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EFFECT OF ORGANIC AND MINERAL FERTILIZERS ON VEGETATIVE GROWTH, BULB YIELD AND QUALITY OF ONION CULTIVARS

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A B S T R A C T

Two year study was carried out at Gemmeiza Agriculture Research Station Farm, Gharbeia Governorate, Agriculture Research Center, during 2010-2011 and 2011-2012 seasons to study the effect of organic and mineral fertilizers on vegetative growth, yield components, bulb yield and quality of \some onion cultivars. The obtained results showed that Giza 20, Giza Red and Texas Early Yellow Grano X Giza 20 cultivars were significantly better in most of the studied characters in both seasons than other cultivars. Texas Early Yellow Grano X Giza 20 cultivar gave highest foliage fresh weight/plant after 120 days of transplanting, highest bulbing ratio at 90 and 120 days from transplanting, highest bulb weight and yield in both season. Mineral fertilization of onion with 214.2 kg N + 71.4 kg P2O5 + 57.1 kg K2O/ha surpassed other studied fertilization treatments and resulted in highest values of most studied characters in both seasons.. It can be concluded that the interaction between onion cultivars and fertilization treatments significantly affected foliage fresh weight/plant at 120 days from transplanting, marketable yield, total culls and total weight loss percentage of onion bulbs after 4 months from harvesting in the second season.

Keywords: Onion, cultivars, mineral fertilizers, NPK, organic fertilizers, farmyard manure, chicken manure, compost.

INTRODUCTION

In Egypt, onion (*Allium cepa* L.) is one of the most important crops used for local consumption and also as exportation commodity. Many agricultural practices judge the productivity of onion yield among these chosen high yielding cultivars, mineral and organic fertilization. There are wide variations among onion cultivars in bulb yield and bulb quality. Thus, choosing best onion cultivar is one of the most critical components of onion production. In this regard; Hervelat and Brigitte (2007) stated that Yellow Dwarf and Leek Yellow cultivars gave highest yield of bulbs, which were 35.30 and 31.56 t/ha, respectively. Kandil *et al.* (2010) indicated that Giza 20 and Composite 9 had the heaviest bulb weight, followed by Giza Red. Highest percentages of TSS and dry matter % were obtained from Giza White, followed by Giza 20. Giza 20 cultivar was associated with maximum total bulbs yield and marketable yield, followed by Composite 9. Shah *et al.* (2012) found that Parachinar Local cv. had highest number of leaves, leaf length, neck height, plant height and total yield. Soleymani and Shahrajabian (2012) stated that foliage fresh weight, bulbing ratio, plant height, weight of bulb, total yield, favorite yield, total percentage of dry matter and nitrate content in bulb was significantly influenced by cultivars and the maximum values of these traits were resulted from Cisakht cultivar.

Mineral fertilizers are one of the principle factors that materially set up onion growth and production. Since, onion plant take up large amounts of three primary nutrients, i.e. nitrogen, phosphorus and potassium since, they are essential nutrients for plant growth and yield. Moursy et al. (2007) found that application of 190.4 kg N/ha gave significantly increased in onion yield, bulb diameter and TSS content as compared with using nitrogen at rate of 95.2 kg N/ha. Yaso et al. (2007) revealed that increasing mineral nitrogen levels led to significant increases on plant height, number of leaves,

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average bulb weight, marketable and total bulbs yield, and total soluble solid (TSS) of onion. These effects were obtained with using 214.2 kg N/ha. Ewais et al. (2010) indicated that fertigation of highest dose of N (285.6 kg N/ha) had a significant effect on chlorophyll contents, dry weight/plant and quality properties under drip irrigation system in new reclaimed sandy soil. Fatideh and Asil (2012) reported that using nitrogen at level of 150 kg/ha produced higher bulbs and dry matter yield. Meanwhile, bulb size and weight were decreased with decrease in amount of nitrogen. The percentage of marketable bulbs, which in considered commercially important, had been considerably higher at 100 kg/ha of nitrogen. Extended storage period, increasing nitrogen had adverse effect on storability of bulbs. Salem, Nourgehan (2012) reported that application of recommended mineral fertilizer 100 % NPK (238 kg N + 71.4 kg P2O5 + 57.1 kg K2O/ha) and spraying onion plants with Agrispon and EM gave highest bulb yield. Soleymani and Shahrajabian (2012) revealed that the maximum bulb diameter, bulb height, weight of bulb, total yield and favorite yield was related to application of 200 kg N/ha, and there were no significant differences between 200 or 300 kg N/ha. Tekalign et al. (2012) found that nitrogen fertilization decreased bulb dry matter content by about 4% over the control. Bulb storability study for eight weeks at ambient condition indicated that highest level of N or P fertilizer caused highest cumulative weight loss. Bulb dry matter content and rotting percentage were not significantly affected by P fertilization.

Addition of organic fertilizer improves soil structure, which can encourage root development and leads to encourage growth (Singer *et al.,* 1998). Yassen and Khalid (2009) showed that all organic fertilizer treatments; *i.e.* mixture of farmyard manure and chicken manure overcame the control treatment (recommended NPK) improved vegetative growth characters, essential oil, some of the main constituents of essential oil and NPK contents. Dina *et al.* (2010) showed that highest number of exportable green onion plants was obtained from chicken manure treatment. These findings are coincidence with those recorded by El-Shatanofy, Manar (2011), Shaheen *et al.* (2011) and Yoldas *et al.* (2011). Salem (2012) concluded that fertilization onion plants with 50 % NPK + 50 % FYM and spraying with Agrispon + EM increased onion yield over the control (100 % NPK without foliar applications) and improved bulbs quality. Hence, this treatment is recommended where the mineral fertilization is reduced to 50 % and this in turn decreases the environment pollution and production costs.

Therefore, this study was conducted to study the effect of different sources for organic fertilizers, minerals NPK fertilizer on growth, bulb yield and its components, blub quality as well as storage ability of some onion cultivars under the environmental conditions of Middle Delta Region.

MATERIAL AND METHODS

Two field experiments were conducted at Gemmeiza Agriculture Research Station Farm, Gharbeia Governorate, Agriculture Research Center, during two seasons of 2010/2011 and 2011/2012. The objectives of this investigation were aimed to study the effect of organic and mineral fertilization on growth, yield and keeping bulbs quality of some onion cultivars.

The experiments were carried out in strip-plot design with four replications. The vertical plots were occupied with three onion cultivars (Giza 20, Giza Red and Texas Early Yellow Grano X Giza 20). Onion seed cultivars were obtained from Onion Research Section, ARC, Egypt. The horizontal plots were allocated with four fertilization treatments as follows:

1- Application of farmyard manure (FYM) at rate of 35.7 t/ha.
2- Application of chicken manure at rate of 10.7 t/ha.
3- Application of compost manure at rate of 11.9 t/ha.
4- Application of recommended doses of mineral fertilizers (NPK) *i.e.* 214.2 kg N + 71.4 kg P_2O_5 + 57.1 kg K_2O/ha.

As ammonium sulphate, calcium super phosphate and potassium sulphate fertilizers used as sources of nitrogen, phosphorus and potassium, respectively.

The amount of mineral fertilizers was splitted into two portions, one half being applied one month after transplanting time before the first irrigation and the remaining portion was applied before the second irrigation, 60 days from transplanting. While the amounts of organic fertilizers were added at soil preparation directly before ridging.

The soil of the experimental sites was clayey, pH was 7.87 and 8.00, available nitrogen was 40.12 and 51.33 ppm, available phosphate was 3.36 and 4.44 ppm and exchangeable potassium was 299.1 and 315.2 ppm in first and second seasons, respectively.

Nitrogen content in used organic fertilizer.

Fertilizer sources	N (%)	N (Kg)
Farmyard manure	0.6	90
Chicken manure	2.0	90
Compost manure	1.8	90
Ammonium sulphate	20.5	90

Each plot area was 10.5 m^2, which consisted of 5 ridges, each of 3.5 m in length and 60 cm in width. The preceding crop was maize (*Zea mays* L.) in both seasons.

Onion seeds were hand drilled in the nursery bed on 11th and 10th October in the first and second seasons, respectively. Seedlings of nearly sixty days old when they usually were 25 cm in height were pulled tied and moved to the permanent land for transplanting on 12th and 13th December in the first and second seasons, respectively. Other cultural practices were carried out in the same manner prevailing in the region.

After 90 and 120 days from transplanting, ten plants were selected at random from every sub-plot to record plant height, number of leaves/plant, foliage fresh weight per plant and bulbing ratio. At harvest time, ten guarded plants were chosen at random from the outer ridges of each plot to determine the following characters: bulb weight (g), total soluble solids (TSS) in bulbs (%) and bulb dry matter (%). Total bulbs yield (t/ha), marketable bulbs yield (t/ha) and culls bulbs yield (t/ha) were determined by harvesting the two middles rows per plot in kg and then converted to t/ha. Marketable yield of each plot were placed in common burlap bags and kept under normal storage conditions. Storability was measured as percentage of total loss in weight of bulbs during storage period (five months). Total soluble solids (TSS) and bulb dry matter percentages in bulbs were determined during storage period. Total loss percentage was determined by examining the yield every month, then rotting and sprouting bulbs were discarded and the remaining yield was weighted.

The soil of the experimental sites was clayey, pH was 7.87 and 8.00, available nitrogen was 40.12 and 51.33 ppm, available phosphate was 3.36 and 4.44 ppm and exchangeable potassium was 299.1 and 315.2 ppm in first and second seasons, respectively. Each plot area was 10.5 m^2, which consisted of 5 ridges, each of 3.5 m in length and 60 cm in width. The preceding crop was maize (*Zea mays* L.) in both seasons.

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All obtained data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the split – plot design as published by Gomez and Gomez (1984) by using "MSTAT-C " computer software package. Least Significant of Difference (LSD) method was used to test the differences between treatment means at 5 % level of probability as described by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Cultivars performance: The obtained results in Tables 1, 2, 3, 4 and 5 showed that onion cultivars (Giza 20, Giza Red and Texas Early Yellow Grano X Giza 20) significantly differed in plant height, foliage fresh

Table 1: Averages of plant height, number of leaves/plant, foliage fresh weight per plant and bulbing ratio at 90 and 120 days from transplanting (DFT) as affected by fertilization treatments of some onion cultivars and their interaction during 2010/2011 and 2011/2012 seasons.

Treatments/ Characters	Plant height (cm)				Number of leaves/plant				Foliage fresh weight (g/plant)				Bulbing ratio			
Seasons	2010/2011		2011/2012		2010/2011		2011/2012		2010/2011		2011/2012		2010/2011		2011/2012	
Sampling times (DFT)	90	120	90	120	90	120	90	120	90	120	90	120	90	120	90	120
A: Cultivars:																
Giza 20	79.05	71.91	69.64	63.10	9.13	8.98	7.28	7.23	165.3	208.7	109.0	159.5	2.09	3.85	2.13	3.44
Giza Red	83.31	75.38	70.26	65.88	8.80	9.46	7.03	7.19	142.5	191.0	89.9	152.0	1.91	3.53	1.87	3.16
Texas X Giza20	78.09	72.66	63.43	63.13	8.74	8.81	7.21	7.96	163.1	214.5	99.0	170.0	2.13	4.21	2.15	3.70
F. test	*	*	*	*	NS	NS	NS	*	*	*	*	*	*	*	*	*
LSD at 5%	3.60	2.59	4.14	2.75	-	-	-	0.47	8.9	5.2	9.8	10.0	0.17	0.20	0.11	0.20
B: Fertilization treatments:																
Farmyard manure	78.24	69.92	63.85	60.19	8.55	8.78	6.83	6.88	146.9	188.3	89.2	143.1	1.91	3.75	1.91	3.36
Chicken manure	80.90	74.38	68.67	64.59	8.98	9.18	7.22	7.70	161.0	212.3	97.0	169.3	2.07	3.89	2.10	3.39
Compost	78.86	72.71	66.82	63.20	8.91	8.86	7.08	7.31	154.0	201.0	103.6	152.7	2.01	3.80	1.99	3.37
Mineral fertilizers	82.59	76.25	71.77	68.17	9.13	9.51	7.56	7.95	166.0	217.3	107.3	176.9	2.18	4.03	2.20	3.62
F. test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
LSD at 5%	2.68	3.13	3.93	3.77	0.52	0.54	0.54	0.65	9.8	10.7	10.8	6.8	0.14	0.15	0.18	0.17
C: Interaction:																
A×B	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	*	NS	NS	NS	NS

weight/plant, bulbing ratio at 90 and 120 days from transplanting and number of leaves/plant at 120 days from transplanting in the second season as well as total yield/fed, marketable yield/fed, total culls/fed, average bulb weight, total soluble solids percentage (TSS), dry matter percentage (DM) in both seasons and total weight loss percentage of bulbs after 3 and 5 months from harvesting in both seasons and after 2 months from harvesting in the second season as well as after 4 months from harvesting in the first season.

It seem that Giza Red cultivar gave tallest plants at 90 and 120 days from transplanting, number of leaves/plant at 120 days from transplanting in the second season, TSS and dry matter percentages in both seasons. It could be noticed that Texas Early Yellow Grano X Giza 20 cultivar associated highest number of leaves/plant at 120 days from transplanting in the second season, foliage fresh weight/plant at 120 from transplanting, bulbing ratio at 90 and 120 days from transplanting in both seasons, total yield, marketable yield, bulb weight in both season, total culls in the second season and total weight loss percentage of onion bulbs every month after harvesting till end of storability in both seasons. Whereas, Giza 20 cultivar recorded the highest values of number of leaves/plant and foliage fresh weight/plant at 90 days from transplanting in both seasons and total culls in the first season. Difference in studied cultivars might be related to genetic factors which resulted from genetic makeup relations for the cultivars.

These results are in good agreement with those stated by Hervelat and Brigitte (2007), Kandil *et al.* (2010), Shah *et al.* (2012) and Soleymani and Shahrajabian (2012).

Effect of fertilization treatments: From obtained results in Tables 1, 2, 3, 4 and 5 fertilization treatments (farmyard manure, chicken manure, compost and mineral NPK fertilizers) showed significant effect on all studied characters (plant height, number of leaves/plant, foliage fresh weight and bulbing ratio at 90 and 120 days from transplanting, total yield, marketable yield, total culls, average bulb weight in both seasons, total soluble solids, dry matter and total weight loss percentages of onion bulbs every month after harvesting till end of storability in both growing seasons. From obtained results of this study it can be noticed that mineral fertilizing onion plants with 214.2 kg N + 71.4 kg P_2O_5 + 57.1 kg K_2O/ha surpassed other studied fertilization treatments and resulted in tallest plants, number of leaves/plant, foliage fresh weight and bulbing ratio at 90 and 120 days from transplanting, total yield, marketable yield, total culls (in the second season), average bulb weight in both seasons, total soluble solids and dry matter percentages in bulbs at harvesting and every month after harvesting till end of storability in both seasons. This fertilization treatment was followed by organic fertilizing with chicken manure then compost in both seasons. On the contrary, lowest means of plant height, number of leaves/plant, foliage fresh weight and bulbing ratio at 90 and 120 days from transplanting, total yield, marketable yield, average bulb weight in both seasons, total soluble solids and dry matter percentages in bulbs at harvesting and every month after harvesting till end of storability were produced from organic fertilizing with farmyard manure in both seasons. Concerning total weight loss percentages in bulbs, maximum values were resulted from fertilizing onion plants by using farmyard manure, while minimum values were obtained from onion plants that mineral NPK fertilizers after 1, 2, 3, 4 and 5 months from harvesting in both seasons.

Table 2: Averages of total yield, marketable yield, total culls and bulb weight at harvesting as affected by fertilization treatments of some onion cultivars and their interaction during 2010/2011 and 2011/2012 seasons.

Treatments/ Characters	**Total yield (t/ha)**		**Marketable yield (t/ha)**		**Total culls (t/ha)**		**Bulb weight (g)**	
Seasons	2010/2011	2011/2012	2010/2011	2011/2012	2010/2011	2011/2012	2010/2011	2011/2012
A: Cultivars:								
Giza 20	38.06	34.06	31.32	27.56	6.57	6.50	139.2	127.4
Giza Red	36.82	33.25	29.89	26.66	6.93	6.59	127.8	126.3
Texas Early Yellow Grano X Giza 20	39.53	38.89	34.89	32.08	4.62	6.93	143.1	142.5
F. test	*	*	*	*	*	*	*	*
LSD at 5%	2.67	2.69	1.69	2.17	0.43	0.36	8.9	8.0
B: Fertilization treatments:								
Farmyard manure	34.72	33.18	28.87	26.20	5.83	6.97	127.7	120.3
Chicken manure	39.58	35.37	33.30	29.16	6.28	6.76	140.2	137.2
Compost	37.89	34.82	32.06	28.61	5.81	5.64	132.3	132.3
Mineral fertilizers	40.34	38.22	33.94	31.11	6.21	7.33	146.6	138.4
F. test	*	*	*	*	*	*	*	*
LSD at 5%	1.74	1.83	1.67	1.86	0.29	0.36	9.3	7.8
C: Interaction:								
A×B	NS	NS	NS	*	NS	*	NS	NS

Table 3: Averages of total soluble solids (TSS) in bulbs at harvesting and every month after harvesting till end of storability as affected by fertilization treatments of some onion cultivars and their interaction during 2010/2011 and 2011/2012 seasons.

Treatments/ Characters	Total soluble solids (TSS %)											
	At harvesting		After 1 month		After 2 months		After 3 months		After 4 months		After 5 months	
Seasons	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012
A: Cultivars:												
Giza 20	11.31	11.51	11.56	11.62	11.72	11.71	12.24	12.24	12.57	12.61	13.02	12.90
Giza Red	11.88	11.86	12.25	12.13	12.67	12.25	12.94	12.48	13.15	12.73	13.64	13.25
Texas Early Yellow Grano X Giza 20	9.85	10.01	10.20	10.25	10.60	10.46	11.23	10.75	11.60	11.00	12.05	11.42
F. test	*	*	*	*	*	*	*	*	*	*	*	*
LSD at 5%	0.59	0.60	0.54	0.57	0.35	0.56	0.61	0.47	0.48	0.53	0.26	0.40
B: Fertilization treatments:												
Farmyard manure	10.78	10.71	11.14	10.95	11.31	11.16	11.89	11.46	12.20	11.62	12.63	12.06
Chicken manure	10.84	11.08	11.31	11.38	11.57	11.45	11.96	11.64	12.30	11.94	12.72	12.36
Compost	11.18	11.24	11.39	11.43	11.64	11.54	12.13	11.95	12.46	12.34	12.93	12.73
Mineral fertilizers	11.25	11.49	11.51	11.57	12.13	11.74	12.57	12.25	12.80	12.55	13.33	12.93
F. test	*	*	*	*	*	*	*	*	*	*	*	*
LSD at 5%	0.36	0.35	0.21	0.36	0.45	0.35	0.51	0.66	0.31	0.44	0.42	0.51
C: Interaction:												
A×B	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

These increases in total bulbs yield by mineral fertilizers over than organic fertilizers might be attributed to the role of nitrogen on chlorophyll, enzymes and protein synthesizes and the role of phosphorous on root growth and development as well as the role of potassium on promotion of enzymes activity and enhancing the translocation of assimilates.

Beside the role of organic manures which are valuable as a source of many fertilizers and essential macro and micronutrients to plants and serves as a good natural soil texture conditioner being rich in organic matter and increase availability and uptake of nitrogen, phosphorus and potassium which positively reflected on plant cell elongation and division as well as stimulate photosynthesis and metabolic processes of organic compounds in plant, thus increasing total bulbs yield/ha. Ewais *et al.* (2010), El-Shatanofy, Manar (2011), Yoldas *et al.* (2011), Fatideh and Asil (2012), Soleymani and Shahrajabian (2012), Dina *et al.* (2010) and Salem (2012) came out similar conclusions.

Effect of interaction: The interaction between onion cultivars and fertilization treatments significantly affected foliage fresh weight/plant at 120 days from transplanting, marketable yield, total culls and total weight loss percentage of onion bulbs after 4 months from harvesting in the second season.

Foliage fresh weight/plant was significantly affected by the interaction between cultivars and fertilization treatments at 120 days from transplanting in the second season.

Highest foliage fresh weight/plant (196.7 g) was obtained when mineral fertilized Texas Early Yellow Grano X Giza 20 cultivar with addition of 214.2 kg N + 71.4 kg P_2O_5 + 57.1 kg K_2O/ha as presented in Fig. 1. Followed by organic fertilized the same cultivar with chicken manure.

On the other hand, lowest foliage fresh weight/plant (140.7 g) was resulted from organic fertilized Giza Red cultivar with farmyard manure.

The interaction between onion cultivars and fertilization treatments cleared significant effect on marketable bulbs yield/ha in the second season of this study. As seems to appear from results in Fig. 2, mineral fertilizing of Texas Early Yellow Grano X Giza 20 cultivar associated with highest marketable bulbs yield (37.22 t/ha). It was followed by organic fertilizing the same cultivar using chicken manure. On the other hand, lowest marketable bulbs yield (24.47 t/ha) was resulted from organic fertilizing Giza Red cultivar and using farmyard manure.

Table 4: Averages of dry matter percentage in bulbs at harvesting and every month after harvesting till end of storability as affected by fertilization treatments of some onion cultivars and their interaction during 2010/2011 and 2011/2012 seasons.

Treatments/ Characters	Dry matter (%)											
	At harvesting		After 1 month		After 2 months		After 3 months		After 4 months		After 5 months	
Seasons	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012
A: Cultivars:												
Giza 20	14.67	15.81	16.28	16.09	16.90	17.21	17.37	17.84	18.84	18.62	19.46	19.12
Giza Red	15.96	15.87	17.06	16.68	18.37	17.28	18.65	18.28	19.06	19.17	20.40	20.25
Texas Early Yellow X Giza 20	13.46	13.78	14.31	14.46	14.84	15.68	15.46	16.15	15.96	16.93	17.09	17.75
F. test	*	*	*	*	*	*	*	*	*	*	*	*
LSD at 5%	0.68	0.78	1.07	0.72	1.13	1.06	0.65	0.62	0.48	0.63	0.97	0.63
B: Fertilization treatments:												
Farmyard manure	13.91	14.45	15.04	15.20	16.04	16.04	16.54	16.83	17.16	17.73	18.54	18.40
Chicken manure	14.66	14.91	15.41	15.62	16.54	16.54	17.08	17.16	17.79	18.03	18.62	18.83
Compost	14.98	15.37	16.25	15.87	16.91	16.95	17.29	17.58	18.08	18.48	19.20	19.30
Mineral fertilizers	15.25	15.87	16.83	16.29	17.33	17.37	17.75	18.12	18.79	18.73	19.58	19.63
F. test	*	*	*	*	*	*	*	*	*	*	-	*
LSD at 5%	0.51	0.64	0.88	0.81	0.52	0.65	0.71	0.69	1.02	0.83	0.53	0.61
C: Interaction:												
A×B	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Total culls/fed was significantly affected by the interaction between onion cultivars and fertilization treatments in the second season. Results in Fig. 3 indicate that, highest total culls (8.36 t/ha) was obtained when mineral fertilizing Giza Red cultivar with NPK at the rate of 214.2 kg N + 71.4 kg P_2O_5 + 57.1 kg K_2O/ha in the second seasons. Followed by organic fertilizing Texas Early Yellow Grano X Giza 20 cultivar with chicken manure without significant differences between them. On the other hand, the lowest mean of total culls (5.38 t/ha) was resulted from organic fertilizing Texas Early Yellow Grano X Giza 20 cultivar with compost.

CONCLUSION

It could be concluded that, fertilizing Texas Early Yellow Grano X Giza 20 cultivar with 214.2 kg N + 71.4 kg P_2O_5 + 57.1 kg K_2O/ha or organic fertilizing with chicken manure at 10.7 t/ha maximized the productivity and bulb quality under the environmental conditions of Middle Delta, Gharbeia Governorate.

Table 5: Averages of total weight loss percentage of onion bulbs every month after harvesting till end of storability as affected by fertilization treatments of some onion cultivars and their interaction during 2010/2011 and 2011/2012 seasons.

Treatments/ Characters	Total weight loss (%)									
	After 1 month		After 2 months		After 3 months		After 4 months		After 5 months	
Seasons	2010/11	2011/12	2010/11	2011/12	2010/11	2011/12	2010/11	2011/12	2010/11	2011/12
A: Cultivars:										
Giza 20	2.60	4.34	8.03	7.82	17.92	9.08	24.93	12.92	30.82	18.97
Giza Red	2.82	3.98	7.09	7.20	16.36	8.46	23.73	12.66	27.75	18.20
Texas Yellow Grano X Giza 20	2.93	4.64	8.42	8.02	19.55	9.31	29.68	13.13	34.87	19.22
F. test	NS	NS	NS	*	*	*	*	NS	*	*
LSD at 5%	-	-	-	0.63	2.09	0.62	0.91	-	0.89	0.70
B: Fertilization treatments:										
Farmyard manure	3.54	5.60	9.21	8.60	20.75	10.16	30.68	15.07	34.56	20.56
Chicken manure	2.89	4.33	8.64	7.90	19.45	9.50	26.91	13.21	32.56	19.53
Compost	2.56	3.96	7.10	7.30	16.33	8.35	24.20	12.14	29.66	17.96
Mineral fertilizers	2.15	3.40	6.45	6.92	15.25	7.79	22.66	11.20	27.80	17.13
F. test	*	*	*	*	*	*	*	*	*	*
LSD at 5%	0.69	0.59	1.25	0.75	1.03	0.72	0.92	0.62	1.70	1.02
C: Interaction:										
A×B	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

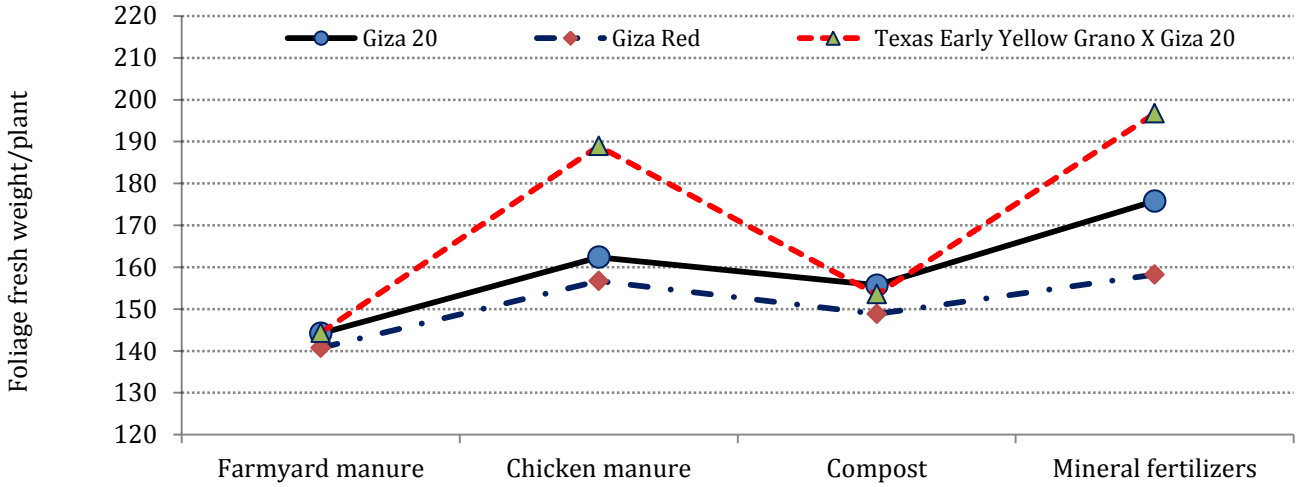

Fig. 1: Averages of foliage fresh weight/plant at 120 days from transplanting as affected by the interaction between onion cultivars and fertilization treatments in 2011/2012 season.

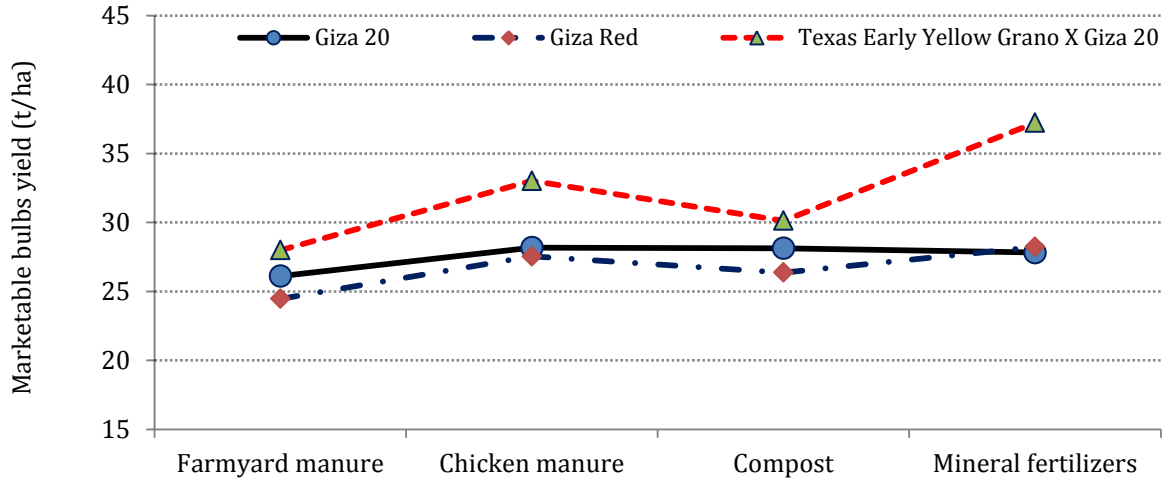

Fig. 2: Averages of marketable bulbs yield (t/ha) as affected by the interaction between onion cultivars and fertilization treatments in 2011/2012 season.

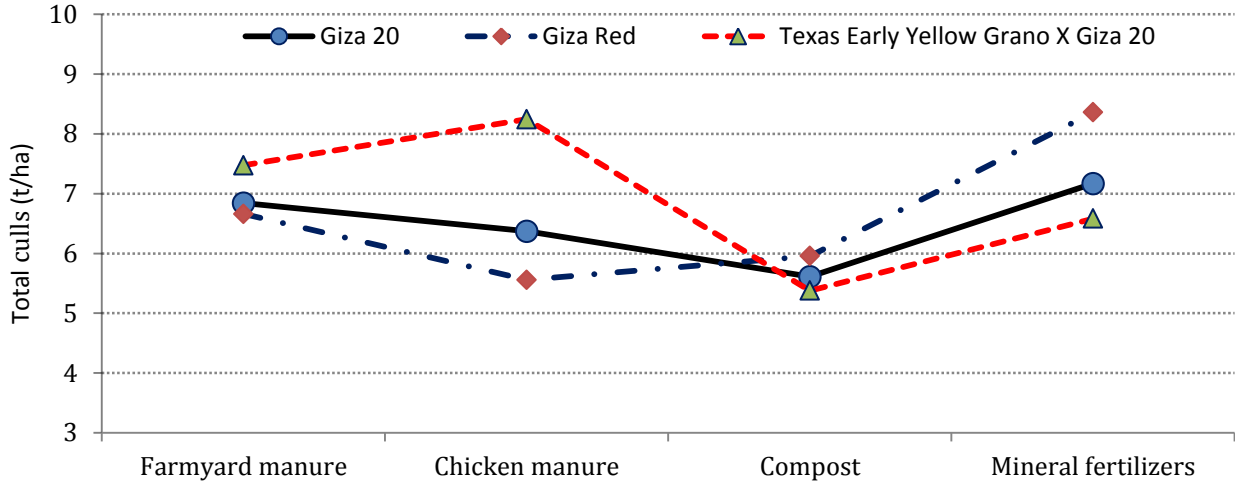

Fig. 3: Averages of total culls (t/ha) as affected by the interaction between onion cultivars and fertilization treatments during 2011/2012 season.

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