EFFECT OF POULTRY MANURE AND FOLIAR IRON APPLICATION ON EGG PLANTS AND SOME SOIL PROPERTIES

S. F. El-Fiki, A.M. Massoud and M.S. Awaad
Soils,Water and Environment Res., Inst., Agric. Res. Center, Giza, Egypt.
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ABSTRACT: ***A field experiment was conducted in two successive seasons of 2007 and 2008 in a clay loam soil, at Damas Mit-Ghmmer, Dakahlia Governorate, Egypt. The objective of the present study is to investigate the effects of three rates of poultry manure 0, 15 and 30 m^3/ fed., as organic materials individually applied or combined with foliar application of iron, at three rates of Fe0, Fe1 and Fe2 on some soil properties and some plant traits, i.e., growth, yield and nutrients status of leaves and fruits and some biochemical contents of eggplant fruits. The obtained results revealed that application of poultry manure altered significantly some soil properties. Total nitrogen and total porosity increased in soil with increasing poultry manure applied rate, however soil reaction (pH) and bulk density decreased as a result of poultry manure application. Application of poultry manure individually, improved eggplant growth parameters, i.e., plant height, fresh weight of leaves, dry weight of leaves. The increases were more pronounced when the manure was combined with iron as foliar spray. Also, the number of fruits /plant, weight of fruits /plant, average weight of fruit g/plant and total yield of fruit /fed of eggplants increased with increasing the rates of poultry manure application and poultry manure combined with foliar application of Fe, which was more effective. Application of poultry manure improved leaves and fruit contents of some elements (N, P, K and Fe) of eggplants grown on the soil. On the other hand, reducing, non-reducing and total sugars and protein contents in fruits increased with the application of poultry manure either individually or combined with Fe as foliar spray. Generally, mixing the poultry manure with the top 30 cm of soil was more effective in improving some soil properties and fertility conditions. Moreover, using poultry manure either individually or combined with iron as a foliar spray improved quality and yield of eggplants grown on the clay loam soil.***

Key words: ***Organic fertilization, iron, nutrition, vegetables, plant growth, soil properties***

INTRODUCTION

Eggplant is considered as one of the major important vegetable crops in Egypt. Eggplant fruits are low in calories but have a mineral composition, which is beneficial for human health. They are also a rich source of potassium, calcium, magnesium and iron (Kowalski *et al.,* 2003 and Golcz *et*

al., 2005). Organic manure has been given more consideration for ensuring sustainable land use and agricultural production improvement. Lack of plant nutrients replenishment and organic matter lead to degraded soil fertility and decreased crop biomass production (FAO, 1991). Addition of organic matter into soil is the key to soil health, it improves many physical, chemical and biological characteristics of the soil, including water holding capacity, cation exchange capacity, pH buffering capacity and chelating micronutrients, also improves soil structure by increases aggregation, enhances biological activities, slowly releases nutrients, and suppresses some diseases in soil. (Mahmood *et al.,* 1997). El-Naggar (1996) found that applying different organic materials, i.e., chicken manure, farmyard manure and town refuse improved soil structure, aeration, moisture retention and were a good source of essential nutrients, as well as their effect on micro flora's activities. Abd-Allah *et al.* (2001) studied the effect of mineral nitrogen, chicken manure and farmyard manure on eggplants, and found that chicken manure at a rate of 15 ton/fed + 80 kg N/fed recorded the highest values of the plant height, fresh weight, dry weight, fruit weight per plant and total yield fed^{-1}.

Iron plays a crucial role in plant and animal metabolism especially in oxidation–reduction reactions. The whole body of a healthy adult human contains 3-5 g of iron and about two third of its concentration in the blood. It is generally one of the most widely spread deficient element in dietary food. Karp et al. (2002) indicated that strawberry fruit quality increased with foliar Fe fertilization. In another study, amino acid chelated Fe applied to a pear cultivar as foliar spraying ameliorated Fe deficiency symptoms and increased total yield by 47% and Fe concentration of leaves by 120% (Koksal, *et al.,* 1999).

The objective of this study is to evaluate the response of eggplant to organic manure (chicken manure) basically applied individually at different rates and/or combined with foliar Fe fertilization at different plant growth stages, i.e., 30 and 60 days after transplanting in terms of plant growth, fruit yield, status of macronutrients plant content, and some biochemical components, as well as their effect on some soil properties.

MATERIALS AND METHODS

A field experiment was conducted during two successive summer seasons of 2007 and 2008, at Damas Mit-Ghmmer, Dakahlia Governorate, Egypt, to evaluate the response of eggplants to both poultry manure and ethylene diamine di-O-hydroxyphenylacetic acid (EDDHA) iron chelates (13%) as foliar spray, applied either individually or both in combination. As well as both fertilizers were tested for their effect on some soil properties. Both poultry manure and EDDHA were applied at different rates of 0, 15 and 30 m^3 and 0, 0.5 and 1 g/L, respectively. Foliar Fe fertilization at different plant

growth stages was conducted at periods of 30 and 60 days from transplanting.

The experimental soil was clayey in texture; some of its initial physical and chemical properties were determined according to the standard methods, outlined by Black (1965) and are presented in Table (1). Also, for poultry manure, total nitrogen was determined by Kjeldhal digestion method and available P, K and Fe, were determined by method given in (A.O.A.C., 1990) and organic matter was determined by the method of Walkley and Black (Black 1965) (Table 2).

Table (1): Initial physical and chemical properties of the soil used.

Soil property	Value
Clay (%)	51.6
Silt (%)	25.3
Sand (%)	23.1
pH (saturated paste)	7.90
EC_e (dS m^{-1})	0.79
OM (%)	1.88
Total $CaCO_3$ (%)	2.51
Total N (%)	0.05
Available P (mg kg^{-1})	7.25
Available K (mg kg^{-1})	531.0
Available Fe (mg kg^{-1})	25.1

Table (2): Chemical properties of poultry manure used in the experiment

Materials	Total N (%)	Total C (%)	C/N Ratio	pH (1:5 susp.)	EC (1:5) dSm^{-1}	Total (g kg^{-1})		
						P	K	Fe (mg kg-1)
Poultry manure	2.11	26.5	12.6	7.1	4.5	51	196	193

Seeds of eggplants (*Solanum melongena* L., *BLACK Beuty*) were sown in a nursery on Feb. 7 and 8 2007 and 2008, respectively. Eggplant seedlings were transplanted after 60 days after sowing. Seedlings were transplanted at 50 cm apart on one side of ridges, 80 cm wide and 3.5 m long. The area of each experimental replicate was 10 m^2, which contained 3 ridges. Complete factorial arrangements of treatments were replicated in a randomized complete block design. Thus, the plant population could be counted by about 9600 plants fed^{-1}. Mineral fertilization with nitrogen, phosphorus and potassium, in the forms ammonium nitrate(33.5%), calcium superphosphate (15% P_2O_5) and potassium sulfate (48%K_2O) were added at recommended

doses, i.e., 150 kg N/fed, 75 kg P_2O_5/fed., and 96 kg K_2O/fed. Nitrogen and potassium fertilizers were divided into two equal parts, the first was applied after two weeks of transplanting and the second was added four weeks later, but super phosphate was added as full dose during soil tillage. Data were recorded for the following growth parameters:

After 90 days of transplanting, a representative sample composed of 3 plants was taken at random from each plot to determine, plant height (cm), fresh and dry weights of leaves (g/plant). These samples were separated, oven dried at 70 ^{0}C till a constant dry weight, then the dry matter was calculated in g/plant and the dried parts were thoroughly ground and stored for chemical analysis.

Crop yield parameters: Number of fruits/plant, weight of fruits/plant and average of fruit weight were calculated in the representative samples taken from ten fruits, which represent the first harvest (90 days after transplanting) total yield was determined per plot and then mathematically converted to obtain the total yield fed^{-1}.

Chemical analysis: The dried fruit samples were ground and digested using a mixture of 1:1 (v/v) concentrated perchloric-sulfuric acids, according to Peterburgski (1968). Nitrogen, phosphorus, potassium and iron were determined in the digested fruit samples and their concentrations were determined as (%) on the basis of their dry matter. Different fruit nutrients were determined as follows: Total nitrogen was determined using micro-Kjeldahl technique and phosphorus was determined photometerically using spectrophotometer (A.O.A.C,1990). While, potassium was determined using flame photometer (Chapman and Pratt, 1961). Also, Fe was determined by a Perkin Elmer Atomic Absorption Spectroscope (Purvis and Peterson, 1956). Crude protein was determined by multiplying N% x 6.25 (A.O.A.C. 1990). Total carbohydrate and sugars were determined according to (A.O.A.C. 1990).

Soil analysis: The remained soil after eggplants harvesting (60 days of transplanting) were sampled from each treatment to determined some soil chemical and physical properties, i.e., N (%), soil reaction (pH), bulk density (g/cm^3) and total porosity (%) (Black,1965).

All obtained data were statistically analyzed as described by Sendecor and Cochran (1980).

RESULTS AND DISCUSSION

Plant growth parameters

Data in Table (3) represent the effect of poultry manure applied at different rates, either individually or combined with foliar Fe-EDDHA at two rates applied in two growths of eggplants seasons. Results indicated that application of poultry manure at two rates of 15 or 30 m^3 per fed. increased

plant height, fresh and dry weights of leaves when compared with the control treatment. High level of poultry manure recorded the highest values of the abovementioned parameters compared to the low level in the1st season. (the same trend was found in the second season). These results can be owed to that the application of poultry manure reduced soil bulk density, increased soil porosity, improved soil aggregation status and thus reduced infiltration rate and increased water retention. The favorable soil physical conditions were actually due to the incorporation of poultry manure into soil (Obi and Ebo, 1995, Akanni *et al.,* 2005).

Table (3): Plant height, fresh weight of leaves and dry weight of leaves of eggplants as affected by poultry manure applied individually or combined with iron spray in (90 days of transplanting) 2007 and 2008 seasons.

Treatments		Plant height (cm)		Fresh weight of leaves (g/plant)		Dry weight of leaves (g/plant)	
Poultry manure Rate (m^3 fed^{-1})	Fe rate (gl^{-1})	2007	2008	2007	2008	2007	2008
0	Fe0	76.1	78.4	302,0	315.0	52,1	53,0
	Fe1	77.2	79.2	323,0	331.0	53,1	54,4
	Fe2	79.5	80.2	332,0	341.0	54,8	55,6
Mean		77.6	79.3	319.0	329.0	53.3	54.3
15	Fe0	88.6	90.4	351,0	362.0	56,1	57,8
	Fe1	90.5	92.3	366,0	375.0	57,3	59,2
	Fe2	92.3	94.2	378,0	388,0	58,6	60,6
Mean		90.5	92.3	365.0	375.0	57.3	59.2
30	Fe0	94.3	95.5	383,0	395,0	61,8	62,1
	Fe1	96.5	97.8	396,0	403,0	62,4	63,2
	Fe2	98.6	100.5	415,0	424,0	63,5	64,5
Mean		96.5	97.9	398.0	407.0	62.5	63.2
L.S.D. at 0 .05		1.820	2.110	5.130	7.480	N.S	N.S

Under foliar application of Fe the growth parameters of eggplants also increased with increasing the applied rate of Fe, as compared with the lower rate and the control treatment. Results also, revealed that can application of Fe with poultry manure at both rates resulted in highly significant increases in some growth parameters of such plants, compared to the control treatment in both cultivation seasons. This may be due to that both poultry

manure and Fe enhanced photosynthesis and metabolism and thus improving the vegetative growth. Also, poultry manure was more effective to provide nutrients to the eggplants because of its high content of such elements.

Data presented in Table (4) indicate that in relation to addition of poultry manure at different rates or foliar Fe at two rates and their interaction significantly influenced the, No. of fruits /plant, weight of fruits /plant, average weight of fruits and total fruit yield (ton /fed).

Table (4) Number, weight, average of fruit weight and total yield of eggplants (ton/fed^{-1}) as affected by poultry manure applied individually or combined with iron spray
At harvest (160 days of transplanting) in 2007 and 2008 seasons.

Treatments		No. of fruits /plant		Weight of fruits /plant		Average weight of fruit (g/plant)		Total yield (ton/fed.)	
Poultry manure Rate (m^3 fed^{-1})	Fe at rate of (gl^{-1})	2007	2008	2007	2008	2007	2008	2007	200
0	Fe0	9,1	9,6	2,00	2,13	220,0	222.0	19,2	20,
	Fe1	11,1	11,6	2,53	2,73	228,0	235,.0	24,3	26,
	Fe2	12,0	12,5	2,87	3,03	239,0	242.0	27,5	29,
Mean		10.73	11.23	2.46	2.63	229.0	229.66	23.66	25.2
15	Fe0	11,8	12,2	2,90	3,23	246,0	265.0	27,8	31,
	Fe1	13,0	13,5	3,50	3,73	269,0	277.0	33,6	35,
	Fe2	14,1	14,5	3,97	4,27	281,0	294.0	38,1	40,
Mean		12.97	13.4	3.45	3.74	274.33	265.33	33.16	35.
30	Fe0	14,4	15,1	4,10	4,50	285,0	298.0	39,4	43,
	Fe1	16,1	16,3	4,73	5,07	294,0	311.0	45,5	48,
	Fe2	17,3	17,6	5,43	5,73	314,0	326.0	52,1	55,
Mean		15.93	16.33	4.75	5.10	297.66	297.66	45.66	48.9
L.S.D. at 0 .05		0.880	1.110	0.560	0.670	4.650	4.900	5.080	7.34

Data also revealed that the plants receiving foliar Fe increased the values of No. of fruits /plant, weight of fruits /plant, average weight of fruits g/plant and total fruit yield (ton/fed.) from (9.1 & 9.6), (2.00 & 2.13), (220 & 222) and (19.2 & 20.5) in the first season and second seasons, respectively, for the control treatments, to (11.1 & 11.6) and (12.0 & 12.5), (2.53 & 2.73) and (2.87 & 3.03), (228 & 228) and (239&239) and (24.3 &26.2), (27.5&29.1),respectively, (i.e. by about (21.97% & 20.83%), (31.86% & 30.20%) & (26.5% & 28.16%), (39.00% & 42.25 %) , (3.63% & 2.70%) & (8.63% & 7.65%) and (26.56 &27.80%) & (43.22% & 41.95%) for plants receiving Fe1 and Fe2 in absence of poultry

manure, respectively. These results may be due to the effect of iron on photosynthesis, oxidation-reduction and respiration processes. These results support those of Hellal et al. (2006) who found that iron application generally increased N-uptake, NO3 content and chlorophyll of maize leaves.

When poultry manure was applied at rates of 15 and 30 m^3 fed^{-1} without addition of Fe, values of No. of fruits /plant, weight of fruits /plant, average weight of fruits (g/plant) and total fruit yield (ton/fed.) increased by about (29.67% & 27.08%) and (58.24% & 57.29%) in the first and second seasons, respectively. Organic fertilizer, such as poultry manure, releases various nutrients into available forms for absorption of the growing plants. Also, utilization of poultry manure accelerates the plant growth and increases the numbers of soil microorganisms that excrete growth promoting substances. That is why vegetables grew better at a later growth stages and gave higher yields. (Levy and Taylor, 2003; Xu et al., 2003; Walker and Bernal, 2004).

Considering the interaction between poultry manure and Fe, data in Table (4) revealed that, the highest values of No. of fruits /plant, weight of fruits /plant, average weight of fruits (g/plant) and total yield in both seasons were obtained by 30 m^{-3}/fed poultry manure + Fe2, while, the lowest ones were recorded for 15 m^3/fed+Fe0 and control treatment.

Concentrations of N, P, K and Fe in the eggplant fruits

Data in Table (5) revealed that the concentrations of N, P, K and Fe in the fruits of eggplants increased significantly, due to all treatments applied, when compared to the control treatment during either seasons.

Data in Table (5) indicated that foliar application of Fe increased the concentrations of N, P, K and Fe in the fruits of eggplants. The mean percentage of increases due to application of both Fe1 and Fe2 in absence of poultry manure in both seasons were (1.730 & 1.753%), (0.181& 0.186%), (1.638 & 1.671%) and (6.99&7.07 mg Fe/100 g dry matter) in the first and second seasons, respectively.

Data in Table (5) revealed that N,P,K and Fe concentrations in eggplants fruits increased with increasing the rate of poultry manure application in both seasons. However, they increased by about (16.93& 16.19%), (28.99 & 31.63%), (16.36& 9.69%) and (5.41 & 5.51%) for the plants receiving 15 m^3 fed^{-1} in the first and second seasons, respectively.

Table (5) Nitogen, phosphorus, potassium and iron content in fruits of egg plants as affected by poultry manure applied individually or combined with iron spray

in 2007 and 2008 seasons.

Treatments		N (%)		P (%)		K (%)		Fe (mg/1 dry matt	
Poultry manure Rate (m^3 fed^{-1})	Fe at rate of (gl^{-1})	2007	2008	2007	2008	2007	2008	2007	2
0	Fe0	1,618	1,636	0,169	0,177	1,619	1,651	5,910	5
	Fe1	1,751	1,785	0,180	0,185	1,641	1,675	7,050	7
	Fe2	1,821	1,838	0,196	0,198	1,654	1,688	8,030	8
Mean		1.730	1.753	0.181	0.186	1.638	1.671	6.99	7
15	Fe0	1,892	1,901	0,218	0,223	1,884	1,881	6,230	6
	Fe1	1,942	1,951	0,227	0,234	1,875	1,911	7,510	7
	Fe2	1,976	1,996	0,239	0,246	1,898	1,933	8,420	8
Mean		1.936	1.949	0.228	0.232	1.885	1.885	7.386	7.
30	Fe0	2,201	2,215	0,258	0,264	2,043	2,075	6,630	6
	Fe1	2,322	2,338	0,269	0,273	2,115	2,136	7,810	7
	Fe2	2.388	2,414	0,275	0,282	2,131	2,153	8,870	8
Mean		2.467	2.322	0.267	0.267	2.096	2.121	7.770	7.
L.S.D. at 0.05		0.053	NS	NS	NS	0.045	0.031	0.423	0

The corresponding percentages of increases for the rate of 30 m^3 fed^{-1} of poultry manure were (36.58 & 35.39%), (52.66 & 45.76%), (26.18 & 25.68%) and (12.18 & 12.54%), for the first and second seasons, respectively. These results may be attributable to the rich composition of poultry manure containing nutrients and other beneficial substances, which via decomposition in soil led to increase N, P, K and Fe contents in the eggplant fruits. This confirms the results of Alice, 2008, who reported that over the short term, chicken manure improved the total nitrogen, phosphorus and potassium contents of the soil, but over the long term, it seemed that compost and kraal manure influenced the soil properties more.

Interaction of poultry manure and Fe on N, P, K and Fe concentrations in the fruits of eggplants is shown in Table (5). Generally, the highest percentages of N, P, K and Fe concentrations in the eggplant fruits occurred by the poultry manure applied at the rate of 30 m^3 fed^{-1} combined with Fe2 or Fe1. The highest increment percentages were (77.99 & 47.55%), (62.72& 55.36%), (29.46&32.10%) and (31.47&31.48%), due to application of poultry manure at the rate of 30 m^3 fed^{-1} combined with Fe2 in the first and second seasons, respectively.

Biochemical constituents:

Data presented in Table (6) revealed that all applied treatments caused significant increases in contents of reducing, non-reducing and total sugars and protein, as compared with the control treatment, in both seasons.

Table (6) Reducing, non-reducing and total sugars and protein content in the fruits of egg plants as affected by poultry manure individually or combined with iron spray in 2007 and 2008 seasons.

Treatments		Sugars g/100g dry matter						Protein	
Poultry manure Rate (m^3 fed^{-1})	Fe at rate of (gl^{-1})	Reducing		Non-reducing		Total sugars		(g/100g dry matter)	
		2007	2008	2007	2008	2007	2008	2007	2008
0	Fe0	2,57	2,63	9,86	9,94	12,43	12,57	10,11	10,2
	Fe1	2,73	2,85	10,14	10,27	12,87	13,12	10,94	11,1
	Fe2	3,13	3,21	10,45	10,58	13,58	13,79	11,38	11,4
Mean		2.81	2.89	10.15	10.26	12.96	13.16	10.81	10.96
15	Fe0	3,25	3,42	11,18	11,34	14,43	14,76	11,83	11,8
	Fe1	3,51	3,73	11,46	11,69	14,97	15,42	12,14	12,1
	Fe2	3,73	3,95	11,94	11,93	15,67	15,88	12,35	12,4
Mean		3.49	3.69	11.52	11.65	15.02	15.35	12.10	12.18
30	Fe0	3,91	4,04	12,09	12,32	16,00	16,36	13,76	13,8
	Fe1	4,25	4,28	12,38	12,57	16,63	16,85	14,51	14,6
	Fe2	4,59	4,73	12,96	12,78	17,28	17,51	14,93	15,0
Mean		4.25	4.35	12.47	12.55	16.63	16.90	14.40	14.5
L.S.D. at 0.05		0.873	0.670	0.352	0.311	0.712	0.556	0.923	0.98

Also, data revealed that the addition of poultry manure either individually or in combination with Fe resulted in a positively significant effect on the contents of reducing, non-reducing and total sugars and protein in both growth seasons.

In this regard, the foliar application of Fe at its higher rate (Fe2) combined with the poultry manure at its higher level resulted in highest increments in the contents of reducing, non-reducing and total sugars and protein of eggplant fruits in both seasons. Tukey and Marczynski (1984) reported that a combined application of both poultry manure and foliar fertilization should be recommended in plant production to increase both

plant productivity and yield quality. Iron foliar application to Fe-deficient fruit crops such as pear, peach, apple, mango and almond increased leaf chlorophyll concentration and improving fruit yield and quality (Alvarez-Fernandez et al., 2006).

Effect of poultry manure on some chemical and physical properties of the experimental soil:

Data of Table (7) indicated that total nitrogen percent in soil treated with poultry manure was higher, compared to the unmanured soil. This may be due to the slow release of nitrogen from the poultry manure. For soil pH, there were no significant differences amongst the tested treatments (Table 7). This could be due to the fact that soil experimental site had a relatively high buffering capacity. These results confirm those of Abu-Zahra and Tahboub (2008), who noted that at the end of experiment, treatments of organic matter had no significant effect on soil pH. In the present work, the lowest mean pH value (7.83) was obtained by the addition of the poultry manure at higher rate of manure. These results may be attributed to organic acids produced during poultry manure decomposition.

Table (7): Effect of poultry manure individually or combined with iron spry on total N, pH, bulk density and total porosity of soil after harvest of eggplant (means of two seasons).

Treatments		N (%)	pH value	Bulk density ($g/cm^{3)}$	Total porosity (%)
Poultry manure Rate (m^3 fed^{-1})	Fe at rate of (gl^{-1})				
0	Fe0	0.161	7.96	1.32	50.2
	Fe1	0.161	7.96	1.32	50.2
	Fe2	0.162	7.96	1.32	50.2
Mean		0.161	7.96	1.32	50.2
15	Fe0	0.194	7.91	1.27	52.1
	Fe1	0.194	7.91	1.27	52.1
	Fe2	0.195	7.91	1.27	52.1
Mean		0.194	7.91	1.27	52.1
30	Fe0	0.228	7.84	1.21	54.3
	Fe1	0.231	7.84	1.21	54.3
	Fe2	0.231	7.83	1.21	54.3
Mean		0.233	7.83	1.21	54.3
L.S.D. at 0.05		0.053	NS	NS	0.13

Bulk density of the soil significantly decreased with increasing the poultry manure rates, compared to the control treatment (Table 7). These results indicated that such physical property of the soil was improved due to the homogeneous distribution of manure constituents within the soil particles and also production of a number of cementing materials, through decomposition of the manure, that can bind the soil particles and formation soil aggregates. (Kohnke,1982).

Data in Table (7) revealed that application of poultry manure increased soil porosity. Aggelides and Londra (2000) stated that the manure application considerably improved soil physical properties by increasing total porosity and changing distribution of soil pore sizes in loamy and clay textured soils. Marinari et al. (2000) also found that total soil porosity increased due the application of organic fertilizers and compost, depending on the amount of materials applied.

CONCLUSION

Application of poultry manure at its two levels to the clay loam soil led to a positive effect on some physico-chemical properties, such as total N, pH bulk density and total porosity. Meanwhile, poultry manure soil application when combined with foliar augmented the values of some growth parameters of eggplants, i.e., yield of fruits and the contents of some biochemical constituents such as reducing, non-reducing and total sugars and protein in the fruits of such vegetables crop.

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تأثير اضافة كلا من مخلفات الدواجن الى التربة و الحديد رشا على نباتات الباذنجان و بعض خواص التربه

سمير فتوح الفقى-علىمحمد مسعود- محمد سعيد عواد

معهد بحوث الأراضى والمياه والبيئة – مركز البحوث الزراعية – الجيزة - مصر

الملخص

أجريت تجربة حقلية بقرية دماص مركز ميت غمر بمحافظة الدقهلية ، خلال موسمين متتاليين هما ٢٠٠٧ و٢٠٠٨، لدراسة تاثير اضافة مخلفات الدواجن بثلاث معدلات مختلفة (٠، ١٥ ، ٣٠ م-^{3} للفدان) الى التربة كمادة عضوية اما منفرده أو بمصاحبة الرش بالحديد بثلاث معدلات (Fe0 ، Fe1، Fe2) على بعض خواص التربة و نموو انتاج محصول الباذنجان و محتوى الاوراق و الثمار من بعض العناصر(N, P, K, Fe) و ايضا على محتوى الثمار لبعض المكونات البيوكيميانيه (السكريات المختزلة و الغير مختزلة و الكلية و البروتين) .

أشارت النتائج الى أن اضافة مخلفات الدواجن أدى الى تغيرات معنويه فى بعض خواص التربة، فقد حدث زيادة فى النيتروجين الكلى فى التربة و أيضا المسامية الكلية. كما ادت الى نقص فى الكثافة الظاهرية و رقم الحموضة (pH) .
و ايضا ادت اضافة مخلفات الدواجن منفردة الى زيادة معنوية فى بعض قياسات النمو مثل طول النبات و الوزن الطازج للاوراق و الجاف و كانت هذه الزياده اكثر تأثيرا عند اضافة مخلفات الدواجن بمصاحبه الرش بالحديد على النبات.
و كذلك حدثت زيادة فى عدد ووزن الثمار ومتوسط وزن الثمار لكل نبات و المحصول الكلى لثمار الباذنجان بزيادة معدل الاضافة من مخلفات الدواجن و اضافه الحديد رشا على النباتات الى زيادة اكثر معنويه.
أدت اضافة مخلفات الدواجن سواء كانت منفرده او مصاحبة للرش بالحديد الى تحسن و زيادة فى محتوى الاوراق و الثمار من بعض العناصر مثل (N, P, K, Fe) و أيضا السكريات المختزلة و الغير مختزلة و السكريات الكلية و البروتين الكلى بالمقارنة بالكنترول.
و لذلك توصى هذه الدراسة باستخدام مخلفات الدواجن بعدل ٣٠ م-^{٣} للفدان مع اضافة الحديد رشا بمعدل (١جم/لتر) لانتاج محصول من الباذنجان عالى الانتاجيه و الجودة.