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EFFECT OF CHEMICALFERTILIZER, POULTRY MANURE AND BIOFERTILIZER ON GROWTH, YIELD AND CHEMICAL CONTENTS OF TOMATO PLANTS.

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ABSTRACT

Two field experiments were carried out during the two successive seasons of 2005 and 2006 at Banha (Qalubia Governorate) to study the effect of rates of poultry manure and chemical nitrogen fertilizer with or without Biofertilizer " Nitrobin " at rates of 500 g./fed. on growth, yield, quality and chemical contents of tomato plants cv. Gs 12. Obtained data showed that using 50 % poultry manure + 50 % mineral fertilizer or 25 % poultry manure + 75 % mineral fertilizer increasing significantly all vegetative growth characteristics (plant length, number of leaves / plant and number of shoots / plants) in the two seasons of study. The highest yield and fruit quality (fruit length, fruit diameter, fruit weight and T.S.S) was found by 25 % poultry manure + 75 % nitrogen mineral fertilizer or 50 % poultry manure + 50 % mineral fertilizer. Using biofertilizer (Nitrobin) increased significantly the vegetative growth characters (plant length, number of leaves and shoots/ plant). Also,using biofertilizer increased significantly the total yield and quality of tomato fruits.
Key words: Tomato, Biofertilizer, Poultry manure, Growth, Yield, Chemical contents.

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is one of the most important vegetable crops cultivated in Egypt. Organic manure such as poultry manure improve the behaviors of several elements in soils through that active groups (fluvic and humic acids) which have the ability to retain the elements in complex and chelate forms and consequently improve the plant growth, yield both qualitatively and quantitavely. However, poultry manure has a height improve directly growth and yield of tomato plants. Organic fertilizers is very important for providing the plants with their nutritional requirements without having any undesirable impacts on the environment. Salem (1986) indicated that organic fertilizers improved the chemical properties and nutritional salutes of the soil, which may be due to decreasing soil pH which lead to solubilitization of nutrients and increases nutrient availability and supply. Also, Mervat and Dahdoh (1995) reported that, the addition of organic manure improved the biological properties of the soil by increasing the populations and activities of micro-organisms in the soil.

The effect of organic manure depend on its source which differed its characteristics such as C/N ratio and available macro and micro nutrients as reported by Mizur and Wojtas (1984).Organic manure such as poultry manure is a good source of nutrients and contains both macro and micro nutrients essential for plant growth as reported by Jeft Cox (1994) and El-Sheikh and Salama (1997).

The bio-fertilizer have great amounts of symbiotic and non – symbiotic bacteria, which are responsible for fixation of N by following of N merits , which reported by Subba – Ruo (1988).

Nitrogen is considered the first essential nutrient elements for both plants and microorganisms, respectively. In spite of the considerable addition of Nitrobin (biofettilizer).

Nitrobin has amounts of symbiotic and non symbiotic bacteria responsible for atmospheric nitrogen fixation. Its application reduces required mineral nitrogen by 25%, increases the availability of various nutrients, enhances the resistance of plants to root disease and reduces the environmental pollution from chemical fertilizer application (Rizk and Shafeek 2000).

Biological fertilization of plants by N2 – Fixing bacteria gained importance in the last years. This methods of fertilization aims to minimize the environmental pollution of mineral fertilizers and decreases coasts. The effect of inoculation of plants with such bacteria on plant yield and productive was studied by (El-Metualy 1998).

Many investigators studied the effect of organic, mineral and bio-fertilization on growth, yield and quality of tomato plants Ibrahime *et al* (1987), Abo- El- Defan (1990), Warman (1990)Togum and Akanbi (2003) and Toor *et al* (2006). Warman (1990) found that addition of chicken manure increased the total yield of tomato plants.

MATERIAL AND METHODS

Two field experiments were carried out during the two successive seasons of 2004 and 2005 at Banha, Qalubia Governorate, to investigate the effect of rates of poultry manure and chemical nitrogen fertilizer with or without Biofertilizer (Nitrobin) on growth, yield, quality and chemical contents of tomato plants c.v Gs12.

Nitrobin is a biofertilizer produced by the Egyptian Ministry of Agriculture and containing active bacteria (Azotobacter sp. and Azospirillum sp.) Capable nitrogen fixating). Nitrobin was used at rate of 500 g/fed. The treatments used in this experiments as follows

1- 100% mineral fertilizer.
2- 100 % organic manure " poultry manure"
3- 75 % organic manure + 25 % mineral fertilizer.
4- 50 % poultry manure + 50 % mineral fertilizer.
5- 25 % poultry manure + 75 % mineral fertilizer.

The recommended dose for tomato plants is 120 N units / fed. Seeds of Gs12 were sown in foam try field with growing media of 1 peat: 1 vermiculite and transplanted into field on 15 th April in the two seasons.

The physical and chemical properties of the experimental soil and poultry manure are presented in Table (1)

Table (1): Chemical analysis of the experimental soil and poultry manure.

Characters	2005		2006	
	Soil	Poultry manure	Soil	Poultry manure
PH	7.85	7.77	7.89	7.62
E.c (m.mohs)	1.55	1.05	1.46	1.07
Nitrogen %	0.15	2.64	0.22	2.36
Phosphorus %	0.06	1.65	0.10	1.32
Potassium %	0.14	2.17	0.11	2.09
Fe ppm	5844	2744	5133	2610
Zn ppm	378	284	366	301
Mn ppm	892	343	765	310
Cu ppm	40	1.5	37	1.4
Pb ppm	41.5	110	39.5	108

The design of the experiments was split – plot with four replicates, where the poultry manure and chemical fertilizer rates were distributed in the main plots and the biofertilizer treatments were arranged in the sub – plots. The plot area was 11.2 m^2 included 4 ridges, each with 70 cm. width and 4.0 m. long.

The normal agricultural treatments of the growing tomato were practiced as usually followed in the commercial production of tomato. Poultry manure was added before sowing and the Nitrobin biofertilizer at rates of 500 g./fed. was added under the plants, 15 day after sowing.

During the vegetative growth period, samples of four plants were taken at 80 days after sowing and the plant length, number of leaves and shoots per plant, fresh and dry weight of leaves, stems and roots were recorded.

Tomato fruits were harvested every week. At harvest time the fruit length (cm) fruit diameter (cm), average fruit weight (g) and total weight of fruits in each experimental plots were recorded and the total yield as ton/fed. was accounted.

Samples of leaves and fruits were dried at 70 ºC, then five grounded and wet digested. Total nitrogen concentration in the tissues of plant leaves and fruits were determined according to the methods described by Jackson (1958). The Fe , Zn , Mn , Cu and Pb contents as ppm were determined in dry leaves and fruits using Atomic Absorption Spectrophotometer, according to Jackson (1967).

All the obtained data were subjected to statistical analysis of variance according to the producer outlined by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Vegetative growth characteristics:-

Effect of source and rates of N fertilizer:-

Data in Table (2) show clearly that, using 50% poultry manure + 50% mineral fertilizer or 25% poultry manure + 75% mineral fertilizer increasing significantly all vegetative growth characteristics (plant length, number of leaves /plant and number of shoots /plants) in the two seasons of study. On

the contrary, the lowest vegetative growth was found by using100 % mineral except for number of shoots / plant. The lowest value was recorded by using 75% poultry manure + 25% mineral fertilizer. These results were true and similar in the two seasons.

Table (2): Effect of fertilizer rates and nitrobin on vegetative growth of tomato plants cv. GS12 during 2005 and 2006 seasons.

Treatments		2005						2006					
		Plant length (cm)	No. of leaves /plant	No. of shoots /plant	Fresh weight			Plant length (cm)	No. of leaves /plant	No. of shoots /plant	Fresh weight		
					Leaves (g)	Stems (g)	Roots (g)				Leaves (g)	Stems (g)	Roots (g)
Fertilizers													
100%Mineral		41.00	43.83	7.00	46.87	40.39	6.42	39.50	38.17	6.83	41.94	46.77	5.89
100% Organic		42.00	41.84	7.17	46.18	34.71	6.80	40.50	42.17	5.84	31.29	44.93	6.32
75%organic +25%mineral		41.58	34.17	5.85	38.43	41.86	5.81	44.83	34.33	5.84	47.83	51.02	7.28
50%organic +50%mineral		44.17	44.17	6.83	56.71	53.39	6.13	50.00	40.67	6.84	45.06	54.48	8.30
25%organic +75%mineral		47.33	36.17	7.17	45.44	50.07	7.03	49.17	34.50	6.33	39.24	50.86	7.75
LSD at 5%		2.43	3.59	1.98	NS	4.00	0.38	4.69	319	0.52	7.16	NS	1.86
Nitroben													
0 (Check)		40.57	38.00	6.27	41.26	41.56	5.76	42.47	36.07	5.60	38.06	45.21	6.09
500 g/fed.		45.87	42.00	7.33	52.19	47.41	7.12	47.53	39.87	7.07	44.09	54.01	8.13
LSD at 5%		2.05	1.65	NS	10.32	3.22	1.66	3.29	3.17	0.69	3.03	5.09	1.33
Interaction													
100% Mineral	0 (Check)	40.67	40.33	6.67	45.99	38.31	6.01	38.00	36.33	6.00	38.35	42.17	5.51
	500 g/fed.	41.33	47.33	7.33	47.75	42.48	6.83	41.00	40.00	7.67	45.53	51.37	6.28
100% Organic	0 (Check)	41.00	39.00	6.67	37.08	31.76	5.60	41.00	40.67	5.00	29.55	42.48	4.84
	500 g/fed.	43.00	44.67	7.67	55.27	41.65	7.99	42.00	43.67	6.67	33.03	47.37	7.80
75% organic +25% mineral	0 (Check)	37.17	34.00	4.33	30.27	38.91	5.67	37.67	31.00	5.67	43.83	46.71	6.12
	500 g/fed.	46.00	34.33	7.33	46.59	44.81	5.94	52.00	37.67	6.00	51.82	55.33	8.45
50% organic +50% mineral	0 (Check)	40.00	42.00	6.67	54.16	49.95	6.13	49.00	39.00	6.00	40.32	45.85	6.82
	500 g/fed.	48.33	46.33	7.00	59.27	56.82	6.13	51.00	42.33	7.67	49.80	63.11	9.77
25% organic +75% mineral	0 Check)	44.00	34.67	7.00	38.82	48.86	5.37	46.67	33.33	5.33	38.23	48.85	7.16
	500g/fed.	50.67	37.33	7.33	52.06	51.27	8.69	51.67	35.67	7.33	40.25	52.87	8.33
LSD at 5%		NS	NS	NS	NS	NS	NS	NS	2.10	1.54	NS	NS	NS

It could be concluded that, the increases in plant growth obtained by poultry manure might be due to the improvement of physical and chemical properties of soil (Abdel Salam *et al* 1988), which affects soil fertility and play an important role in nutrient availability and increases in nutrient availability and increases in nutrients uptake. Moreover, the supplied organic manure amended the microorganisms with necessary nutrients elements and increased the microbial respiration and CO_2 output. Furthermore, the slow released nutrients from organic manure afforest abundant balanced soil solution. Consequently, root system absorb more nutrients in these favorable condition. Slow release of nutrients might favorers metabolic activity in the plant tissues. These favorable conditions allow plants to grow better and more assimilation would be stored. The favorable effect of organic manure

beside mineral fertilizer on the vegetative growth of tomato plants was in agreement with that obtained by Heeb *et al* (2005) and Hu and Barker (2004) of tomato plants.

Effect of biofertilizer :-

Data in Table (2) obviously showed that, using biofertilizer (Nitrobin) increased significantly the vegetative growth characters (plant length , number of leaves and shoots/ plant) except for number of shoots / plant in the first season failed to reach the 5% level of significance. These findings were similar and true in both seasons.

The superiority of using the biofertilizer (Nitrobin) compared to control (without biofertilizer) may be due to the release of the fixing nitrogen, hence increasing the concentration and availability of N in the root zone. Nitrogen enhances protein synthesis, division and enlargement of cells as well as it is important for the photosynthetic processes. Thus, an increase in plant growth and its development was obtained. This results are agree with those obtained by Abdalla *et al* (2001) on pepper plants.

Effect of the interaction :-

The interaction between poultry manure and nitrogen chemical fertilizer as well as biofertilizer had no significant effect on vegetative growth characteristics except for number of leaves /plant in the second season (Table 2). However, the highest plant length of tomato plant was found by using 25% poultry manure + 75% mineral plus biofertilizer in the first season and by 75% poultry manure + 25% mineral fertilizer by biofertilizer in the second one. Moreover, the highest leaves number was found by 100% mineral fertilizer with biofertilizer in the first season and by 100% poultry manure with biofertilizer in the second season. Using this treatment give the highest amount of shoots number /plant in the first season and by 100% mineral fertilizer with biofertilizer or by using 50% poultry manure + 50% mineral fertilizer plus biofertilizer in the second one. On the other hand, the lowest values of vegetative growth was found by using 75% poultry manure + 25% mineral fertilizer without using biofertilizer except for shoots number /plant, the lowest values when using 100% poultry manure without using biofertilizer.

Fresh weight of tomato plants :-

Effect of source and rates of N fertilizer :-

Data in Table (2) reported that, using 75% poultry manure + 25% mineral fertilizer increasing significantly fresh weight of tomato plants in the two seasons of study except for fresh weight of leaves in the first season and fresh weight of stems in the second one. Moreover, the highest values of fresh weight of tomato plants organs (leaves, stems and roots) was recorded by using treatment of 75% poultry manure + 25% mineral fertilizer except for the fresh weight of roots in the first season, the highest value was found by 25% poultry manure + 75% mineral fertilizer. On the contrary, the lowest value was found by using 100% mineral fertilizer or 100% poultry manure in the both seasons. It could be observed that, the poultry manure caused a slight increase fresh weight of tomato organs. This observation might be

attributed much to the superiority in the plant growth characters. These results were coincided with those reported by Togun and Akanbi 2003 .

Effect of biofertilizer:-

Results in Table (2) show that, using biofertilizer increased significantly all fresh weight of tomato organs (leaves, stems and roots). This picture was clearly manifest in both seasons. These results were coincided with those reported by Awad and Khalil (2003) of squash plants and Abdallah *et al* (2004).

Effect of the interaction :-

Results in Table (2) revealed that the interaction between poultry manure and nitrogen fertilizer levels plus biofertrilizer had not a significant effect on the fresh weigh of tomato organs (leaves, shoots and roots) in the two seasons of study. These results were true and similar in the two seasons. These results indicate that, each factor of the treatments act independently.

Yield and its quality:-

Effect of source and rates of N fertilizer:-

The results reported in Table (3) demonstrate clearly that, using poultry and nitrogen chemical fertilizer increasing significantly total yield of tomato and all quality of tomato fruits except for T.S.S in the first season and fruit length in the second one. The highest yield and fruit quality (fruit length, fruit diameter, fruit weight and TSS) was found by 75% poultry manure + 25% nitrogen mineral fertilizer. These results were true in the two seasons. Meanwhile, the lowest total yield and fruit quality of tomato fruits were recorded by using 100% mineral fertilizer or 100% poultry manure. The increase in the total yield and good quality of tomato fruits resulting by poultry manure may be attributed to that organic manure enhanced soil aggregation, soil aeration and increasing water holding capacity and offers good environmental conditions for the root system of tomatoes. In addition, organic manures are slow release nutrients allover the growth season. Poultry manure is rich in its nitrogen and nutrients content. These favorable conditions creates better nutrients absorption and favors the growth and development of root system which in true reflects better vegetative growth, photosynthetic activity and dry matter accumulation. Consequently higher total yield would be obtained by poultry manure. The reports recorded other investigators such as Togum and Akanbi (2003) and Toor *et al* (2006) of tomato plants.

Effect of biofertilizer :-

Data presented in Table (3) indicated that, using biofertilizer increased significantly the total yield and quality of tomato fruits. These results were similar and true in the two seasons of study. The highest total yield with biofertilizer was 20.0 and 23.88 ton/fed. in the first and second seasons compared with 19.10 and 23.48 ton/fed. without biofertilizer in the first and second seasons, respectively.

Table (3): Effect of fertilizer rates and nitrobin on dry weight and fruit quality of tomato plants cv. GS12 during 2005and2006 seasons.

Treatments	2005								2006							
	Dry weight			Fruit	Fruit	Fruit		Total	Dry weight			Fruit	Fruit	Fruit		Total
	Leaves (g)	Stems (g)	Roots (g)	length (cm))	diameter (cm)	weight (g)	T.S.S.	yield ton/fed.	Leaves (g)	Stems (g)	Roots (g)	length (cm))	diameter (cm)	weight (g)	T.S.S.	yield ton/fed.
Fertilizers																
100%Mineral	13.55	5.68	2.38	4.17	4.60	46.40	4.43	22.90	12.52	3.55	2.38	4.58	4.32	44.07	4.62	18.40
100% Organic	13.45	5.80	2.87	3.55	3.63	35.58	4.65	21.85	13.23	3.93	2.87	3.13	4.75	52.32	4.75	17.85
75%organic +25%mineral	10.99	5.49	2.20	4.22	4.33	43.33	5.82	24.45	12.25	4.83	3.35	4.78	4.23	41.42	5.88	20.10
50%organic +50%mineral	12.08	7.19	2.02	4.42	4.58	46.13	5.00	24.25	12.23	6.07	3.42	4.98	4.13	48.35	4.67	19.60
25%organic +75%mineral	12.37	9.56	3.91	4.13	4.80	45.73	5.08	24.15	12.92	6.48	3.67	4.35	4.98	42.62	5.75	19.25
LSD at 5%	1.04	1.96	0.72	0.46	0.32	5.77	NS	1.07	0.37	1.36	0.77	NS	0.45	3.85	0.61	1.21
Nitroben																
0 (Check)	11.24	5.94	2.06	3.97	4.13	38.75	4.69	23.48	11.19	4.22	2.58	4.10	4.13	41.48	4.85	19.10
500 g/fed.	13.73	7.54	3.29	4.23	4.69	48.12	5.30	23.88	14.06	5.72	3.70	4.62	4.84	50.03	5.44	20.00
LSD at 5%	1.31	1.07	0.89	NS	0.27	5.09	0.45	0.22	1.84	0.71	0.65	0.40	0.25	5.58	0.36	0.19
Interaction																
100% Mineral **0 (Check)**	12.66	4.49	1.73	4.13	4.27	40.63	4.37	23.90	11.17	3.19	2.42	4.33	4.00	39.60	4.40	18.70
100% Mineral **500 g/fed.**	14.43	6.87	3.03	4.20	4.93	52.17	4.50	24.40	13.87	3.90	2.34	4.83	4.63	48.53	4.83	19.80
100% Organic **0 (Check)**	11.02	5.02	2.55	3.37	3.13	34.60	4.43	21.40	11.41	4.14	2.34	3.13	4.40	48.70	4.50	16.60
100% Organic **500 g/fed.**	15.88	6.57	3.19	3.73	4.13	36.57	4.87	21.90	15.05	3.72	3.39	3.13	5.10	55.93	5.00	18.10
75% organic **0 (Check)**	9.19	4.96	1.57	4.03	4.00	35.07	5.50	24.40	11.20	3.78	2.44	4.33	4.07	33.97	5.67	19.40
+25% mineral **500 g/fed.**	12.79	6.01	2.82	4.40	4.67	51.60	6.13	24.40	13.30	5.88	4.27	5.23	4.40	48.87	6.20	20.60
50% organic **0 (Check)**	11.78	6.41	1.64	4.33	4.67	43.50	4.67	23.60	10.63	4.81	2.41	4.63	3.63	48.47	4.17	20.40
+50% mineral **500 g/fed.**	12.38	7.97	2.39	4.50	4.70	48.77	5.33	23.90	13.82	7.33	4.42	5.33	4.63	48.23	5.17	20.70
25% organic **0 (Check)**	11.57	8.84	2.79	3.97	4.60	39.97	4.50	24.10	11.56	5.16	3.27	4.10	4.53	36.67	5.50	19.40
+75% mineral **500 g/fed.**	13.17	10.27	5.03	4.30	5.00	51.50	5.67	24.80	14.28	7.79	4.07	4.60	5.43	48.57	6.00	20.80
LSD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	4.12	1.57	NS	NS	NS	NS	NS	NS

The obtained results are in good accordance with those which were reported by Wang (1998) and Abd El- Hafeze and Shehata (2001).

Effect of the interaction:-

Results in Table (3) found that the interaction between organic and mineral fertilizer as well as biofertilizer had not a significant effect on the total yield and fruit quality of tomato fruits in the two seasons of study. These results were true and similar indicate that, each factor of the treatments act independently.

Nitrogen content :-

Effect of source and rates on nitrogen fertilizer

Data in Table (4 and 5) show clearly that, using nitrogen fertilizer as a chemical fertilizer or a poultry manure source significantly increased nitrogen % in tomato tissues (leaves and fruits). Generally, it could be found that, the highest amount of nitrogen % in tomato tissues ' leaves and fruits" were found by using 75% poultry manure + 25% mineral fertilizer. This results held good in the two seasons of study. On the contrary, the lowest amount of nitrogen % in tomato tissues was recorded by using 100% poultry manure in the first season and by using 25% poultry manure + 75% mineral fertilizer of tomato leaves as well as by using 100% mineral fertilizer of tomato fruits in

the second season. The obtained results are in good accordance with those which were reported by Singh *et al.* 2004, who found that using poultry manure, inorganic fertilizer and biofertilizer increased the N concentration in tomato plants.

Table (4): Effect of fertilizer rates and nitrobin on chemical contents in leaves of tomato plants cv. GS12 during 2005 and 2006 seasons.

Treatments		2005						2006					
		N%	Fe (p.p.m)	Zn (p.p.m)	Mn (p.p.m)	Cu (p.p.m)	Pb (p.p.m)	N%	Fe (p.p.m)	Zn (p.p.m)	Mn (p.p.m)	Cu (p.p.m)	Pb (p.p.m)
Fertilizers													
100%Mineral		2.47	1259.00	117.00	133.00	32.50	114.50	2.17	1617.00	105.00	121.00	41.50	104.50
100% Organic		1.81	1574.50	87.00	110.00	24.00	55.00	1.58	1386.00	93.00	97.00	25.00	42.50
75%organic +25%mineral		2.64	1733.50	172.00	170.00	48.00	90.50	2.24	1788.00	248.00	149.00	37.00	81.00
50%organic +50%mineral		2.25	1626.00	151.00	160.00	36.00	82.00	2.11	1652.00	217.00	138.00	33.00	74.00
25%organic +75%mineral		1.83	1370.00	123.00	144.50	31.00	64.00	1.45	1374.00	200.00	123.50	29.00	59.50
LSD at 5%		0.47	238.01	54.12	26.19	7.50	34.57	0.11	217.34	78.91	16.33	7.31	41.56
Nitroben													
0 (Check)		2.13	1487.00	127.20	142.00	37.40	84.20	1.89	1550.00	164.60	123.20	33.00	74.80
500 g/fed.		2.27	1538.20	133.20	145.20	39.40	68.20	1.45	1576.60	180.00	128.40	32.80	69.80
LSD at 5%		0.10	43.97	4.49	2.55	1.35	12.13	0.27	21.99	13.18	4.85	NS	3.25
Interaction													
100% Mineral	**0 (Check)**	2.34	1560.00	114.00	130.00	50.00	116.00	2.16	1600.00	101.00	120.00	43.00	112.00
	500 g/fed.	2.60	1589.00	120.00	136.00	55.00	113.00	2.18	1634.00	110.00	122.00	40.00	97.00
100% Organic	**0 (Check)**	1.71	1233.00	85.00	110.00	23.00	56.00	1.54	1383.00	90.00	92.00	24.00	44.00
	500 g/fed.	1.91	1285.00	89.00	110.00	25.00	54.00	1.62	1390.00	96.00	102.00	26.00	41.00
75% organic +25% mineral	**0 (Check)**	2.60	1707.00	169.00	166.00	46.00	99.00	2.21	1780.00	230.00	146.00	38.00	83.00
	500 g/fed.	2.67	1767.00	176.00	174.00	50.00	82.00	2.27	1796.00	266.00	152.00	36.00	79.00
50% organic +50% mineral	**0 (Check)**	2.21	1602.00	148.00	158.00	36.00	84.00	2.09	1630.00	212.00	136.00	32.00	75.00
	500 g/fed.	2.29	1650.00	155.00	163.00	37.00	80.00	2.12	1674.00	222.00	141.00	34.00	73.00
25% organic +75% mineral	**0 (Check)**	1.80	1340.00	120.00	140.00	32.00	66.00	1.43	1360.00	190.00	122.00	30.00	60.00
	500 g/fed.	1.81	1400.00	126.00	149.00	30.00	62.00	1.47	1389.00	201.00	125.00	28.00	59.00
LSD at 5%		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Effect of biofertilizer:-

Data in Table (4 and 5) obviously showed that, using biofertilizing (Nitribin) increased significantly the total amount of nitrogen percentage in the two seasons of study except for nitrogen % of tomato fruits. The obtained results are in good accordance with those which were reported by Singh *et al.* 2004.

Effect of the interaction:-

The interaction between poultry manure and nitrogen chemical fertilizer as well as biofertilizer had no significant effect on nitrogen % of tomato tissues "leaves and fruits" in the two seasons of study. However, the highest amount of nitrogen % was recorded by using 75% mineral fertilizer +

25% poultry manure with biofertilizer. These results held true in the two seasons of study. On the contrary, the lowest amount of nitrogen % of tomato tissues was recorded by using 100% poultry manure without biofertilizer in the first season. On the other hand, the lowest nitrogen % of tomato leaves when used 25 % mineral fertilizer + 75% poultry manure and the lowest nitrogen % of tomato fruits was found by 100% poultry manure without biofertilizer.

Content of Fe, Cu, Zn , Mn and Pb in tomato tissues :-

Effect of source and rates of nitrogen fertilizer:-

Data in Table (4 and5) show that, using nitrogen fertilizer as a chemical fertilizer or a poultry manure source significantly increased Fe, Cu, Zn , Mn and Pb amount in tomato tissues (leaves and fruits). Generally , it could be found that , the highest amount of Fe "ppm" in tomato tissues of leaves was found by using 75% poultry manure + 25% mineral fertilizer. These results held good in the both seasons of study. On the other hand, the lowest amount of Fe (ppm) was recorded by using 100% mineral fertilizer in the first season and with 25% poultry manure + 75% mineral fertilizer in the second one.

Regarding with Fe (ppm) in tomato fruits, it could be found that, the highest amount of Fe in tomato fruits was found by using 25% poultry manure + 75% mineral fertilizer. On the contrary, the lowest amount of Fe was recorded by 100% poultry manure.

Regarding with Zn (ppm), the highest amount of Zn in tomato tissues (leaves and fruits) was found by using 75% poultry manure + 25% mineral fertilizer. On the other hand, the lowest amount of Zn in tomato tissues (leaves and fruits) was recorded by using 100% poultry manure. This results held good in the two seasons of study.

The same trend was found by Mn (ppm) in tomato tissues (leaves and fruits) in the two seasons of study.

Regarding with Cu (ppm) in tomato tissues (leaves and fruits). It could be found that, the highest Cu in tomato leaves was found by using 75% poultry manure + 25% mineral fertilizer. On the contrary, the lowest amount of Cu in tomato leaves was found by using 100% poultry manure in the two seasons of study. In the same time, the highest amount of Cu in tomato fruits was found by using 100% mineral fertilizer and the lowest amount of Cu was recorded by 100 % poultry manure. This results held good and true in the two seasons of study.

Regarding with Pb (ppm) in the tomatoes tissues (leaves and fruits). It could be found that, the highest amount of Pb in tomato tissues (leaves and fruits) was recorded by 100% mineral fertilizer. On the other hand, the lowest amount of Pb in tomato tissues (leaves and fruits) was found by using 100% poultry manure in the both seasons of study. The obtained results are in good accordance with those which were reported by Melo *et al.* 2003, who reported that, there were positive and significant correlations between Mn, Zn and Cu in the compost and Mn, Zn and Cu uptake by tomato plant.

Effect of biofertilizer :-

Data in Table (4 and5) obviously showed that, using biofertilizer (Nitrobin) increased significantly the total amount of Fe, Cu, Zn , Mn and Pb (ppm) in the two seasons of study. But, using biofertilizer was decreased content of Mn in fruits in the first season and Cu in leaves in the second season, and in the same time, using biofertilizer was decreased Pb in tomato tissiues (leaves and fruits) in the two seasons of study.

Effect of the interaction:-

Results in Table (4 and5) found that the interaction between organic and mineral fertilizer as well as biofertilizer had not a significant effect on the amount of Fe, Cu, Zn , Mn and Pb (ppm) of tomato tissues (leaves and fruits) in the two seasons of study. These results indicate that, each factor of the treatments act independently.

Table (5): Effect of fertilizer rates and nitrobin on chemical contents in fruits of tomato plants cv. GS12 during 2005 and 2006 seasons.

Treatments		2005						2006					
		N%	Fe (p.p.m)	Zn (p.p.m)	Mn (p.p.m)	Cu (p.p.m)	Pb (p.p.m)	N%	Fe (p.p.m)	Zn (p.p.m)	Mn (p.p.m)	Cu (p.p.m)	Pb (p.p.m)
Fertilizers													
100%Mineral		2.16	1317.50	103.00	48.00	30.50	120.00	1.83	1303.00	83.00	40.50	27.50	103.50
100% Organic		1.49	1257.50	71.00	37.50	18.50	49.00	1.44	1195.00	69.50	33.50	16.50	40.50
75%organic +25%mineral		2.25	1393.50	146.00	63.50	21.00	69.50	2.47	1421.00	123.00	58.00	20.50	61.00
50%organic +50%mineral		2.20	1449.50	133.00	57.00	22.00	61.50	1.76	1474.00	110.00	51.50	23.50	56.50
25%organic +75%mineral		1.52	1471.50	120.00	53.00	22.50	54.50	1.68	1481.50	92.00	50.00	20.50	51.00
LSD at 5%		0.34	88.12	16.22	11.35	5.25	36.14	0.29	79.15	26.77	11.87	4.09	27.97
Nitroben													
0 (Check)		1.90	1371.80	111.80	59.00	22.80	72.80	1.68	1360.00	93.60	45.00	21.60	64.80
500 g/fed.		1.94	1384.00	117.40	54.00	23.00	69.20	1.68	1389.00	97.60	48.40	21.80	60.20
LSD at 5%		NS	11.65	5.33	3.27	NS	2.61	NS	17.50	2.89	2.18	NS	2.55
Interaction													
100% Mineral	**0 (Check)**	2.14	1306.00	100.00	44.00	29.00	122.00	1.69	1290.00	80.00	39.00	27.00	110.00
	500 g/fed.	2.18	1329.00	106.00	52.00	32.00	119.00	1.97	1317.00	86.00	42.00	28.00	97.00
100% Organic	**0 (Check)**	1.46	1245.00	68.00	36.00	19.00	50.00	1.40	1178.00	68.00	33.00	17.00	43.00
	500 g/fed.	1.52	1270.00	74.00	39.00	18.00	48.00	1.47	1212.00	71.00	34.00	16.00	38.00
75% organic +25% mineral	**0 (Check)**	2.24	1384.00	143.00	60.00	22.00	73.00	2.01	1406.00	120.00	54.00	21.00	63.00
	500 g/fed.	2.26	1403.00	149.00	67.00	20.00	66.00	2.12	1436.00	126.00	62.00	20.00	59.00
50% organic +50% mineral	**0 (Check)**	2.18	1459.00	130.00	55.00	21.00	63.00	1.89	1460.00	110.00	50.00	23.00	56.00
	500 g/fed.	2.22	1440.00	136.00	59.00	23.00	60.00	1.93	1489.00	110.00	53.00	24.00	57.00
25% organic +75% mineral	**0 (Check)**	1.50	1465.00	118.00	50.00	23.00	56.00	1.63	1470.00	90.00	49.00	20.00	52.00
	500 g/fed.	1.54	1478.00	122.00	56.00	22.00	53.00	1.72	1493.00	95.00	51.00	21.00	50.00
LSD at 5%		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

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تـأثير التسـميد الكيمـاوى والعضـوى و الحيـوى علـى النمـو والمحصـول والجـودة والتركيب الكيميائى لنباتات الطماطم

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***قسم بحوث الخضر – المركز القومي للبحوث– الدقى– القاهرة – مصر.**

****قسم تكنولوجيا الحاصلات البستانية – المركز القومى للبحوث– الدقى– القاهرة – مصر.**

أجريت تجربتان حقليتان فى منطقة بنها (محافظة القليوبية) خلال الموسم الصيفي لعامي ٢٠٠٥ و ٢٠٠٦ لدراسة تأثيرمعدلات مختلفة من سماد الكتكوت والتسميد الكيماوى مع أو بدون التسميد الحيوى النيتروبين على النمو والمحصول والجودة والتركيب الكيميائى لنباتات الطماطم صنف GS12٠

وقد اوضحت النتائج أن استخدام ٥٠% سماد الكتكوت +٥٠% السماد المعدنى أو استخدام ٢٥% سماد الكتكوت +٧٥% السماد المعدنى للفدان أدى إلى زيادة كل صفات النمو الخضرفى كلا موسمى الزراعة٠ وتحقق أعلى محصول وجودة لثمار الطماطم بإستخدام معاملة ٧٥% سماد الكتكوت +٢٥% السماد المعدنى أدى إستخدام التسميد الحيوى إلى زيادة معنوية فى كل صفات النمو الخضرى وكذلك بالنسبة للمحصول الكلى وجودة ثمار الطماطم٠

Table (2): Effect of fertilizer rates and nitrobin on vegetative growth of tomato plants cv. GS12 during 2005 and 2006 seasons.

Treatments		2005						2006					
		Plant length (cm)	No. of leaves /plant	No. of shoots /plant	Fresh weight Leaves (g)	Stems (g)	Roots (g)	Plant length (cm)	No. of leaves /plant	No. of shoots /plant	Fresh weight Leaves (g)	Stems (g)	Roots (g)
Fertilizers													
100%Mineral		41.00	43.83	7.00	46.87	40.39	6.42	39.50	38.17	6.83	41.94	46.77	5.89
100% Organic		42.00	41.84	7.17	46.18	34.71	6.80	40.50	42.17	5.84	31.29	44.93	6.32
75%organic +25%mineral		41.58	34.17	5.85	38.43	41.86	5.81	44.83	34.33	5.84	47.83	51.02	7.28
50%organic +50%mineral		44.17	44.17	6.83	56.71	53.39	6.13	50.00	40.67	6.84	45.06	54.48	8.30
25%organic +75%mineral		47.33	36.17	7.17	45.44	50.07	7.03	49.17	34.50	6.33	39.24	50.86	7.75
LSD at 5%		2.43	3.59	1.98	NS	4.00	0.38	4.69	319	0.52	7.16	NS	1.86
Nitroben													
0 (Check)		40.57	38.00	6.27	41.26	41.56	5.76	42.47	36.07	5.60	38.06	45.21	6.09
500 g/fed.		45.87	42.00	7.33	52.19	47.41	7.12	47.53	39.87	7.07	44.09	54.01	8.13
LSD at 5%		2.05	1.65	NS	10.32	3.22	1.66	3.29	3.17	0.69	3.03	5.09	1.33
Interaction													
100% Mineral	0 (Check)	40.67	40.33	6.67	45.99	38.31	6.01	38.00	36.33	6.00	38.35	42.17	5.51
	500 g/fed.	41.33	47.33	7.33	47.75	42.48	6.83	41.00	40.00	7.67	45.53	51.37	6.28
100% Organic	0 (Check)	41.00	39.00	6.67	37.08	31.76	5.60	41.00	40.67	5.00	29.55	42.48	4.84
	500 g/fed.	43.00	44.67	7.67	55.27	41.65	7.99	42.00	43.67	6.67	33.03	47.37	7.80
75% organic +25% mineral	0 (Check)	37.17	34.00	4.33	30.27	38.91	5.67	37.67	31.00	5.67	43.83	46.71	6.12
	500 g/fed.	46.00	34.33	7.33	46.59	44.81	5.94	52.00	37.67	6.00	51.82	55.33	8.45
50% organic +50% mineral	0 (Check)	40.00	42.00	6.67	54.16	49.95	6.13	49.00	39.00	6.00	40.32	45.85	6.82
	500 g/fed.	48.33	46.33	7.00	59.27	56.82	6.13	51.00	42.33	7.67	49.80	63.11	9.77
25% organic +75% mineral	0 Check)	44.00	34.67	7.00	38.82	48.86	5.37	46.67	33.33	5.33	38.23	48.85	7.16
	500g/fed.	50.67	37.33	7.33	52.06	51.27	8.69	51.67	35.67	7.33	40.25	52.87	8.33
LSD at 5%		NS	NS	NS	NS	NS	NS	NS	2.10	1.54	NS	NS	NS

Table (3): Effect of fertilizer rates and nitrobin on dry weight and fruit quality of tomato plants cv. GS12 during 2005and2006 seasons.

Treatments	2005								2006							
	Dry weight Leaves (g)	Stems (g)	Roots (g)	Fruit length (cm))	Fruit diameter (cm)	Fruit weight (g)	T.S.S.	Total yield ton/fed.	Dry weight Leaves (g)	Stems (g)	Roots (g)	Fruit length (cm))	Fruit diameter (cm)	Fruit weight (g)	T.S.S.	Total yield ton/fed.
Fertilizers																
100%Mineral	13.55	5.68	2.38	4.17	4.60	46.40	4.43	22.90	12.52	3.55	2.38	4.58	4.32	44.07	4.62	18.40
100% Organic	13.45	5.80	2.87	3.55	3.63	35.58	4.65	21.85	13.23	3.93	2.87	3.13	4.75	52.32	4.75	17.85
75%organic +25%mineral	10.99	5.49	2.20	4.22	4.33	43.33	5.82	24.45	12.25	4.83	3.35	4.78	4.23	41.42	5.88	20.10
50%organic +50%mineral	12.08	7.19	2.02	4.42	4.58	46.13	5.00	24.25	12.23	6.07	3.42	4.98	4.13	48.35	4.67	19.60
25%organic +75%mineral	12.37	9.56	3.91	4.13	4.80	45.73	5.08	24.15	12.92	6.48	3.67	4.35	4.98	42.62	5.75	19.25
LSD at 5%	1.04	1.96	0.72	0.46	0.32	5.77	NS	1.07	0.37	1.36	0.77	NS	0.45	3.85	0.61	1.21
Nitroben																
0 (Check)	11.24	5.94	2.06	3.97	4.13	38.75	4.69	23.48	11.19	4.22	2.58	4.10	4.13	41.48	4.85	19.10

500 g/fed.		13.73	7.54	3.29	4.23	4.69	48.12	5.30	23.88	14.06	5.72	3.70	4.62	4.84	50.03	5.44	20.00
LSD at 5%		1.31	1.07	0.89	NS	0.27	5.09	0.45	0.22	1.84	0.71	0.65	0.40	0.25	5.58	0.36	0.19
Interaction																	
100% Mineral	**0 (Check)**	12.66	4.49	1.73	4.13	4.27	40.63	4.37	23.90	11.17	3.19	2.42	4.33	4.00	39.60	4.40	18.70
	500 g/fed.	14.43	6.87	3.03	4.20	4.93	52.17	4.50	24.40	13.87	3.90	2.34	4.83	4.63	48.53	4.83	19.80
100% Organic	**0 (Check)**	11.02	5.02	2.55	3.37	3.13	34.60	4.43	21.40	11.41	4.14	2.34	3.13	4.40	48.70	4.50	16.60
	500 g/fed.	15.88	6.57	3.19	3.73	4.13	36.57	4.87	21.90	15.05	3.72	3.39	3.13	5.10	55.93	5.00	18.10
75% organic +25% mineral	**0 (Check)**	9.19	4.96	1.57	4.03	4.00	35.07	5.50	24.40	11.20	3.78	2.44	4.33	4.07	33.97	5.67	19.40
	500 g/fed.	12.79	6.01	2.82	4.40	4.67	51.60	6.13	24.40	13.30	5.88	4.27	5.23	4.40	48.87	6.20	20.60
50% organic +50% mineral	**0 (Check)**	11.78	6.41	1.64	4.33	4.67	43.50	4.67	23.60	10.63	4.81	2.41	4.63	3.63	48.47	4.17	20.40
	500 g/fed.	12.38	7.97	2.39	4.50	4.70	48.77	5.33	23.90	13.82	7.33	4.42	5.33	4.63	48.23	5.17	20.70
25% organic +75% mineral	**0 (Check)**	11.57	8.84	2.79	3.97	4.60	39.97	4.50	24.10	11.56	5.16	3.27	4.10	4.53	36.67	5.50	19.40
	500 g/fed.	13.17	10.27	5.03	4.30	5.00	51.50	5.67	24.80	14.28	7.79	4.07	4.60	5.43	48.57	6.00	20.80
LSD at 5%		NS	NS	NS	NS	NS	NS	NS	NS	4.12	1.57	NS	NS	NS	NS	NS	NS

Table (4): Effect of fertilizer rates and nitrobin on chemical contents in leaves of tomato plants cv. GS12 during 2005 and 2006 seasons.

Treatments		2005						2006					
		N%	Fe (p.p.m)	Zn (p.p.m)	Mn (p.p.m)	Cu (p.p.m)	Pb (p.p.m)	N%	Fe (p.p.m)	Zn (p.p.m)	Mn (p.p.m)	Cu (p.p.m)	Pb (p.p.m)
Fertilizers													
100%Mineral		2.47	1259.00	117.00	133.00	32.50	114.50	2.17	1617.00	105.00	121.00	41.50	104.50
100% Organic		1.81	1574.50	87.00	110.00	24.00	55.00	1.58	1386.00	93.00	97.00	25.00	42.50
75%organic +25%mineral		2.64	1733.50	172.00	170.00	48.00	90.50	2.24	1788.00	248.00	149.00	37.00	81.00
50%organic +50%mineral		2.25	1626.00	151.00	160.00	36.00	82.00	2.11	1652.00	217.00	138.00	33.00	74.00
25%organic +75%mineral		1.83	1370.00	123.00	144.50	31.00	64.00	1.45	1374.00	200.00	123.50	29.00	59.50
LSD at 5%		0.47	238.01	54.12	26.19	7.50	34.57	0.11	217.34	78.91	16.33	7.31	41.56
Nitroben													
0 (Check)		2.13	1487.00	127.20	142.00	37.40	84.20	1.89	1550.00	164.60	123.20	33.00	74.80
500 g/fed.		2.27	1538.20	133.20	145.20	39.40	68.20	1.45	1576.60	180.00	128.40	32.80	69.80
LSD at 5%		0.10	43.97	4.49	2.55	1.35	12.13	0.27	21.99	13.18	4.85	NS	3.25
Interaction													
100% Mineral	**0 (Check)**	2.34	1560.00	114.00	130.00	50.00	116.00	2.16	1600.00	101.00	120.00	43.00	112.00
	500 g/fed.	2.60	1589.00	120.00	136.00	55.00	113.00	2.18	1634.00	110.00	122.00	40.00	97.00
100% Organic	**0 (Check)**	1.71	1233.00	85.00	110.00	23.00	56.00	1.54	1383.00	90.00	92.00	24.00	44.00
	500 g/fed.	1.91	1285.00	89.00	110.00	25.00	54.00	1.62	1390.00	96.00	102.00	26.00	41.00
75% organic +25% mineral	**0 (Check)**	2.60	1707.00	169.00	166.00	46.00	99.00	2.21	1780.00	230.00	146.00	38.00	83.00
	500 g/fed.	2.67	1767.00	176.00	174.00	50.00	82.00	2.27	1796.00	266.00	152.00	36.00	79.00
50% organic +50% mineral	**0 (Check)**	2.21	1602.00	148.00	158.00	36.00	84.00	2.09	1630.00	212.00	136.00	32.00	75.00
	500 g/fed.	2.29	1650.00	155.00	163.00	37.00	80.00	2.12	1674.00	222.00	141.00	34.00	73.00
25% organic +75% mineral	**0 (Check)**	1.80	1340.00	120.00	140.00	32.00	66.00	1.43	1360.00	190.00	122.00	30.00	60.00
	500 g/fed.	1.81	1400.00	126.00	149.00	30.00	62.00	1.47	1389.00	201.00	125.00	28.00	59.00
LSD at 5%		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table (5): Effect of fertilizer rates and nitrobin on chemical contents in fruits of tomato plants cv. GS12 during 2005 and 2006 seasons.

Treatments		2005						2006					
		N%	Fe (p.p.m)	Zn (p.p.m)	Mn (p.p.m)	Cu (p.p.m)	Pb (p.p.m)	N%	Fe (p.p.m)	Zn (p.p.m)	Mn (p.p.m)	Cu (p.p.m)	Pb (p.p.m)
Fertilizers													
100%Mineral		2.16	1317.50	103.00	48.00	30.50	120.00	1.83	1303.00	83.00	40.50	27.50	103.50
100% Organic		1.49	1257.50	71.00	37.50	18.50	49.00	1.44	1195.00	69.50	33.50	16.50	40.50
75%organic +25%mineral		2.25	1393.50	146.00	63.50	21.00	69.50	2.47	1421.00	123.00	58.00	20.50	61.00
50%organic +50%mineral		2.20	1449.50	133.00	57.00	22.00	61.50	1.76	1474.00	110.00	51.50	23.50	56.50
25%organic +75%mineral		1.52	1471.50	120.00	53.00	22.50	54.50	1.68	1481.50	92.00	50.00	20.50	51.00
LSD at 5%		0.34	88.12	16.22	11.35	5.25	36.14	0.29	79.15	26.77	11.87	4.09	27.97
Nitroben													
0 (Check)		1.90	1371.80	111.80	59.00	22.80	72.80	1.68	1360.00	93.60	45.00	21.60	64.80
500 g/fed.		1.94	1384.00	117.40	54.00	23.00	69.20	1.68	1389.00	97.60	48.40	21.80	60.20
LSD at 5%		NS	11.65	5.33	3.27	NS	2.61	NS	17.50	2.89	2.18	NS	2.55
Interaction													
100% Mineral	**0 (Check)**	2.14	1306.00	100.00	44.00	29.00	122.00	1.69	1290.00	80.00	39.00	27.00	110.00
	500 g/fed.	2.18	1329.00	106.00	52.00	32.00	119.00	1.97	1317.00	86.00	42.00	28.00	97.00
100% Organic	**0 (Check)**	1.46	1245.00	68.00	36.00	19.00	50.00	1.40	1178.00	68.00	33.00	17.00	43.00
	500 g/fed.	1.52	1270.00	74.00	39.00	18.00	48.00	1.47	1212.00	71.00	34.00	16.00	38.00
75% organic +25% mineral	**0 (Check)**	2.24	1384.00	143.00	60.00	22.00	73.00	2.01	1406.00	120.00	54.00	21.00	63.00
	500 g/fed.	2.26	1403.00	149.00	67.00	20.00	66.00	2.12	1436.00	126.00	62.00	20.00	59.00
50% organic +50% mineral	**0 (Check)**	2.18	1459.00	130.00	55.00	21.00	63.00	1.89	1460.00	110.00	50.00	23.00	56.00
	500 g/fed.	2.22	1440.00	136.00	59.00	23.00	60.00	1.93	1489.00	110.00	53.00	24.00	57.00
25% organic +75% mineral	**0 (Check)**	1.50	1465.00	118.00	50.00	23.00	56.00	1.63	1470.00	90.00	49.00	20.00	52.00
	500 g/fed.	1.54	1478.00	122.00	56.00	22.00	53.00	1.72	1493.00	95.00	51.00	21.00	50.00
LSD at 5%		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS