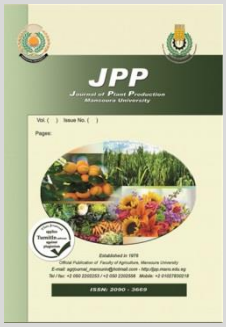
Journal of Plant Production

Journal homepage: www.jpp.mans.edu.eg
Available online at: www.jpp.journals.ekb.eg

Effect of Different Organic and Mineral Fertilizers on Growth, Yield and Quality of Onion Grown in Sandy Soil under The New Valley Governorate Conditions

El-Dekashey, M. H. Z.[1]; S. Y. Attallah[1]; M. A. M. Ali[2*] and R. A. Mostafa[2]

[1]Vegetable Department, Faculty of Agriculture, Assiut University, Egypt.
[2]Horticulture Department, Faculty of Agriculture, New Valley University, Egypt.



ABSTRACT

The current study was performed at the Research Farm of Faculty of Agriculture, New Valley University during 2017/2018 and 2018/2019 seasons in order to evaluate response of onion cv. Giza 6 to some organic fertilizers, i.e., cattle manure and poultry manure in addition to mineral fertilizers as control treatment. The results obtained showed that the vegetative growth characters and yield components of onion plants were significantly influenced by fertilizers kinds. Combination of poultry manure at 75% of recommended fertilizers and 25% of mineral fertilizers recorded the highest values for both vegetative growth characters and yield components, i.e., plant height, leaves number, plant fresh and dry weight, crop growth rate, bulb fresh weight, bulb diameter, bulb dry matter, marketable yield and total yield in a comparison to mineral fertilizers (control) in both seasons. While, the content of chlorophyll a, b, total carotenoids, N, P and K in onion leaves and vitamin C, sulfur volatile oil and TSS in onion bulb were increased significantly by application of poultry manure at 25% of recommended fertilizers plus 75% of mineral fertilizers compared to mineral fertilizers (control) in both seasons. It can be concluded that application of poultry manure at 75% of recommended fertilizers plus 25% of mineral fertilizers increased growth , yield and improved bulb quality of onion plants cv. Giza 6 under the New Valley Governorate conditions.

Keywords: *Allium cepa* L. cv. Giza 6, chemical constituents, poultry manure, NPK-fertilizers.

INTRODUCTION

Onion (*Allium cepa* L.) is one of the most popular vegetable crops in the world. It occupied the third rank after tomato and potato. In Egypt, it is cultivated not only for local consumption but also for exportation, so it is considered a source foreign of foreign currency. Onion is cultivated in more than 135 countries in world, producing 29.3 billion kilograms onion bulbs yearlly. During 2016 season, the total harvested area in Egypt amounting to 68.053 ha, produced about 2.379.035 tons with an average of 34.95 tons of dry onions/ha (FAOSTAT, 2017).

It considered as a rich source of carbohydrates, protein, vitamin C, phosphorus and calcium also possess good medicinal properties (Ramesh *et al*., 2017).

Onion is one of the most popular vegetable crops cultivated in the New Valley Governorate, which is located in the south-west of Egypt's Western Desert.; The most of soils in the New Valley Governorate are newly reclaimed sand soil., therefore, growing onion in that soils is faced by different problems, such as low amounts of available nutrients and reduction in organic matter content (Abdelhafez *et al*., 2016), as well as poor hydro-physic, chemical and biological properties, therefore a regular need for nitrogen fertilizers addition is essential to encounter the low fertility problem in New addition Valley soil. The best means of maintaining soil fertility and productivity could be through applying of organic manures either alone or in addition to mineral fertilizers.

Mineral fertilizers play an essential function in onion production. Many investigators indicated that nutrient uptake was enhanced by enhancing the available of NPK fertilizers. Nevertheless, the continuous and imbalanced use of fertilizers may adversely affect the sustainability of agricultural production as well as rise environmental pollution. The residuals of each of pesticides and mineral fertilizers are the crucial factors that reduce the exportable quantities of Egyptian onion (Magdi and Mohamed, 2009).

Cultivating with continuous applying mineral fertilizers lead to an increase in soil acidity and soil physical degradation, which in turn may cause a yield reduction (Adeinyan and Ojeniyi, 2003).

In recent times, attention has been attracted towards organic manures as a valuable practice for sustainable agriculture to meet the nutrient requirements of crops (Gwari *et al.*, 2014). Nutrients were more available to crops by applying organic manures to the soil because the increase in soil water holding capacity would take place (Dada and Fayinminnu, 2010). Also, organic manures have a vital role on root development by enhancing the root rhizosphere conditions and that promoted plant development by enhancing the microorganisms population (Shaheen *et al*., 2007).

Addition of organic manures in particular to sandy soil, which was low in organic matter and had unfavorable physical and biological properties and more N leaching, improved these unfavorable characters and enhanced crops productivity (Awosika *et al*., 2014).

Therefore, this experiment aims to investigate the impact of both organic manures, i.e., cattle and poultry

* **Corresponding author.**
E-mail address: mohamedahmedali77@aun.edu.eg
DOI: 10.21608/jpp.2020.114580

manure in addition to mineral fertilizers on vegetative growth, productivity and quality on onion bulb cv. Giza 6 under the New Valley Governorate conditions.

MATERIALS AND METHODS

Description of the study site:

A field experiment was carried out at Agricultural Research Farm of the Faculty of Agriculture, New Valley University that is located 10 km off the New Valley Governorate road to Assiut during two consecutive winter growing season 2017/2018 and 2018/2019.

Experimental soil analysis:

Five samples of soil were randomly taken from the experimental soil surface (0-30 cm depth) before cultivation to detect the physical and chemical characteristics according to the methods of Black (1965) and Page *et al.* (1982). Data of soil analysis are presented in Table (1).

Experimental design and tested treatments:

Onion seedlings 60 day old with an average of 8 mm in diameter and 25 cm in length were transplanted on October 25th and October 30th in 2017 and 2018 seasons, respectively.

The experiment included 9 treatments conducted in a randomized complete-block design (RCBD) with 3 replicates. Experimental plot had four rows each row was 3 m long and 60 cm wide. Onion seedlings were transplanted 10 cm apart on the both sides of each row.

Organic fertilizers were obtained from the Poultry and Livestock Research Station, Faculty of Agriculture, New Valley University, Egypt. They were analyzed for determination of their nutrient contents as shown in Table (2).

Table 1. Physical and chemical properties of the experimental site during 2017/2018 and 2018/2019 seasons.

Soil properties		Season	
		2017/2018	2018/2019
Physical analysis	Particle size distribution (%)		
	Coarse sand	4.73	5.16
	Fine sand	76.05	74.18
	Silt	12.24	13.94
	Clay	6.98	6.72
	Texture class	Sandy	Sandy
Chemical analysis	EC. dsm^{-1} (1:5 ex.)	1.32	1.24
	pH (1:2.5 w/v)	8.09	8.19
	Organic matter (%)	0.57	0.66
	$CaCO_3$ (%)	5.78	5.98
	SP %	38.6	41.3
	Available nutrients (mg/kg)		
	N	41.3	43.2
	P	5.16	5.62
	K	88.9	86.5

Table 2. Chemical analysis of cattle and poultry manures during 2017/2018 and 2018/2019 seasons*

Ser.	Component	Cattle manure		Poultry manure	
		2017/2018	2018/2019	2017/2018	2018/2019
1	EC. dsm^{-1} (1:10 ex.)	4.31	4.12	3.87	3.75
2	pH (1:5 w/v)	6.49	6.68	6.21	6.09
3	O.M %	58.10	60.48	69.09	69.59
4	O.C %	33.78	35.16	40.17	40.46
5	N %	1.75	1.88	2.66	2.79
6	C/N ratio	19.3	18.7	15.1	14.5
7	P %	0.41	0.46	0.55	0.58
8	K %	0.59	0.65	0.69	0.74
9	SP %	132	125	104	108

***This analysis was carried out by the lab of Soil, Water and Environmental Research Institute, Agricultural Research Center, Mansoura, Egypt.**

Time and method of treatments:

Mineral fertilizers were added to the soil at the recommended dose as follows; ammonium sulfate (20.6%) at 150 kg/fed., calcium super phosphate (15.5% P_2O_5) at 400 kg/fed., and potassium sulfate (48% K_2O) at 60 kg/fed., the phosphorus fertilizer was added during soil preparation. Nitrogen and potassium were divided into two equal doses, the 1st dose was added after one month from transplanting and the other one was added after one month from the first according to the Ministry of Agriculture instruction.

Mature organic fertilizers, i.e., cattle and poultry manures were added and mixed with the soil (at levels 25, 50, 75 and 100% of recommended mineral fertilizers, equal 1.79, 3.59, 5.38 and 7.18 ton/fed. for cattle manure and 1.19, 2.38, 3.58 and 4.77 ton/fed. for poultry manure, respectively) during soil preparation 10 days before transplanting. Quantities of cattle and poultry manures were calculated based on total nitrogen content of these manures. Mineral fertilizers (NPK) and organic manures, i.e., cattle and poultry manure were used at different levels as following:

1) Control treatment as 100% of recommended mineral fertilizers (T1).
2) Cattle manure at 100% of recommended fertilizers (T2).
3) Cattle manure at 75% of recommended fertilizers plus 25% of mineral fertilizers (T3).
4) Cattle manure at 50% of recommended fertilizers plus 50% of mineral fertilizers (T4).
5) Cattle manure at 25% of recommended fertilizers plus 75% of mineral fertilizers (T5).
6) Poultry manure at 100% of recommended fertilizers (T6).
7) Poultry manure at 75% of recommended fertilizers plus 25% of mineral fertilizers (T7).
8) Poultry manure at 50% of recommended fertilizers plus 50% of mineral fertilizers (T8).
9) Poultry manure at 25% of recommended fertilizers plus 75% of mineral fertilizers (T9).

Data recorded:

Vegetative growth characters:

Vegetative parameters were recorded using 10 randomly sampled plants from each plot at different growth stages, i.e., 30, 60, 90 and 120 days after transplanting to estimate plant height (cm), leaves number, plant fresh and dry weight (g). Additionally, crop growth rate (CGR) at different periods was calculated by the formula reported by Richards (1969):

$$\mathbf{CGR\ (g/day) = W_2\text{-}W_1/T_2\text{-}T_1,}$$

where W1 and W2 are the total dry weight (bulbs + leaves)/plant at the time of sampling T1 and T2, respectively.

Chemical constituents of leaves:

At 135 days after transplanting, samples of plant leaves were taken, oven dried at 70° C till constant weight. Dried samples of the leaves were crushed separately and samples of 0.5 g were digested with mixture of sulfuric acid and hydrogen peroxide and then brought to a final volume of 100 ml with distilled water, in order to measure N, P and K levels by the methods of Jones *et al.* (1991) and Jackson (1970), respectively. Chlorophyll a, b and total carotenoids (mg/g F.W) were determined according to Lichenthaler and Wellburn (1983).

Yield and its components:

At harvesting time (the last week of April in both seasons), all onion plants in each plot were harvested and cured for 15 days after harvest, weighted and converted to

record bulb fresh weight (g), bulb diameter (cm), marketable yield (ton/fed.) and total yield (ton/fed.). Furthermore, bulb dry matter (%) and relative total yield (%) were calculated as follows:

$$\text{Bulb dry matter (\%)} = \frac{\text{Bulb dry weight}}{\text{Bulb fresh weight}} \times 100$$

$$\text{Relative total yield (\%)} = \frac{\text{Total yield of treatment}}{\text{Total yield of control}} \times 100$$

Chemical constituents of bulb:

A sample (10 bulbs) was randomly selected for each plot to determine vitamin C (mg/100g F.W) which was determined according to the method described by Mazumdasr and majumdas (2003), sulfur volatile oil (%) was determined according to A.O.A.C. (2000) and total soluble solids (TSS) % was recorded by digital refractometer (Atago N1, Japan).

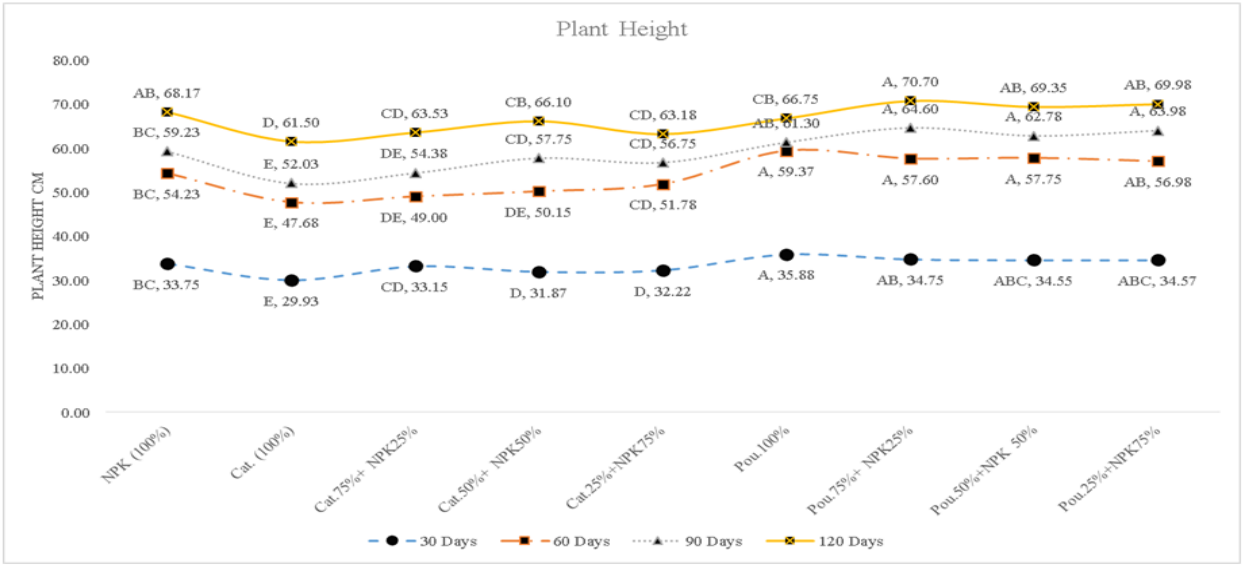
Statistical analysis:

According Snedecor and Cochran (1980), data were exposed to analysis of variance (ANOVA). Based on homogeneity of error variance, the two seasons combined data were used in combined ANOVA. The treatment means were compared using Duncan's multiple range test at probability of 5% level according to Duncan (1958).

RESULTS AND DISCUSSION

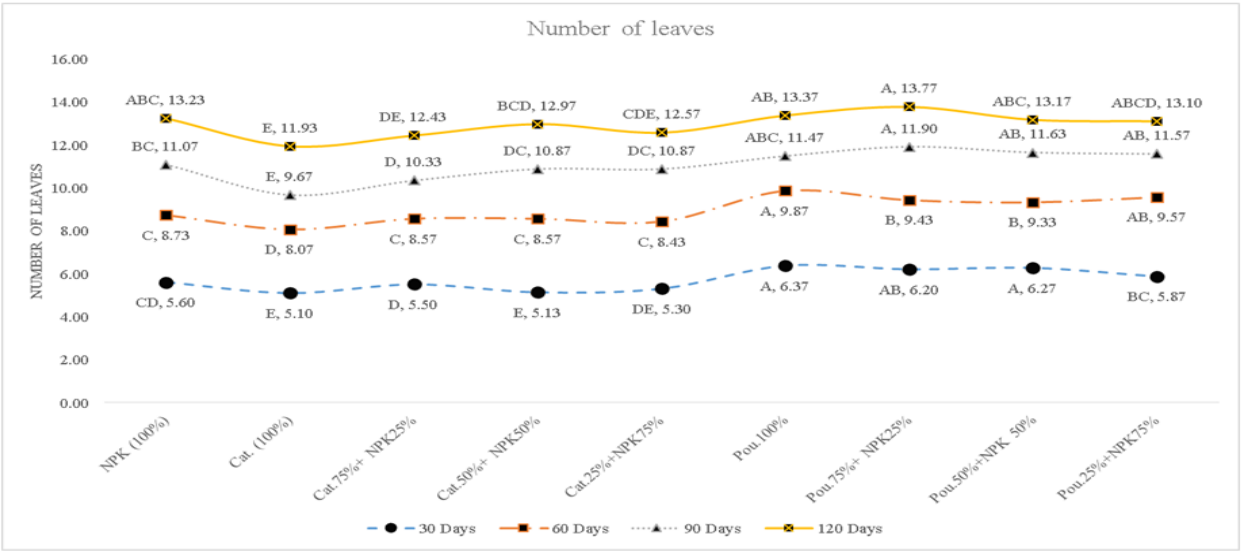
1. Vegetative growth characters:

The response of onion vegetative growth to different kinds of fertilizers was presented in Figures (1-5). Significant differences were found among the treated fertilizers regarding vegetative growth characters. Plants fertilized with poultry manure at 100% of recommended fertilizers (T6) recorded the highest values for plant height, number of plant leaves, plant fresh weight and plant dry weight 30 and 60 days after transplanting compared to cattle manure and mineral fertilizers (control) in both seasons.



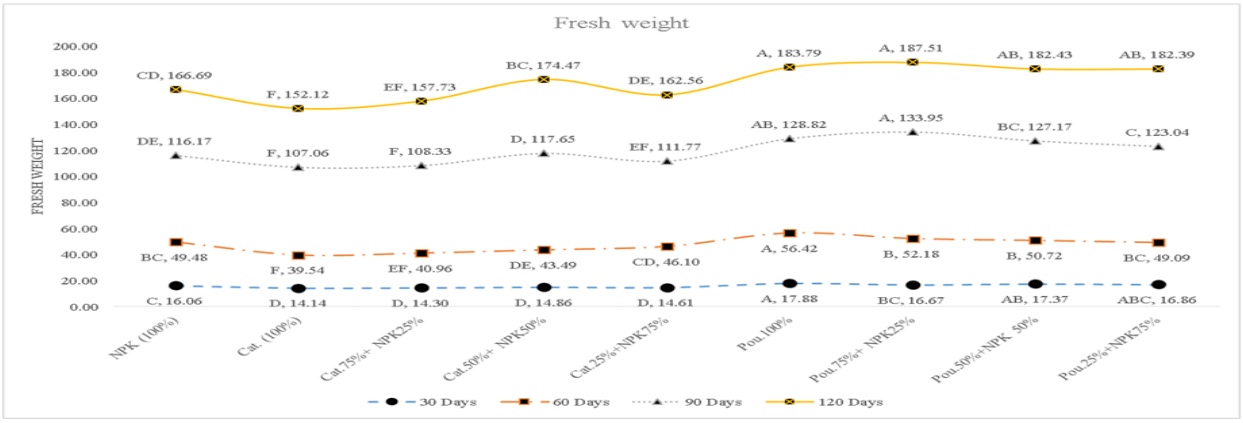
Values having the same alphabetical letter(s) did not show a significant difference at 0.05 level of significance according to Duncan's multiple range test.

Figure 1. Effect of organic and mineral fertilization treatments on plant height (cm) of onion plants 30, 60, 90 and 120 days after transplanting as a mean values over the two winter seasons of 2017/2018 and 2018/2019.



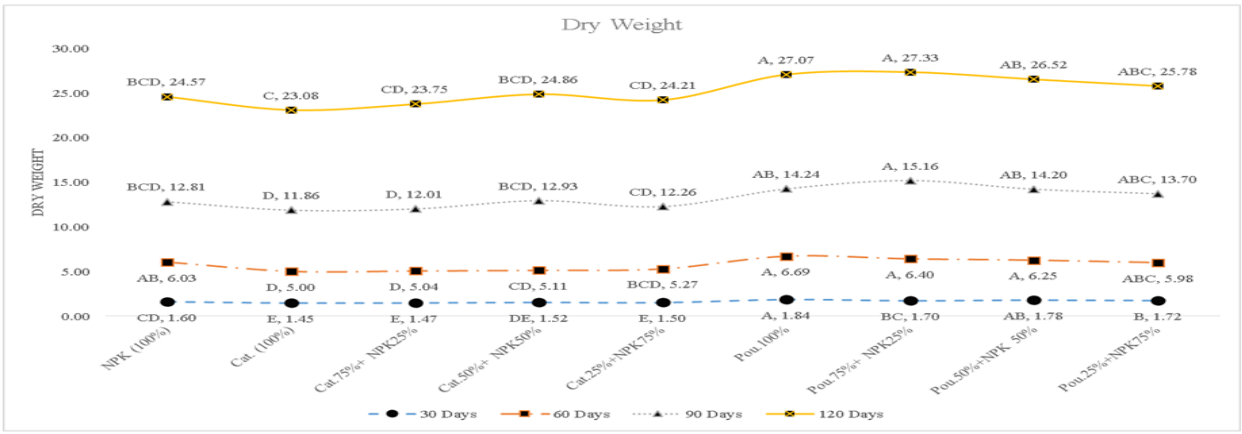
Values having the same alphabetical letter(s) did not show a significant difference at 0.05 level of significance according to Duncan's multiple range test.

Figure 2. Effect of organic and mineral fertilization treatments on number of plant leaves of onion plants 30, 60, 90 and 120 days after transplanting as a mean values over the two winter seasons of 2017/2018 and 2018/2019.



Values having the same alphabetical letter(s) did not show a significant difference at 0.05 level of significance according to Duncan's multiple range test.

Figure 3. Effect of organic and mineral fertilization treatments on plant fresh weight (g) of onion plants 30, 60, 90 and 120 days after transplanting as a mean values over the two winter seasons of 2017/2018 and 2018/2019.

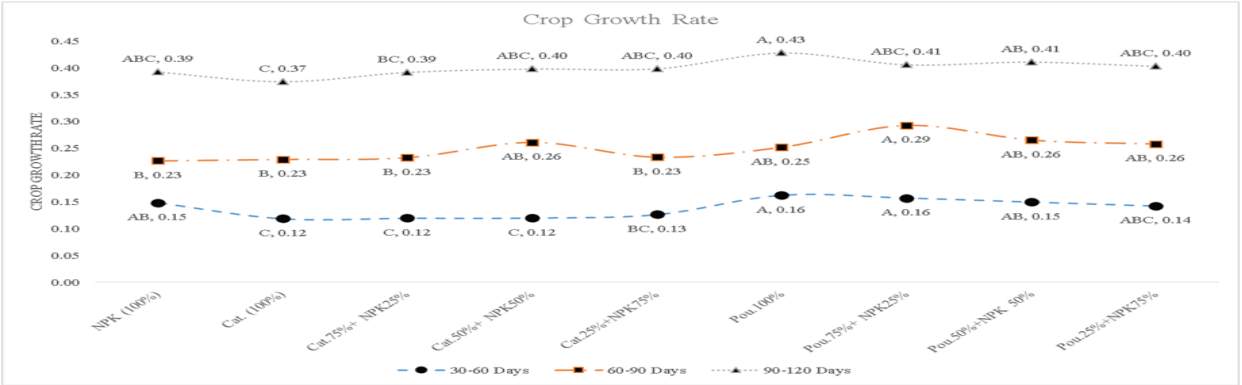


Values having the same alphabetical letter(s) did not show a significant difference at 0.05 level of significance according to Duncan's multiple range test.

Figure 4. Effect of organic and mineral fertilization treatments on plant dry weight (g) of onion plants 30, 60, 90 and 120 days after transplanting as a mean values over the two winter seasons of 2017/2018 and 2018/2019.

Poultry manure at 75% of recommended fertilizers plus 25% of mineral fertilizers (T7) recorded the highest values for plant height, number of plant leaves, plant fresh weight and plant dry weight 90 and 120 days after transplanting compared to cattle manure and mineral fertilizers (control) in both seasons. Clear significant differences between poultry manure at 75% of recommended fertilizers plus 25% of mineral fertilizers (T7) and mineral fertilizers (control) were observed in plant fresh weight and plant dry weight in both seasons.

Results of the effect of different types of fertilizers on crop growth rate parameter are shown in Figure (5) for 2017/2018 and 2018/2019 seasons. Generally, poultry manure enhanced crop growth rate of onion plants at different stages compared to mineral fertilizers (control). Application of poultry manure at 75% of recommended fertilizers plus 25% of mineral fertilizers (T7) gave the highest values for crop growth rate of onion plants at the period of 60-90 days after transplanting compared to cattle manure and mineral fertilizers (control) in both seasons. The increase was significant in both seasons compared to control treatment. This result in agreement with those detected by Falodun *et al.* (2013) who indicated that application of poultry manure with NPK fertilizers enhanced the growth of onion plants in terms of crop growth rate.



Values having the same alphabetical letter(s) did not show a significant difference at 0.05 level of significance according to Duncan's multiple range test.

Figure 5. Effect of organic and mineral fertilization treatments on crop growth rate (g/day) of onion plants at different periods of 30-60, 60-90 and 90-120 days after transplanting as a mean values over the two winter seasons of 2017/2018 and 2018/2019.

The superiority of poultry manure over cattle manure may refer to readily available nutrients of poultry manure (Tiamiyu *et al*., 2012). Further, it contains more amounts of organic matters, organic carbon and N, P, K as shown in Table (2). Moreover, poultry manure can easily supplies P to plants than other organic manure types (Garg and Bahl, 2008). Concerning the positive effects on vegetative growth in our study, as per poultry manure versus mineral fertilizer, may due to quick and extended availability of macro nutrients like N, P and K to plants at primitive stages of plant development. In contrast, NPK of organic manure need more time for utilization by plants due to its slow releasing (Meenakumari and Shekhar, 2012).

2. Chemical constituents of leaves:

The results of leaves chemical content (chlorophyll a, b, total carotenoids, N, P and K) are presented in Tables (3 and 4). Among the different treatments, applying poultry manure at 25% of recommended fertilizers plus 75% of mineral fertilizers (T9) produced the highest content of chlorophyll a, b and total carotenoids comparing to cattle manure and mineral fertilizer (control) and the content of chlorophyll a, b and total carotenoids were significant with (T9) compared to (control) in both seasons.

Table 3. Effect of organic and mineral fertilization treatments on chlorophyll *a, b* and total carotenoids contents in onion leaves 135 days after transplanting during winter seasons of 2017/2018 and 2018/2019.

Treatments	Chlorophyll *a* (mg/g F.W)		Chlorophyll *b* (mg/g F.W)		Total carotenoids (mg/g F.W)	
	1st season	2nd season	1st season	2nd season	1st season	2nd season
Mineral fertilizers 100% (control)	0.619 bc	0.650 cd	0.444 de	0.480 de	0.704 de	0.750 cd
Cattle manure 100%	0.560 e	0.590 f	0.429 ef	0.434 g	0.650 g	0.693 f
Cattle manure 75% + 25% mineral fertilizers	0.618 bc	0.615 ef	0.420 fg	0.451 fg	0.676 fg	0.715 ef
Cattle manure 50% + 50% mineral fertilizers	0.633 bc	0.677 bc	0.456 cd	0.495 cd	0.718 cd	0.767 bc
Cattle manure 25% + 75% mineral fertilizers	0.671 a	0.710 ab	0.478 ab	0.524 ab	0.746 ab	0.798 ab
Poultry manure 100%	0.582 de	0.602 ef	0.409 g	0.443 fg	0.662 g	0.703 ef
Poultry manure 75% + 25% mineral fertilizers	0.603 cd	0.633 de	0.435 ef	0.465 ef	0.690 ef	0.732 de
Poultry manure 50% + 50% mineral fertilizers	0.649 ab	0.687 b	0.468 bc	0.509 bc	0.732 bc	0.781 bc
Poultry manure 25% + 75% mineral fertilizers	0.682 a	0.725 a	0.494 a	0.539 a	0.761 a	0.813 a

Values having the same alphabetical letter(s) did not show a significant differce at 0.05 level of significance according to Duncan's multiple range test.

Table 4. Effect of organic and mineral fertilization treatments on N, P and K contents in onion leaves 135 days after transplanting during winter seasons of 2017/2018 and 2018/2019.

Treatments	Nitrogen (%)		Phosphorus (%)		Potassium (%)	
	1st season	2nd season	1st season	2nd season	1st season	2nd season
Mineral fertilizers 100% (control)	2.34 cd	2.44 cd	0.218 cd	0.229 cd	2.63 de	2.79 cd
Cattle manure 100%	1.86 f	2.01 f	0.172 f	0.183 e	2.22 f	2.40 f
Cattle manure 75% + 25% mineral fertilizers	2.04 ef	2.16 ef	0.190 ef	0.205 de	2.44 ef	2.54 ef
Cattle manure 50% + 50% mineral fertilizers	2.47 bc	2.59 bc	0.233 bc	0.246 bc	2.76 cd	2.90 c
Cattle manure 25% + 75% mineral fertilizers	2.71 ab	2.82 ab	0.261 a	0.275 a	3.03 ab	3.15 ab
Poultry manure 100%	1.93 ef	2.03 ef	0.185 ef	0.191 e	2.31 f	2.43 ef
Poultry manure 75% + 25% mineral fertilizers	2.18 de	2.30 de	0.203 de	0.218 d	2.59 de	2.66 de
Poultry manure 50% + 50% mineral fertilizers	2.60 ab	2.67 bc	0.247 ab	0.261 ab	2.89 bc	3.02 bc
Poultry manure 25% + 75% mineral fertilizers	2.83 a	2.94 a	0.275 a	0.287 a	3.16 a	3.30 a

Values having the same alphabetical letter(s) did not show a significant differce at 0.05 level of significance according to Duncan's multiple range test.

These results are in agreement with Mahala (2015) on onion. These may be due to the effect of nitrogen on chlorophyll because nitrogen is a constituent of the chlorophyll molecule.

Moreover, poultry manure at 25% of recommended fertilizers plus 75% of mineral fertilizers (T9) recorded the highest values of N, P and K content in onion leaves compared to cattle manure and mineral fertilizers (control). The content of N, P and K were significant with (T9) comparing to (control) in both seasons. These results are in accordance with Sultana *et al.* (2014). They proved that combined application of organic and inorganic types of fertilizers enhanced the concentrations of N, P and K in leaves of onion at harvest.

The higher amount of nutrients in plant leaves may be due to higher nutrient uptake by plant leaves which resulted in healthy plant growth, i.e., more number of leaves. If the plant shows more growth then it is inevitable that plant takes more nutrients from the soil. So, this is a possible reason regarding maximum nutrient content.

3. Yield and its components:

The results on yield and its components, i.e., bulb fresh weight (g), bulb diameter (cm), bulb dry matter (%), marketable yield (ton/fed.) and total yield (ton/fed.) are presented in Table (5).

Data of different yield parameters for onion bulb indicated significant differences among fertilization treatments for all parameters. Bulb fresh weight, bulb diameter, bulb dry matter, marketable yield and total yield tended to be greater with application of poultry manure than cattle manure and mineral fertilizers (control).

It was observed that applying poultry manure at 75% of recommended fertilizers plus 25% of mineral fertilizers (T7) recorded the highest values of bulb fresh weight (131.04 and 133.56 g) comparing to mineral fertilizers (control) in both seasons, respectively. These results are in line with Ncayiyana *et al.* (2017) on onion. They concluded that application of NPK combined with poultry manure increased bulb weight comparing to NPK alone or other treatments.

Moreover, treatment (T7) recorded the highest values of bulb diameter (6.40 and 6.56 cm) compared to mineral fertilizers (control) in both seasons, respectively. These results are in conformity with those reported by Gebremichael *et al.* (2017 a) on onion, they reported that application of both organic manures and inorganic fertilizers resulted in significantly higher bulb diameter of onion compared to other treatments.

Table 5. Effect of organic and mineral fertilization treatments on bulb fresh weight, bulb diameter, bulb dry matter, marketable and total yield of onion plants during winter seasons of 2017/2018 and 2018/2019.

Treatments	Bulb fresh Weight (g)		Bulb diameter (cm)		Bulb dry matter (%)		Marketable yield (ton/fed.)		Total yield (ton/fed.)		Relative total yield (%)	
	1st season	2nd season	1st season	2nd season	1st season	2st season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Mineral fertilizers 100% (control)	115.43 bc	118.67 cd	5.21 de	5.36 de	13.40 c	14.23 cd	5.36 de	5.74 de	6.05 cd	6.34 cd	100	100
Cattle manure 100%	105.30 d	108.65 e	4.57 f	4.63 g	12.25 e	13.23 e	4.23 g	4.56 g	4.86 f	5.12 f	80.33	80.75
Cattle manure 75% + 25% mineral fertilizers	107.97 cd	112.70 de	4.61 f	4.80 fg	12.58 de	13.32 de	4.39 g	4.87 g	5.10 f	5.48 ef	84.29	86.43
Cattle manure 50% + 50% mineral fertilizers	111.33 cd	115.23 de	4.92 ef	5.08 ef	12.75 de	13.57 de	4.63 fg	5.01 fg	5.25 ef	5.56 ef	86.77	87.69
Cattle manure 25% + 75% mineral fertilizers	114.09 bc	116.16 de	5.07 e	5.23 e	13.15 cd	13.69 de	4.96 ef	5.37 ef	5.63 de	5.94 de	93.05	93.69
Poultry manure 100%	122.48 ab	124.23 bc	5.57 cd	5.70 cd	13.62 bc	14.78 bc	5.59 cd	5.94 cd	6.20 c	6.47 c	102.47	102.05
Poultry manure 75% + 25% mineral fertilizers	131.04 a	133.56 a	6.40 a	6.56 a	14.57 a	16.04 a	6.56 a	7.01 a	7.08 a	7.44 a	117.02	117.35
Poultry manure 50% + 50% mineral fertilizers	129.58 a	133.16 a	6.06 ab	6.23 ab	14.23 ab	15.60 ab	6.27 ab	6.60 ab	6.81 ab	7.05 ab	112.56	111.19
Poultry manure 25% + 75% mineral fertilizers	125.40 a	129.00 ab	5.82 bc	5.90 bc	14.05 ab	15.20 ab	5.94 bc	6.26 bc	6.50 bc	6.75 bc	106.61	106.46

Values having the same alphabetical letter(s) did not show a significant differce at 0.05 level of significance according to Duncan's multiple range test.

Concerning bulb dry matter content, the increase was significant by treatment (T7) compared to mineral fertilizers (control) in both seasons of study. These results are in agreement with Singh *et al.* (2008) on onion, they observed that highest dry matter yield of onion plants was obtained with 100% NPK plus farmyard manure at 10 ton/ha.

In addition, treatment (T7) increased values of marketable yield (6.56 and 7.01 ton/fed.) and total yield (7.08 and 7.44 ton/fed.) comparing to mineral fertilizers (control) in both seasons, respectively. The results are in agreement with Gebremichael *et al.* (2017 b) on onion. Moreover, Ncayiyana *et al.* (2017) revealed that marketable yield significantly increased by applying inorganic N and poultry manure as compared with 0 kg/ha N plus cattle manure alone in onion plants. The increases in total yield were about 17.02 and 17.35% for poultry manure at 75% of recommended fertilizers plus 25% of mineral fertilizers (T7) over the control treatment in both seasons, respectively. These results are in agreement with Mahala (2015) and Ncayiyana *et al.* (2017) on onion, they reported that total yield significantly enhanced when combination of poultry manure with mineral fertilizer was applied as compared with mineral fertilizer alone or other treatments in onion plants.

The increased yield and its traits as applying poultry manure could be explained by the fact of rapid availability and utilization of nitrogen for carbohydrates production that helped in increasing yield and might be attributed to balanced C:N ratio and accelerate activity of plant metabolism (Mahala *et al.*, 2018). The promotive effect of mineral fertilizers might be due to impact of nitrogen on synthesizes of chlorophyll, enzymes and protein and role of phosphorous on root growth and development as well as the effect of potassium on enhancing of enzymes activity and improving the assimilates translocation.

4. Chemical constituents of bulb:

The results on bulb chemical content (vitamin C, sulfur volatile oil and TSS) are illustrated in Table (6). It is showed that poultry manure at 25% of recommended fertilizers plus 75% of mineral fertilizers (T9) recorded the highest values for bulb chemical content of vitamin C, sulfur volatile oil and TSS compared to cattle manure and mineral fertilizers (control) in both seasons.

Table 6. Effect of organic and mineral fertilization treatments on vitamin C, sulfur volatile oil and total soluble solids contents in onion bulb at harvesting date during winter seasons of 2017/2018 and 2018/2019.

Treatments	Vitamin C (mg/100g F.W)		Sulfur volatile oil (%)		Total soluble solids (%)	
	1st season	2nd season	1st season	2nd season	1st season	2nd season
Mineral fertilizers 100% (control)	14.30 cd	15.28 cd	1.389 cd	1.495 de	13.67 ab	14.63 ab
Cattle manure 100%	13.09 f	14.01 e	1.113 e	1.130 f	11.42 c	12.30 b
Cattle manure 75% + 25% mineral fertilizers	13.58 ef	14.80 de	1.222 de	1.253 ef	12.40 bc	13.40 b
Cattle manure 50% + 50% mineral fertilizers	14.66 bc	15.68 bc	1.516 bc	1.621 cd	13.11 bc	14.03 ab
Cattle manure 25% + 75% mineral fertilizers	15.35 ab	16.67 a	1.754 ab	1.888 ab	13.00 bc	13.86 ab
Poultry manure 100%	13.24 f	14.08 e	1.172 de	1.190 f	12.51 bc	13.43 b
Poultry manure 75% + 25% mineral fertilizers	13.95 de	14.95 cd	1.252 de	1.363 ef	14.40 ab	14.70 ab
Poultry manure 50% + 50% mineral fertilizers	14.97 bc	16.10 ab	1.635 ab	1.757 bc	14.50 ab	14.73 ab
Poultry manure 25% + 75% mineral fertilizers	15.73 a	16.91 a	1.843 a	2.021 a	15.40 a	16.50 a

Values having the same alphabetical letter(s) did not show a significant differce at 0.05 level of significance according to Duncan's multiple range test.

These results are in harmony with those reported by Singh *et al.* (2012) on onion. They found that fertilizing onion plants with 90 kg N through poultry manure plus 30 kg N through urea recorded significant value of vitamin C concentration. Moreover, bulb ascorbic acid concentration of onion plants significantly increased with the application of poultry manure and cattle manure in a comparison with 120 kg/ha inorganic nitrogen (Ncayiyana *et al.*, 2017).

In addition, the content of sulfur volatile oil in onion bulb at harvest stage was positively enhanced as a result of application of mineral nitrogen fertilizer doses (Ali and El-Tokhy, 2018). Furthermore, our results are consistent with the findings of Mahala (2015) on onion and Diriba-Shiferaw *et al.* (2016) on garlic. They stated that application of NPK in combination with poultry manure significantly increased TSS content and that may be due to

the lesser starch content when soils supplied with inorganic fertilizer which implies the starch metabolism and poor translocation of sugar to growing part.

Organic manures slowly release the nutrients compared to mineral fertilizers. Consequently, plants supplied with organic fertilizers often grow slower than the plants fertilized with mineral nutrients, which in turn might reduce their water content and causing higher concentration of plant constitutes, e.g., sugars and acids (Guichard *et al*., 2001).

CONCLUSION

These results suggest that, fertilization of onion plants cv. Giza 6 with poultry manure at 75% of recommended fertilizers plus 25% of mineral fertilizers increased growth, yield and improved bulb quality under the New Valley Governorate conditions.

REFERENCES

A.O.A.C. Association of Official Analytical Chemists (2000). Official Methods of Analysis. 17 th ed., A.O.A.C. International, Maryland, U.S.A., pp: 1250.

Abdelhafez, A. A.; M. A. M. Ali; A. I. El-Tokhy and M. E. Amer (2016). Effects of nitrogen and herbicides on onion production in a newly reclaimed soil and their potential health risks. Egyptian J. Desert Res., 66(1): 115-136.

Adeinyan, O. N. and S. O. Ojeniyi (2003). Comparative effectiveness of different level of poultry manure with NPK fertilizer on residual soil fertility, nutrient uptake and yield of maize. Moor J. Agric. Res., 4(2): 191-197.

Ali, M. A. M. and A. I. El-Tokhy (2018). Effect of nitrogen and some weed control methods on yield and quality of onion in a newly reclaimed soil. Egyptian J. Desert Res., 68(1): 117-133.

Awosika, O. E.; M. A. Awodun and S. O. Ojeniyi (2014). Comparative effect of pig manure and NPK fertilizer on agronomic performance of tomato (*Lycopersicon esculentum* mill). American Journal of Experimental Agriculture, 4(11): 1330-1338.

Black, C. A. (1965). Methods of Soil Analysis. Part 2. Chemical and Microbiological Properties. Amer. Soci. Agron., Madison, Wisconsin, USA.

Dada, O. A. and O. O. Fayinminnu (2010). Influence of cattle dung and weeding regimes on period of weed control in okra. Not. Bot. Hort. Agrobot. Cluj., 38(1): 149-154.

Dancan, D. B. (1958). Multiple range and Multiple F test. Biometrics 11: 1-42.

Diriba-Shiferaw G.; R. Nigussie-Dechassa; W. Kebede; T. Getachew and J. J. Sharma (2016). Influence of combined application of inorganic N and P fertilizers and chicken manure on quality and shelf-life of garlic (*Allium sativum* L.) bulbs. Journal of Postharvest Technology, 4(4): 56-67.

Falodun E. J.; J. O. Ehigiator and R. K. A. Egharevba (2013). Growth and yield of onion as influenced by organic and inorganic fertilizer in Edo Rainforest of Nigeria. Agro-Science, 12(3): 15-24.

FAOSTAT (2017). Food and Agriculture Organization of the United Nations. Data available at http: // www .fao.org/faostat/en/#data/QC.

Garg, S. and G. S. Bahl (2008). Phosphorus availability to maize as influenced by organic manures and fertilizer P associated phosphatase activity in soils. Bioresource Technology, 99(13): 5773-5777.

Gebremichael, Y.; K. W. A. Chavhan and F. Gedamu (2017 a). Effect of integrated nutrient management on growth and bulb yield of onion (*Allium cepa* L.) under irrigation at Selekleka, Northern Ethiopia. Int. J. of Life Sciences, 5(2): 151-160.

Gebremichael, Y.; K. Woldetsadik and F. Gedamu (2017 b). Effect of combined application of organic manure and inorganic nitrogen on marketable yield, shelf life of onion and soil fertility status after harvest. Asian Research Journal of Agriculture ARJA, 6(3): 1-13.

Guichard, S.; N. Bertin; C. Leonardi and C. Gary (2001). Tomato fruit quality in relation to water and carbon fluxes. Agronomie, 21(4): 385-392.

Gwari, E. Y.; B. A. Gambo and B. H. Kabura (2014). Effect of organic manures and irrigation intervals on the growth and yield of onion (*Allium cepa* L.) in Central and Southern Borno State, Nigeria. Int. J. Adv. Agric. Res., 2(7) :106-111.

Jackson, M. L. (1970). Soil Chemical Analysis. Prentice Hall, Englewood Cliffs, N. J.

Jones, J.; B. J. B. Wolf and H. A. Mills (1991). Plant analysis Handbook: A Practical Sampling, Preparation, Analysis, and Interpretative Guide. Micro-Macro Publishing, Athens, Ga.

Lichtenhaler, H. K. and A. R. Wellburn (1983). Determinations of total carotenoids and chlorophylls a and b of leaf extracts in different solvents. Biol. Soc. Trans., 11(5): 591-592.

Magdi, A. A. M. and M. F. Mohamed (2009). Enhanced yield and quality of onion (*Allium cepa* L.cv Giza 6) produced using organic fertilization. Ass. Univ. Bull. Environ. Res., 12(1): 9-18.

Mahala, P. (2015). Integrated nutrient management in rabi onion (*Allium cepa* L.). Ph. D. Thesis, College of Agriculture (Sri Karan Narendra Agriculture University), Jobner.

Mahala, P.; M. R. Chaudhary and O. P. Garhwal (2018). Yield and quality of rabi onion (*Allium cepa* L.) influenced by integrated nutrient management. Int. J. Curr. Microbiol. App. Sci., 7(5): 3313-3321.

Mazumdar, B. C. and K. Majumder (2003). Methods on Physico-Chemical Analysis of Fruits. University College of Agriculture, Calcutta University, 108-109.

Meenakumari, T. and M. Shekhar (2012). Vermicompost and other fertilizers effect on growth, yield and nutritional status of tomato (*Lycopersicon esculentum*) plant. World Research Journal of Agricultural Biotechnology, 1(1): 14-16.

Ncayiyana, M. M.; M. Maboko and I. Bertling (2017). Alterations in yield, physicochemical components and mineral composition of onion following organic manure and inorganic nitrogen application. Acta Agriculturae Scandinavica, Section B - Soil & Plant Science, 68(3): 213-219.

Page, A. L., R. H. Miller and D. R. Keeney (1982). Methods of Soil Analysis. Part II Chemical and Microbiological Properties. A. S. A. Madison Wisconsin, USA.

Ramesh , G.; K. Ajithkumar; Y. S. Amaresh and A. S. Savitha (2017). Influence of integrated nutrient management on growth parameters, yield and severity of disease in onion (*Allium cepa* L.). International Journal of Current Microbiology and Applied Sciences, 6(8): 1020-1028.

Richards, F. J. (1969). Plant Physiology. The quantitative analysis of plant growth, 3-77pp. Edited by F.C.Steward, Vol. VA- analysis of plant growth, Academic press, Inc. III fifth Avenue, New York 10003.

Shaheen, A. M.; F. A. Rizk and S. M. Singer (2007). Growing onion plants without chemical fertilization. Res. J. Agr. Biol. Sci., 3(2): 95-104.

Singh, A. P.; O. Singh; V. Singh and S. Kumar (2008). Effect of integrated use of FYM and inorganic fertilizers on yield and uptake of nutrients by onion. Progressive Agriculture, 8(2): 265-267.

Singh, P. C.; R. Saravanan and S. R. Singh (2012). Effect of NPK with different doses of organic manures on growth and yield of garlic (*Allium sativum* L.) var Yamuna Safed-2 (G-50). Environment and Ecology, 30(2): 329-331.

Snedecor, G. W. and W. G. Cochran (1980). Statistical methods. 7th Ed. Iow State Univ. Press, Iowa, USA.

Sultana, S.; A. K. Paul; D. Sultana and J. R. Sarker (2014). Influence of integrated organic-inorganic nitrogen on growth and nutrient concentration of summer onion (*Allium cepa* L.). Bangladesh Journal of Agricultural Research, 39(3): 529-545.

Tiamiyu, R. A.; H. G. Ahmed and A. S. Muhammad (2012). Effect of sources of organic manure on growth and yields of okra (*Abelmoschus esculentus* L.) in Sokoto, Nigeria. Nigerian Journal of Basic and Applied Science, 20(3): 213-216.

تأثير الأسمدة العضوية والمعدنية المختلفة على نمو ومحصول وجودة البصل المزروع في التربة الرملية تحت ظروف محافظة الوادي الجديد

محمد حمام زين العابدين الدقيشى[١] ، شرين يعقوب عطالله [١] ، محمد احمد محمد علي[٢] ورحاب احمد مصطفى[٢]

[١]قسم الخضر - كلية الزراعة - جامعة أسيوط - مصر

[٢]قسم البساتين - كلية الزراعة - جامعة الوادي الجديد – مصر

أجريت التجربة الحالية في المزرعة البحثية بكلية الزراعة جامعة الوادي الجديد خلال موسمي ٢٠١٨/٢٠١٧ و ٢٠١٩/٢٠١٨م لتقييم إستجابة البصل صنف جيزة ٦ لبعض الأسمدة العضوية مثل سماد الماشية وسماد الدواجن ، بالإضافة إلى الأسمدة المعدنية (معاملة المقارنة). أظهرت النتائج التي تم الحصول عليها أن صفات النمو الخضري ومكونات المحصول لنباتات البصل تأثرت معنوياً بأنواع الأسمدة. كما أن إستعمال خليط من سماد الدواجن بنسبة ٧٥ ٪ من الأسمدة الموصى بها و٢٥ ٪ من الأسمدة المعدنية قد سجل أعلى القيم لكل من صفات النمو الخضري ومكونات المحصول مثل طول النبات ، عدد الأوراق ، الوزن الطازج والجاف للنبات ، معدل نمو المحصول ، الوزن الطازج للبصلة ، قطر البصلة ، المادة الجافة للبصلة ، المحصول التسويقي والمحصول الكلي مقارنة بالأسمدة المعدنية (معاملة المقارنة) في كلا الموسمين. بينما المحتوى من كلوروفيل أ ، ب ، والكاروتينات الكلية والنيتروجين والفسفور والبوتاسيوم في أوراق البصل ، وفيتامين جـ والزيت الكبريتي المتطاير والمواد الصلبة الذائبة الكلية في البصلة قد زاد معنوياً عند استعمال سماد الدواجن بنسبة ٢٥ ٪ من الأسمدة الموصى بها و٧٥ ٪ من الأسمدة المعدنية مقارنة بالأسمدة المعدنية (معاملة المقارنة) في كلا الموسمين. يمكن أن نخلص إلى أن إستعمال سماد الدواجن بنسبة ٧٥ ٪ من الأسمدة الموصى بها و٢٥ ٪ من الأسمدة المعدنية قد أدى إلى زيادة النمو والمحصول وتحسين جودة الأبصال في نباتات البصل صنف جيزة ٦ تحت ظروف محافظة الوادي الجديد.