EFFECT OF SOME ORGANIC MANURES ON GROWTH AND CHEMICAL COMPOSITION OF SWEET PEPPER (*CAPSICUM ANNUUM*, L) GROWN IN A SANDY SOIL.

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Abstract

This investigation was carried out to study the effect of some organic manures on growth, and chemical composition of pepper (*Capsicum annuum*, L) in a sandy soil during 1999and 2001 seasons. This investigation included 16 treatments (NPK, cattle, chicken and compost containing 165 kg N/fed. and their combination). Treatments received NPK + chicken manure + compost at a rate of ($^1/_3$+$^1/_3$+$^1/_3$) increased plant height, number of leaves and stems as well as their fresh weight and increased concentration of N, P and K in leaves and stems. The same treatment increased total yield and physical properties "length, diameter, weight and flesh thickness" and chemical composition "ascorbic acid, acidity, carotiodies and T.S.S" of pepper fruits.

Key words: Pepper, (*Capsicum annuum*, L), N fertilizer, Organic manure, Cattle, Chicken, Compost, Growth, Yield, Chemical composition.

INTRODUCTION

Organic system of producing vegetables and food have been recently attracting a great deal of interest from both the general public and potential producers. Many claims have been put forward as to the beneficial effects of organic nitrogen fertilizers used in organic system on crop quality. However, validations of these cliam are based largely on the theoretical extrapolation rather than scientific measurements.

Sweet pepper (*Capsicum annuum*, L) is one of the most important vegetable crops grown in open field and plastic houses in Egypt. Organic fertilizers such as cattle manure, chicken manure and compost in sandy soils improve the soil structure, this support root development leading to higher yield and better quality of sweet pepper. Moreover, organic matter plays an important role in the chemical behaviors of several metals in soils throughout its active groups (fluvic and humic acids) which have the ability to retain the metals in complex and chelate forms. Many investigators studied the effect of applying fertilizer either in mineral form (Shaheen and Omar, 1989) or in

organic form as cattle manure. Abou Hussin (2001) using chicken and compost manure reported that such fertilizer at different levels increased plant vegetative growth expressed as plant height, number of leaves and branches as well as dry matter of plant foliage. In this respect, fertilizing solanacea crops with mineral fertilizers as well as organic manures led to increaing of early marketable and total yield of tested crops as well as improved quality of produced fruits (Eid *et al.*, 1997). Similar finding were reported by Fattah Allah *et al.* (1997) on pepper using different organic sources. El- Kassas *et al.* (1997) found that organic manures either in the form of cattle or chichen manure increased the concentration and uptake of macro - and micro-nutrients in shoots of pepper plants. Moreover, Hsieh Ching Fang *et al.* (1994). reported that fertilizing pepper plants with mineral fertilizers as well as organic manures led to increasing vitamin C, total acidity and total soluble solid in pepper fruits.

MATERIALS AND METHODS

Two field experiments were carried out during summer seasons of 1999 and 2001 in Taba farm at "Sadat City" to investigate the effect of some organic manures and chemical fertilizers on the vegetative growth, chemical composition, yield and fruit quality of sweet pepper (*Capsicum annuum,* L.). Seeds of pepper cv. California wonder sown in seedling trays with 1:1 volume peatmoss and vermiculate media on 21st of January in first season and first 1st of January in the second one. Transplants were planted in the field after 46 days of seed sowing. The experiments included the following treatments:

1- Chemical fertilizer at a rate of 165 kg N/fed.

2- Chemical fertilizer + cattle manure " control" (135 kg N/fed. as a mineral form + 30 kg N/fed. cattle manure).

3- Cattle manure "alone" 60 m^3/ fed. in 1999 season and 63 m^3/fed. in 2001 season (contains 165 kg N/fed.)

4- Chicken manure " alone" 36.66 m^3/fed. in 1999 season and 40.22 m^3/fed. in 2001 season (contains 165 kg N/fed.)

5- Compost "alone" 33.67 m^3/fed. in 1999 season and 32.5 m^3/fed. in 2001 season (contains 165 kg N/fed.)

6- Chemical fertilizer + cattle manure ($^1/_2$ +$^1/_2$).

7- Chemical fertilizer + chicken manure ($^1/_2$+$^1/_2$).

8- Chemical fertilizer + compost ($^1/_2$ +$^1/_2$).

9- Cattle manure + chicken manure ($^1/_2$+$^1/_2$).

10- Cattle manure + compost ($^1/_2$+$^1/_2$).

11- Chicken manure + compost ($^1/_2$+$^1/_2$).

12- Chemical fertilizer + cattle manure + chicken manure ($^1/_3$+$^1/_3$+$^1/_3$).

13- Chemical fertilizer + chicken manure + compost ($^1/_3$+$^1/_3$+$^1/_3$).

14- Chemical fertilizer + cattle manure + compost ($^1/_3$+$^1/_3$+$^1/_3$).

15- Cattle manure + chicken manure + compost ($^1/_3$+$^1/_3$+$^1/_3$).

16- Chemical fertilizer + cattle manure + chicken manure + compost ($^1/_4$+$^1/_4$+$^1/_4$+$^1/_4$).

Chemical NPK fertilizers were added using ammonium sulphate (20.6 % N) at a rate of 800.97 kg/fed. (165 kg N/fed.), calcium superphosphate (15.5 % P_2O_5 at a rate of 300 kg/fed. and potassium sulphate (48 % K_2O) at a rate of 150 kg/fed. These treatments were arranged in a complete randomized block design with three replicates. The plot area was 12 m^2 (1 m. width and 12 m. length). The distance between plants was 25 cm. in two rows. The drip irrigation system was adopted.

Five plants were taken randomly from each plot at the flowering stage. Plant height, number of leaves and stems, fresh and dry weights of leaves and stems were recorded.

Chlorophyll a,b and total chlorophyll were determined in green leaves according to the methods discribed by A.O.A.C (1975).

Leaves and stems were dried at 70° C to a constant weight and macro - and micro-elements were assayed. Total nitrogen was determined according to the method described by Markaham (1942), phosphorus using the method of Trough and Mayer (1939) and potassium by the Flame photometer according to Brown and Lilleland (1946). Copper, zinc, nickek and lead were determined using the Atomic Absorption Spectrophotometer.

At the marketable green stage all the fruits of each plant were harvested weekly starting from 90 days after transplanting and the following parameters were recorded: early, total and marketable yield (ton/fed).

Ten fruits were chosen randomly as a represntative sample from the fourth picking for each treatment of the three replicates and the following parameters were recorded:

-Physical properties:

Average fruit weight, fruit length and diameter as well as flesh thickness.

-Chemical properties.

Ascorbic acid (vitamin C), total acidity, total soluble solids and total chlorophyll content were assayed according to A.O.A.C (1975). Total carotenoids were determined according to the method described by Van Wattesteine (1957). Data were subjected to statistical analysis of variance according to Gomez and Gomez (1984) using L.S.D at 5 % level.

RESULTS AND DISCUSSION

1- Vegetative growth

Data presented in Table 1 show that application of organic manures either in a single form or mixed with mineral fertilizer (NPK) to pepper plants increased vegetative growth characteristics expressed as plant height, number of leaves and stems as well as fresh and dry matter percentage for leaves and stems during both seasons. The highest estimates were obtained using NPK + chicken manure + compost followed by the treatment of NPK + chicken manure + cattle manure at a rate of $^1/_3$ +$^1/_3$ + $^1/_3$. On the other hand, the lowest values were resulted by cattle manure alone. However, such the treatment reflected the highest percentage of dry matter for both leaves and stems. These results may be due to that organic manures support the number of leaves and fresh and dry matter % of plant through the stimulation effect on the meristematic activity of tissues, where these organic manures are rich in NPK and other minerals which are compulsory for plant growth.

Table 1. Effect of organic manures and chemical fertilizers on vegetative growth characters of pepper plants in 1999 and 2001 seasons

Treatments	1999							2001						
	Plant height /plant (cm)	Number of leaves /plant	Number of stems / plant	Fresh weight of leaves (gm)	Dry matter of leaves (%)	Fresh weight of stems (gm)	Dry matter of stems (%)	Plant height / plant (cm)	Number of leaves / plant	Number of stems / plant	Fresh weight of leaves (gm)	Dry matter of leaves (%)	Fresh weight of stems (gm)	Dry matter of stems (%)
NPK	46.00	207.33	16.50	140.20	17.38	76.66	16.23	48.00	260.00	22.83	160.80	18.86	86.23	18.86
NPK+cattle manure*	47.00	220.33	17.16	147.23	16.73	82.73	16.51	50.30	288.67	23.33	168.30	19.99	95.00	17.70
Cattle manure	43.00	127.00	14.00	96.40	19.36	56.00	17.92	44.72	199.83	18.20	135.30	18.76	66.60	21.27
Chicken manure	47.17	199.00	20.33	129.73	17.33	74.83	16.28	51.65	260.00	24.50	143.50	18.90	82.10	18.63
Compost manure	50.00	177.33	21.50	141.83	17.50	77.66	16.82	52.42	261.50	25.00	152.40	18.44	84.07	20.28
NPK+Cat. (1:1)	49.17	214.33	17.33	145.83	15.15	80.00	16.76	51.68	227.00	22.33	146.80	19.62	81.66	20.23
Cat.+Ch. (1:1)	54.00	199.17	15.66	136.83	15.39	78.00	17.05	46.40	205.00	22.00	141.60	19.54	79.06	19.68
Com.+Cat. (1:1)	44.82	146.00	18.00	124.00	16.55	73.00	17.48	47.83	248.33	20.00	153.00	19.84	83.13	20.32
NPK+Ch. (1:1)	45.50	208.33	15.66	142.66	16.57	80.73	16.47	48.43	231.67	23.66	161.60	19.63	83.90	20.18
Com. +Ch. (1:1)	45.32	167.50	17.33	144.50	18.57	82.66	16.40	45.43	245.17	23.00	164.60	19.26	85.73	18.63
Com. + NPK(1:1)	45.50	212.00	18.00	153.46	16.72	84.33	16.11	45.40	229.50	21.33	156.40	18.79	87.26	20.41
NPK+Ch.+ Cat. (1:1:1)	44.00	224.20	20.66	145.30	16.74	82.66	15.48	51.10	232.83	20.66	165.60	18.14	85.06	20.31
NPK+Ch.+ Com. (1:1:1)	55.00	231.00	23.50	154.66	17.55	88.66	16.29	56.45	292.00	25.20	178.50	19.82	97.46	18.90
Cat.+ Ch.+ Com. (1:1:1)	46.67	173.33	18.66	146.30	16.78	87.33	15.48	49.32	244.33	20.66	171.50	19.43	91.66	18.69
NPK+Com.+ Cat. (1:1:1)	43.50	164.33	18.66	145.30	16.91	86.00	15.42	50.33	239.19	22.00	170.00	20.71	92.66	19.29
NPK+Cat.+ Ch. +Com. (1:1:1:1)	44.50	165.00	15.50	138.73	16.70	78.76	16.51	45.88	216.33	21.33	158.50	19.53	85.23	18.30
L.S.D at 0.05	4.11	44.54	0.99	7.16	1.81	3.47	N.S	0.43	8.67	3.69	8.13	N.S	4.82	1.64

*Control

Cat.= cattle manure. Ch.= chicken manure. Com.= compost.

1:1= ½ + ½, 1:1:1 = $^1/_3$ +$^1/_3$ +$^1/_3$ and 1:1:1:1= ¼+$^1/_4$+$^1/_4$+$^1/_4$.

2- Chemical composition of plant folige

a- Photosynthetic pigments

Results reported in Table 2 show that, the highest amounts of photosynthtic pigments, i.e., chlorophyll a,b and total chlorophyll were resulted from the plants fertilized with NPK + compost + chicken manure at ($^1/_3$+$^1/_3$+$^1/_3$) in the first season and from those fertilized with NPK + chicken manure + cattle manure at ($^1/_3$+$^1/_3$+$^1/_3$) in the second one. However, the lowest quantiteis of chlorophyll a,b and total chlorophyll (a+b) were resulted from the leaves of plants fertilized with cattle manure only. In this regard, Shehata (1992) mentioned that composted organic materials contain considerable amounts of macronutrients such as nitrogen, phosphorus and micronutrients, i. e. Fe, Mn and Mg that can contribute in chlorophyll synthesis in plant. Moreover, Abdel Aty (1997) reported similar results on pepper.

Table 2. Effect of organic manures and chemical fertilizers on chlorophyll content of pepper plants in leaves during 1999 and 2001 seasons.

Treatments	1999			2001		
	Chlorophyll (a) mg/dc²	Chlorophyll (b) mg/dc²	Chlorophyll (a+b) mg/dc²	Chlorophyll (a) mg/dc²	Chlorophyll (b) mg/dc²	Chlorophyll (a+b) mg/dc²
NPK	2.00	1.51	3.51	1.65	1.54	3.20
NPK + cattle manure *	2.07	1.72	3.41	1.69	1.76	3.78
Cattle manure	1.05	1.16	2.21	1.04	1.53	2.50
Chicken manure	2.09	1.45	3.53	1.58	2.14	4.36
Compost	2.18	1.55	3.71	2.07	2.16	4.24
NPK + cattle manure (1/2+1/2)	2.13	1.91	3.52	1.54	2.25	3.80
Cattle + chicken manure (1/2+1/2)	1.98	1.33	3.31	2.18	3.53	5.95
Compost + cattle manure (1/2+1/2)	2.10	1.34	3.45	1.97	2.31	4.28
NPK + chicken manure (1/2+1/2)	2.04	1.27	3.31	2.32	2.84	4.85
Compost + chicken manure (1/2+1/2)	2.02	1.56	3.59	2.28	2.75	5.03
Compost + NPK (1/2+1/2)	1.20	1.34	3.55	2.17	3.03	5.21
NPK + chicken manure + cattle (1/3+1/3+1/3)	2.08	1.64	3.73	2.38	3.76	6.13
NPK +chicken manure+ Compost (1/3+1/3+1/3)	2.13	1.74	3.81	2.08	3.80	5.81
Cattle manure + chicken manure +compost (1/3+1/3+1/3)	2.06	1.48	3.54	2.17	3.82	5.98
NPK + compost + cattle manure (1/3+1/3+1/3)	1.93	1.56	3.46	2.09	3.32	5.41
NPK + cattle manure + chicken manure + compost (1/4+1/4+1/4+1/4)	2.14	1.30	3.17	2.29	3.52	5.86
L.S.D at 5%	0.21	N.S	0.59	0.64	1.36	1.81

*Control

Cat.= cattle manure. Ch.= chicken manure. Com.= compost.

1:1= ½ + ½ , 1:1:1 = $^1/_3$ +$^1/_3$ +$^1/_3$ and 1:1:1:1= ¼+$^1/_4$+$^1/_4$+$^1/_4$.

Table 3. Effect of organic manures and chemical fertilizers on macro-nutrients of pepper plants in 1999 and 2001 seasons

Treatments	1999						2001					
	Nitrogen %		Phosphorus %		Potassium %		Nitrogen %		Phosphorus %		Potassium %	
	Leaves	Stems	Leaves	Stems	Leaves	Stems	Leaves	Stems	Leaves	Stems	Leaves	Stems
NPK	3.93	3.79	0.87	1.14	3.30	3.21	3.86	3.43	0.80	0.94	3.23	3.45
NPK+cattle manure *	4.04	3.83	0.88	0.98	3.38	3.27	3.89	3.58	0.82	0.97	2.62	3.56
Cattle manure	3.28	3.49	0.76	0.85	3.10	3.06	3.58	3.32	0.81	0.84	2.32	3.30
Chicken manure	3.63	3.83	0.70	0.99	3.38	3.40	4.35	3.38	0.83	0.98	3.11	3.43
Compost	3.77	3.69	0.73	1.00	3.53	3.34	4.33	3.35	0.90	1.04	2.98	3.35
NPK+ Cat. (1:1)	3.57	3.73	0.78	0.88	3.37	3.11	4.14	3.59	0.80	0.88	3.21	3.75
Cat. + Ch. (1:1)	3.82	3.71	0.74	0.84	3.24	3.10	3.79	3.50	0.80	0.85	2.73	3.55
Com. + Cat. (1:1)	3.59	3.77	0.71	0.90	3.13	2.99	3.82	3.45	0.79	0.88	3.10	3.75
NPK+ Ch. (1:1)	3.80	3.99	0.69	1.08	3.30	3.06	4.25	3.65	0.81	1.00	3.24	3.76
Com. + Ch. (1:1)	3.38	3.95	0.75	1.03	3.27	3.06	3.94	3.67	0.80	0.99	2.17	3.75
Com. + NPK(1:1)	3.73	3.75	0.74	1.13	3.20	3.20	4.24	3.66	0.80	1.04	3.01	3.54
NPK+ Ch.+ Cat. (1:1:1)	3.63	3.71	0.74	0.96	3.24	3.04	3.81	3.60	0.81	0.94	2.85	3.57
NPK+ Ch.+ Com. (1:1:1)	3.66	4.11	0.89	1.19	3.72	3.34	4.38	3.69	0.89	1.17	3.51	3.84
Cat. + Ch. + Com. (1:1:1)	3.47	3.64	0.79	0.94	3.35	3.23	4.15	3.51	0.82	0.92	3.17	3.02
NPK+ Com.+ Cat. (1:1:1)	3.74	3.65	0.79	1.16	3.35	3.10	3.78	3.63	0.80	1.14	2.98	3.51
NPK+Cat.+ Ch. +Com. (1:1:1:1)	3.62	3.67	0.67	1.15	3.14	2.86	3.61	3.51	0.76	1.13	2.90	3.76
L.S.D at 0.05	N.S	N.S	N.S	N.S	N.S	N.S	0.04	0.19	N.S	0.19	0.48	0.39

*Control

Cat.= cattle manure. Ch.= chicken manure. Com.= compost.

1:1= ½ + ½ 1:1:1 = $^1/_3 + ^1/_3 + ^1/_3$ and 1:1:1:1= $^1/_4 + ^1/_4 + ^1/_4 + ^1/_4$.

b- Mineral content (NPK)

Data recorded in Table (3) show that, the highest nitrogen, phosphorus and potassium percentages in leaves and stems were found in plants fertilized with NPK + chicken manure+ compost at ($^1/_3$+$^1/_3$+$^1/_3$). On the other hand, the lowest percentage were found in the leaves and stems of plants treated with cattle manure only. Obtained results are in harmony with those obtain by Midan (1995) and Walid Qawasmi *et al.* (1999) on pepper.

Yield and its components:

Data presented in Table 4 show the effect of mineral fertilizer, organic manures and their mixture on total yield of fruits and its components, i.e., early and marketable yield. The highest fruit yield, marketable and total yield were produced by fertilizing pepper with NPK + chicken manure + compost at ($^1/_3$+$^1/_3$+$^1/_3$) followed by fertilizing the plant with NPK + cattle manure "control" and NPK in a single form. On the other hand, the lowest total yield, early and marketable yield were produced by plants fertilized with cattle manure only.

It could be concluded that in order to produce higher early, marketable and total fruit yield of pepper the plants must be supplied with NPK + chicken manure + compost and/or NPK + cattle manrue " control". The increase in total produced yield, might be due to the function of the increase in the vegetative growth and dry matter contents of the plant (Table 1) and also to the increase of the average fruit weight. Similar findings were obtained by Eid *et al.* (1991).

a- Physical properties of fruits.

Results in Table 4 show that organic manure had a great influence on the average weight, length and diameter of fruit as well as flesh thickness during the two growth seasons. The highest values of physical fruit trails were resulted from plants fertilized with NPK + chicken manure + compost at ($^1/_3$+$^1/_3$+$^1/_3$). In contrast, the lowest values were produced by the plants fertilized with cattle manure only. Here, the most suitable treatment for fertilizing pepper plant was to use NPK + chicken manure + compost at a level of ($^1/_3$+$^1/_3$+$^1/_3$) to produce fruits with good physical quality of pepper. This increase in physical fruit quality might attributed to that the applying organic manure combined with chemical fertilizers increase the macro - and micro-nutrients necessary for plant growth and fruit requirements.

b- Chemical fruit quality

1- Macro- elements (NPK) content: The results reported in Table 5 show that the organic and chemical fertilizers had no significant effect on macro- element (NPK) content of produced fruit in 1999 and 2001 seasons. However, the highest percentages of total nitrogen, phosphorus and potassium in fruit were found in pepper fruits of plant fertilized with NPK + chicken manure+ compost ($^1/_3$+$^1/_3$+$^1/_3$). On the other hand, the lowest percentages were estmiated for plants fertilized with cattle manure only in 2001 season. These results are in harmony with those obtain by Midan (1995).

Table 4 . Effect of some organic manures and chemical fertilizers on early , total, marketable yield and physical properties of pepper plants in 1999 and 2001 seasons

Treatments	1999							2001						
	Early yield Ton/fed.	Total yield Ton/fed.	Marketable yield Ton/fed.	Average weight of fruits (gm)	Length of fruits (cm)	Diameter of fruits (cm)	Flesh thickness of fruits (mm)	Early yield Ton/fed.	Total yield Ton/fed.	Marketable yield Ton/fed	Average weight of fruits (gm)	Length of fruits (cm)	Diameter of fruits (cm)	Flesh thickness of fruits (mm)
NPK	3.409	10.366	10.009	64.35	3.52	4.03	2.33	3.16	11.780	11.345	60.83	5.20	5.30	3.20
NPK + cattle manure *	3.535	10.754	10.182	71.10	3.90	4.03	2.36	3.25	12.258	11.658	65.33	5.93	5.80	2.30
Cattle manure	2.34	7.330	7.010	63.46	4.10	4.10	2.30	2.621	7.920	7.645	58.83	5.10	6.00	3.20
Chicken manure	2.39	8.588	8.278	72.37	4.56	4.20	2.66	2.952	10.232	9.894	67.60	5.96	6.53	3.36
Compost	2.52	8.952	8.711	73.66	4.66	4.50	2.73	2.784	11.390	10.118	70.66	6.00	5.71	3.76
NPK + Cat. (1:1)	2.528	9.074	8.961	75.40	4.16	4.36	3.13	2.799	11.590	11.311	77.16	5.66	5.71	3.76
Cat. + Ch. (1:1)	2.403	8.893	8.688	76.56	4.33	4.26	3.16	2.660	9.109	8.892	72.90	5.83	5.73	3.70
Com. + Cat. (1:1)	2.571	8.418	8.261	75.83	4.26	4.23	3.50	2.941	11.067	10.875	72.80	6.06	6.40	3.93
NPK + Ch. (1:1)	2.485	8.369	7.874	67.16	4.43	4.50	3.50	2.653	8.408	8.038	64.90	6.10	5.76	3.80
Com. + Ch. (1:1)	2.411	8.463	8.270	73.14	4.30	4.50	3.40	2.712	8.570	8.361	71.16	6.76	5.90	3.30
Com. + NPK(1:1)	2.489	8.569	8.411	73.89	4.80	4.50	3.40	2.749	8.491	8.298	71.16	6.76	5.90	3.30
NPK+ Ch.+ Cat. (1:1:1)	2.562	8.787	8.621	70.50	4.46	4.16	3.26	2.866	9.756	9.548	71.16	6.33	5.80	3.36
NPK+ Ch. + Com. (1:1:1)	3.478	10.813	10.568	81.90	5.63	4.70	3.59	3.559	12.538	12.233	80.40	6.79	6.60	3.96
Cat. + Ch. + Com. (1:1:1)	2.570	8.392	8.558	64.60	4.76	4.43	3.56	2.477	8.269	8.039	70.46	6.40	5.90	3.50
NPK+ Com.+ Cat. (1:1:1)	2.693	8.828	8.623	77.00	4.50	4.63	3.30	2.770	8.963	8.687	72.70	6.46	6.23	3.26
NPK+ Cat.+ Ch. + Com. (1:1:1:1)	2.415	8.219	8.039	66.10	4.33	4.30	3.23	2.372	8.792	8.581	67.16	5.60	5.60	3.36
L.S.D at 0.05	0.128	0.474	0.577	4.22	0.54	N.S	0.02	0.342	0.822	0.767	3.42	0.58	0.58	0.04

*Control

Cat.= cattle manure. Ch.= chicken manure. Com.= compost.

1:1= ½ + ½ , 1:1:1 = $^1/_3$ +$^1/_3$ +$^1/_3$ and 1:1:1:1= ¼+$^1/_4$+$^1/_4$+$^1/_4$

Table 5. Effect of organic manures and chemical fertilizers on macro and micro- nutrients of pepper fruits in 1999 and 2001 seasons.

Treatments	1999							2001						
	N % in fruits	P% in fruits	K % in fruits	Cu ppm	Zn ppm	Ni ppm	Pb ppm	N % in fruits	P% in fruits	K % in fruits	Cu ppm	Zn ppm	Ni Ppm	Pb ppm
NPK	2.53	0.31	2.06	40.33	12.63	1.66	9.66	2.38	0.29	2.43	25.83	8.58	1.74	8.90
NPK + Cattle manure *	2.54	0.32	2.27	36.50	12.06	1.69	9.10	2.42	0.31	2.57	27.50	6.18	1.98	8.10
Cattle manure	2.32	0.27	1.68	35.13	11.85	1.31	5.16	2.30	0.22	2.34	23.16	7.70	0.82	3.83
Chicken manure	2.40	0.29	1.96	33.83	12.62	1.51	6.33	2.35	0.30	2.47	19.00	11.16	0.94	3.86
Compost	2.47	0.29	2.16	34.66	12.16	1.50	4.63	2.38	0.30	2.39	27.00	8.50	0.92	6.40
NPK + Cat. (1:1)	2.33	0.32	2.09	47.16	14.16	1.46	7.66	2.35	0.25	2.38	24.83	14.01	1.15	7.73
Cat. + Ch. (1:1)	2.23	0.32	2.06	39.66	10.88	1.05	4.46	2.47	0.25	2.82	21.33	7.66	1.27	4.23
Com. + Cat. (1:1)	2.43	0.36	1.93	35.16	12.51	1.05	4.33	2.39	0.23	2.44	20.50	9.55	0.75	3.00
NPK+ Ch. (1:1)	2.54	0.28	2.09	38.66	10.33	1.66	6.93	2.35	0.23	2.44	25.66	9.96	0.80	6.50
Com. + Ch. (1:1)	2.36	0.35	2.06	42.50	14.11	0.77	5.46	2.52	0.27	2.73	19.20	8.38	0.64	5.06
Com. + NPK(1:1)	2.37	0.31	2.09	41.83	13.15	1.23	6.66	2.56	0.37	2.77	20.16	10.13	1.15	5.63
NPK + Ch. + Cat. (1:1:1)	2.49	0.34	1.96	43.83	12.60	1.52	7.40	2.48	0.32	2.86	19.83	9.00	1.71	5.86
NPK + Ch. + Com. (1:1:1)	2.55	0.28	2.31	38.66	12.76	1.46	7.03	2.62	0.38	2.89	21.33	8.84	0.97	4.93
Cat. + Ch. + Com. (1:1:1)	2.35	0.33	1.43	41.33	10.98	1.45	4.48	2.47	0.32	2.35	30.16	8.88	1.09	4.33
NPK+ Com.+ Cat. (1:1:1)	2.36	0.29	1.48	41.83	12.28	1.10	8.42	2.42	0.29	2.61	28.53	9.63	1.39	5.16
NPK + Cat. + Ch. + Com. (1:1:1:1)	2.29	0.30	2.06	37.83	9.76	1.56	4.98	2.39	0.30	2.38	30.20	9.65	1.30	5.50
L.S.D at 0.05	N.S	N.S	N.S	N.S	N.S	N.S	2.26	N.S	N.S	N.S	N.S	2.19	N.S	2.88

*Control

Cat.= cattle manure. Ch.= chicken manure. Com.= compost.

1:1= ½ + ½ , 1:1:1 = $^1/_3$ +$^1/_3$ +$^1/_3$ and 1:1:1:1= ¼+$^1/_4$+$^1/_4$+$^1/_4$

2- Micro- elements (Cu, Zn, Ni, Pb) content Copper,zinc, nickal and lead minerals: The results reported in Table 5 indicate that, the different fertilizer treatments had no significant effect on Cu, Zn and Ni contents of pepper fruits in the first season as well as Cu and Ni in the second one. However, the effect of the different fertilizer treatments on Pb of fruits in 1999 experment as well as Zn and Pb of the fruits in 2001 season were significant. In addition, the highest content of micro-elements, was connected with the application of NPK + cattle manure at ($^1/_2 + {}^1/_2$) in case of Cu and Zn, NPK + cattle manure as a control in case of Ni and NPK only in case of Pb, respectively during both seasons.In this respect, adding chemical fertilizers particularly NPK as macro-nutrients to the organic manure may enhance chemical activities within organic manure and promote the release of N, P and K and micro-elements and heavy metals thereby it may increase these elements in rooting zone, consequently increasing their absorption by plant and translocated them to the storage parts (fruits).

3- Organic constituents (carotenodis, acidity,ascorbic acid and T.S.S) of pepper fruits: The results reported in Table 6 show that, the use of mineral fertilizers combined with organic manure in form of NPK + chicken manure + compost at ($^1/_3+{}^1/_3+{}^1/_3$) of recommended dose of each resulted in highest content of fruits from carotenodis, ascorbic acid and T.S.S compard to those resulted from the other treatments. On the other hand, using organic manure in the form of compost only at the recommended dose resulted in the highest fruit content of total acidity during both seasons of study. These results are in accordance with those reported by Fattah Allah *et al.* (1997) on pepper.

Table 6. Effect of organic manures and chemical fertilizers on the fruits chemical properties of pepper fruits in 1999 and 2001 seasons.

Treatments*	1999				2001			
	Carotonodis	Ascorbic acid mg/100gm	Acidity mg/100gm	TSS %	Carotonodis	Ascorbic acid mg/100gm	Acidity mg/100gm	TSS %
NPK	0.50	77.30	131.16	4.60	0.86	76.66	133.02	4.01
NPK+cattle manure *	0.52	84.00	131.83	5.35	0.87	83.66	134.34	4.33
Cattle manure	0.49	101.00	131.33	4.90	0.84	99.33	140.78	4.23
Chicken manure	0.50	101.33	144.00	6.00	0.85	100.66	138.95	4.34
Compost	0.49	106.30	152.00	5.73	0.83	104.66	155.83	4.46
NPK+ cattle manure (1/2+1/2)	0.50	108.30	144.66	5.36	0.84	108.33	145.37	4.40
Cattle + chicken manure (1/2+1/2)	0.50	116.30	143.83	5.00	0.86	115.33	145.00	4.06
Compost+cattle manure (1/2+1/2)	0.51	103.66	137.80	5.73	0.85	102.33	138.12	4.60
NPK+chicken manure (1/2+1/2)	0.51	101.33	136.40	4.86	0.87	100.66	138.56	4.53
Compost+chicken manure (1/2+1/2)	0.50	104.00	142.70	5.70	0.83	105.66	145.03	4.46
Compost+NPK(1/2+1/2)	0.51	117.60	143.30	6.20	0.83	113.33	145.43	4.23
NPK+chicken manure +Cattle manure (1/3+1/3+1/3)	0.51	115.60	137.40	5.86	0.84	114.66	139.43	4.60
NPK+chicken manure +Compost (1/3+1/3+1/3)	0.53	125.60	145.10	6.33	0.89	120.00	147.78	4.80
Cattle manure + chicken manure +compost (1/3+1/3+1/3)	0.51	108.00	144.20	5.70	0.84	105.33	146.01	4.33
NPK+compost+ Cattle manure (1/3+1/3+1/3)	0.51	107.60	140.50	5.73	0.83	104.00	141.82	4.33
NPK+cattle manure + chicken manure +compost (1/4+1/4+1/4+1/4)	0.51	98.00	137.80	5.36	0.82	96.33	139.84	4.30
L.S.D at 5%	0.01	15.78	5.17	0.76	0.02	15.78	5.89	0.19

*Control

1:1= ½ + ½ , 1:1:1 = 1/3 +1/3 +1/3 and 1:1:1:1= ¼+1/4+1/4+1/4

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تأثير بعض المخصبات العضوية على نمو و التركيب الكميائى لمحصول الفلفل الحلو المنزرع فى تربة رملية .

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أجرى هذا البحث لدراسة تأثير بعض انواع الاسمدة العضوية على النمو و المحصول و جودتة و التركيب الكيميائى لمحصول الفلفل المنزرع فى تربة رملية فى موسمى ١٩٩٩ -٢٠٠١ وقد أشتملت الدراسة على ١٦ معاملة عبارة عن الانواع المختلفة من الاسمدة العضوية (سماد الماشية و سماد الكتكوت و سماد الكمبوست، مع التسميد المعدنى بمعدل ١٦٥ وحدة نيتروجين/ فدان) و التفاعلات المختلفة لهذة المصادر. و قد رتبت المعاملات فى ثلاثة مكررات و كان التصميم الأحصائى المتبع هو قطاعات كاملة العشوائية و تم دراسة الصفات المورفولوجية و المحصول و جودتة و المكونات الكيميائية فى كل من الأوراق و السيقان، أظهرت النتائج التى تم التوصل اليها الى أن استخدام التسميد بالسماد المعدنى + سماد الكتكوت + سماد الكمبوست بمعدل (١/٣ + ١/٣ +١/٣) أدى الى زيادة تركيز كل من النيتروجين و الفوسفور و البوتاسيوم فى كل من الأوراق و السيقان بالأضافة الى زيادة المحصول الكلى للفلفل الحلو، و تفوقت صفات جودة القرون من حيث طول و قطر و سمك القرن، أما بالنسبة لمحتوى ثمار الفلفل من الكاروتين و فيتامين ج و الحموضة الكلية و المواد الصلبة الذائبة الكلية فقد أرتفع مع أستخدام هذة المعاملة و بالتالى فهى تعتبر المعاملة المثالية فى مثل هذه الظروف.