in Table (7) show that the highest TSS% value was produced by combination of Giza 20 and 30 kg N (Enc.)/fed

Table 6: Means of average bulb weight, marketable bulbs yield, culls yield, total bulbs yield, bulb diameter, TSS % and dry matter content as influenced by onion cultivar and N-fertilizer source in combined analysis over 2008/09 and 2009/10 seasons.

Factor	Bulbs yield				Bulb quality		
	Av. bulb weight (g)	Mark. yield (t/fed)	Culls yield (t/fed)	Total yield (t/fed)	Bulb diameter (cm)	TSS %	Dry matter content
Cultivars(c) :							
C_1- Giza 20	92.02 b	10.38 b	2.28	12.66 b	5.87 b	12.80 a	16.52 a
C_2- Giza Red	97.94 a	11.31 a	2.33	13.64 a	6.64 a	12.29 b	14.99 b
F-test	**	**	NS	**	**	**	*
N-fertilizer source(N):							
N_1 6 t comp./fed	83.92 e	9.81 e	2.43 b	12.25 e	5.72 e	13.08 b	16.78 ab
N_2 8 t comp./fed	86.53 e	10.64 d	2.35 b	12.99 d	6.12 d	12.41 c	16.36 b
N_3 10 t comp./fed	99.18 c	11.12 c	2.12 c	13.24 c	6.42 bc	12.45 c	15.52 c
N_4 30 kg N(Enc.)/fed	78.77 f	8.74 f	3.11 a	11.85 f	5.35 f	13.51 a	17.14 a
N_5 60 kg N(Enc.)/fed	92.69 d	10.73 d	2.13 c	12.87 d	6.23 cd	12.53 c	15.76 c
N_6 90 kg N(Enc.)/fed	106.09 b	11.73 b	2.04 c	13.77 b	6.65 b	12.26 c	14.50 d
N_7 90 kg N(Min.)/fed	117.69 a	13.15 a	1.95 c	15.09 a	7.29 a	11.59 d	14.23 d
F-test	**	**	**	**	**	**	**
Interaction (C x N)	**	**	**	**	NS	**	NS

***, ** and NS indicated P<0.05, P<0.01 and not significant, respectively. Means within the same column for each factor designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test.**

Table 7: Average bulb weight (g), marketable bulbs yield (t/fed), Culls yield (t/fed), total bulbs yield (t/fed) and TSS% as affected by the interaction between onion cultivar and N-fertilizer source in combined analysis over 2008/09 and 2009/10 seasons.

Cultivar	N-fertilizer source						
	6 t comp./fed	8 t comp./fed	10 t comp./fed	30 kg N(Enc.)/fed	60 kg N(Enc.)/fed	90 kg N(Enc.)/fed	90 kg N(Min.)/fed
Average bulb weight (g)							
Giza 20	80.32 gh	84.46 fg	94.25 de	82.93 fg	86.93 efg	103.70 bc	111.53 b
Giza Red	87.51 efg	88.60 ef	104.10 bc	74.61 h	98.45 cd	108.48 b	123.85 a
Marketable bulbs yield (t/fed)							
Giza 20	9.31 i	10.30 h	10.64 g	8.39 k	10.20 h	11.11 ef	12.73 b
Giza Red	10.31 h	10.98 f	11.62 d	9.08 j	11.27 e	12.35 c	13.56 a
Culls yield (t/fed)							
Giza 20	2.31 cde	2.33 cde	2.12 def	2.90 b	2.07 ef	2.12 def	2.08 ef
Giza Red	2.55 c	2.37 cd	2.11 def	3.33 a	2.19 def	1.95 fg	1.81 h
Total bulbs yield (t/fed)							
Giza 20	11.62 i	12.63 fg	12.76 f	11.30 j	12.27 h	13.23 e	14.81 b
Giza Red	12.86 f	13.35 e	13.73 d	12.41 gh	13.46 e	14.31 c	15.37 a
TSS%							
Giza 20	13.31 b	12.28 ef	12.74 d	13.80 a	12.85 cd	12.55 de	12.10 ef
Giza Red	12.85 cd	12.54 cd	12.16 ef	13.21 bc	12.21 ef	11.97 f	11.07 g

Means designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test .

C. Macro elements content:

The combined data in Table (8) show that the differences in N and K contents of onion bulbs as affected by the two cultivars did not reach the 5% level of significant level. However, P content was significantly higher in cultivar "Giza Red" when compared to cultivar "Giza 20". This superiority might be attributed to that Giza Red attained the maximum values of plant growth measurements as well as total bulbs yield and its physical properties, consequently, these might be reflected on the chemical properties of onion bulbs. In this connection, Mohamed and Gomei (1999) found that the

differences in N, P and K contents as affected by different cultivars did not reach the 5% level of significant.

There was a significant difference in macro elements content due to N-fertilizer source (Table 8). Results revealed that the maximum of nitrogen content was recorded with 90 kg N/fed as ammonium nitrate. The rise of P and K contents in bulb depends on increasing compost doses and they were maximum at 10 tons compost/fed. But inferior values of N, P and K were observed with 30kg N (Enc.)/fed. Then, it was considered that the decrease in the elements content of bulbs by applying manure would be due to the element, which causes enlargement of bulb, and increasing yield consequently reduces the unit amount of these elements (dilution effects). Coolong *et al*. (2004) stated that in onion bulbs N and P content was increased by N application. Yoldas *et al*. (2011) found that increasing the rate of cattle manure doses significantly increased K content of onion, while N content had low level.The interaction between onion cultivar and the source of N-fertilizer was significantly affected P content only (Table 9) and the highest P content was found by adding 10 tons compost/fed for Giza Red without significant with Giza 20 onion cultivar under the same source.

D. Storability of onion bulbs:

Data presented in Table (8) indicate significant differences between the two cultivars for total weight loss of onion during storage period of six months after harvest, except at the third period. Giza Red was affected greater than Giza 20. It is clear from the previous results that Giza Red had low storability than Giza 20. These differences in percentages of bulbs weight loss may be attributed to the genetic differences between the tested onion cultivars , in addition, onion cv. Giza 20 is characterized by having a high capability to control sprouting phenomena under the local storage condition at North Delta. The differences between onion cultivars in respect to storability were reported by many investigators such as El-Kafoury *et al*., 1996; Abbey *et al*., 2000; Leilah *et al*., 2003 and Marey and Morsy 2010.

Table 8: Percent of macro elements content and total weight loss percent of two onion bulbs cultivars during storage period of six months as affected by N-fertilizer source in combined analysis over 2008/09 and 2009/10 seasons.

Factor	Percent of			Weight loss percent Storage period (Months)		
	N	P	K	2	4	6
Cultivars(c):						
C_1- Giza 20	1.58	0.28 b	0.56	9.69 b	7.74 b	13.64
C_2- Giza Red	1.59	0.32 a	0.53	10.34 a	8.10 a	14.25
F-test	NS	*	NS	**	*	NS
N-fertilizer source (N):						
N_1 6 t comp./fed	1.31 d	0.24 d	0.51 c	9.17 c	6.90 d	12.51 de
N_2 8 t comp./fed	1.42 cd	0.32 b	0.54 bc	9.55 bc	7.58 c	12.82 d
N_3 10 t comp./fed	1.77 b	0.41 a	0.72 a	10.34 b	8.37 b	14.49 c
N_4 30 kg N(Enc.)/fed	1.08 e	0.24 d	0.44 d	8.87 c	6.66 d	11.93 e
N_5 60 kg N(Enc.)/fed	1.57 c	0.29 bc	0.51 c	9.89 bc	7.91 c	13.99 c
N_6 90 kg N(Enc.)/fed	1.89 b	0.32 b	0.57 b	10.65 b	8.56 b	15.43 b
N_7 90 kg N(Min.)/fed	2.07 a	0.27 cd	0.53 c	12.05 a	9.47 a	16.46 a
F-test	**	**	**	**	**	**
Interaction (C x N)	NS	**	NS	NS	*	NS

***, ** and NS indicated P<0.05, P<0.01 and not significant, respectively. Means within the same column for each factor designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test.**

Table 9: Effect of the interaction between onion cultivar and N-fertilizer source on percent of P content and total weight loss percent at the second storage period (4 months) in combined analysis over 2008/09 and 2009/10 seasons.

Cultivar	N-fertilizer source						
	6 t comp./fed	8 t comp./fed	10 t comp./fed	30 kg N(Enc.)/fed	60 kg N(Enc.)/fed	90 kg N(Enc.)/fed	90 kg N(Min.)/fed
Percent of P content							
Giza 20	0.26 efg	0.31 cde	0.39 ab	0.24 fg	0.27 efg	0.29 def	0.21 g
Giza Red	0.22 g	0.33 cd	0.42 a	0.24 fg	0.33 cd	0.35 bc	0.32 cde
Total weight loss percent(4 months)							
Giza 20	6.99 fg	7.70 de	7.94 de	6.48 g	7.74 de	8.31 cd	9.04 b
Giza Red	6.80 fg	7.47 ef	8.79 bc	6.84 fg	8.07 de	8.80 bc	9.90 a

Means designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test.

N-fertilizer source had a significant effect on total weight loss of onion bulbs at all storage periods (Table 8). Therefore, the minimum weight loss percentage of onion bulbs was obtained from applying 30 kg N (Enc.)/fed or 6 tons (compost)/fed. While, excessive N application contributes to increase storage losses. This may be attributed to the negative relation between TSS in bulbs and sprouting percentage of bulbs during the storage period, which resulted from mineral fertilizer. This finding was in accordance with those reported by Mohamed and Gamie (1999), Tumbare and Pawar (2003) and Geries (2007).

Results recorded in Table (9) indicate that the effect of interaction between onion cultivar and N-fertilizer source was significant for total weight loss percentage only at the second storage period (4 months). Giza Red recorded the highest total weight loss under 90kg N/fed as mineral fertilizer.

Conclusion

In conclusion, Giza 20 cv. with application of 30 kg N (Enciabein)/fed produced the highest and significant total soluble solids and dry matter content. While, Giza Red cv. with application of 90 kg N(mineral)/fed produced the highest and significant average bulb weight. Application of 30 kg N (Enciabein) decreased the weight loss after six month. Further studies are needed to evaluate combination of organic and mineral fertilizers to identify optimal rates of organic and mineral fertilizers for proper growth and production of onion.

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إنتاجية وجودة صنفين من البصل تحت الأسمد العضوية وبطيئة الذوبان والمعدنية

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****قسم بحوث الميكروبيولوجيا الزراعية. معهد بحوث الأراضى والمياة والبيئة ـ مركز البحوث الزراعية.**

يعتبر استخدام الأسمدة العضوية والطبيعية والبطيئة الذوبان الأمنة فى إنتاج المحاصيل من الاتجاهات الحديثة للإنتاج لهذا فقد أجرى هذا البحث فى موسمين شتويين ٢٠٠٨/٢٠٠٩ ، ٢٠٠٩/٢٠١٠ بالمزرعة البحثية لمحطة البحوث الزراعية بسخا ـ محافظة كفرالشيخ ـ مصر وذلك لدراسة تأثير مصادر التسميد النتروجينى على النمو والمحصول وجودته والقدرة التخزينية لصنفى البصل جيزة ٢٠ ، جيزة أحمر.تم تنفيذ التجارب فى تصميم القطع المنشقة مرة واحدة احتلت الأصناف القطع الرئيسية بينما احتلت القطع المنشقة على معـاملات مصـادر التسـميد النيتروجينـى التاليـة: ٦ طـن كمبوسـت/فدان ، ٨ طـن كمبوسـت/فدان ، ١٠ طـن كمبوسـت/فدان ، ٣٠ كجـم نتروجين/فدان فى صورة إنسيابين (سماد بطىء الذوبان) ، ٦٠ كجم نتروجين/فدان فى صورة انسيابين ، ٩٠ كجم نتروجين/فدان فى صورة إنسيابين ، ٩٠ كجم نتروجين/فدان فى صورة نترات الأمونيوم.

وتتلخص أهم النتائج المتحصل عليها فى النقاط الأتية:

١- أوضحت النتائج تفوق الصنف جيزة أحمر على الصنف جيزة ٢٠ فى معظم صفات النمو الخضرى عند عمرى ٩٠ ، ١٢٠ يوم من الشتل حيث أعطى أعلى المتوسطات لصفات طول النبات ، عدد الاوراق/نبات ، قطر البصلة وقطر العنق ، وزن البصلة الطازج ، الوزن الطـازج والجـاف للنبـات وكـذلك المحصـول والجـودة (محصـول الأبصـال القابلـة للتسـويق/فدان ، محصـول النقضـة/فدان ، محصول الأبصال الكلى/فدان ومتوسط وزن البصلة). بينما تفوق الصنف جيزة ٢٠ فى المواد الصلبة الذائبة والنسبة المئوية للمادة الجافة.

٢- أظهرت النتائج تفوق التسميد المعدنى بمعدل ٩٠ كجم نتروجين/فدان للحصول على أعلى القيم من ارتفاع النبات ، عدد الأوراق/نبات ، قطر البصلة، قطر عنق البصلة ، الوزن الغض للأبصال، الوزن الغض للنبات وكذلك الوزن الجاف للنبات.

٣- أشارت النتائج أن التسميد بمعدل ٣٠ كجم نتروجين (انسيابين) أو التسميد بمعدل ٦ طن كومبوست/فدان للحصول على اعلى محتوى من المادة الجافة فى الأبصال.

٤- أظهرت نتائج التفاعل أن الصنف جيزة احمر مع التسميد بمعدل ٩٠كجم نتروجين/فدان اعطى اعلى وزن غض للنبات وكذلك اعلى وزن جاف للنبات.

٥- أشارت النتائج أن التسميد بمعد ٩٠ كجم نتروجين (معدنى) للحصول على اعلى محصول صالح للتسويق، اعلى محصول كلى ، اقل محصول نقضة/فدن واعلى متوسط وزن بصلة. بينما ادى التسميد بمعدل ٣٠ كجم نتروجين (انسيابين) او التسميد بمعدل ٦ طن كومبوست/فدن للحصول على أعلى محتوى من المادة الجافة .

٦- أعطى الصنف جيزة احمر تحت معدل التسميد النتروجينى ٩٠ كجم نتروجين للفدان كسماد معدنى أعلى محصول صالح للتسويق ومحصول كلى واقل محصول نقضة وأعلى متوسط وزن البصلة. بينما اعطى الصنف جيزة ٢٠ تحت معدل ٣٠ كجم نتروجين (انسيابين) أعلى محتوى من نسبة المواد الصلبة الذائبة الكلية والمادة الجافة.

٧- أشارت النتائج ان أبصال الصنف جيزة ٢٠ أحتوت على أقل نسبة من الفوسفور وتميزت بقدرة تخزينية أعلى حتى١٨٠ يوم تخزين.

قام بتحكيم البحث

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