RESPONSE OF VALENCIA ORANGE TREES TO SOME SOURCES OF ORGANIC FERTILIZERS UNDER DIFFERENT TYPES OF SOIL

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ABSTRACT

The investigation was carried out during two successive seasons 2008 and 2009 on Valencia orange trees twenty years old, budded on sour orange rootstock at three types of soil i.e, silty loam of a private citrus orchard of Belbais, Sharkia governorate, loamy sand of a private farm of Abshway, Fayoum governorate and sandy soil at El- Horia farm at El-Nobaria sector, El-Behera governorate to study the effect of different sources of organic manure fertilizers i.e. (poultry manure, sheep manure, cattle manure, sewage sludge compost and town waste compost at the rate of 71.4 kg/tree, Rock phosphate (24.5%P_2O_5) was the source of phosphate fertilizer and Felspar (7.9%K_2O)was the source of potassium on comparing with mineral fertilizer [800gm ammonium sulphate 20.5%N, 400gm Calcium super phosphate 15.5%P_2o_5 and 400gm Potassium sulphate 48%K_2O] per tree on vegetative growth, leaf (water, pigment and mineral) contents, fruiting parameters (fruit set, June drop and fruiting) percentage, yield and fruit quality. In addition the amounts of N,NH_4, NO_3,P,K,Fe, Mn, Zn and Cu that remained in each studied soil at the end of the experiment were also studied. The obtained results revealed that vegetative growth, leaf water, chlorophylls and mineral contents, fruit set, fruiting, yield and fruit quality significantly increased as a result of organic manure addition specially when using poultry manure, whereas, leaf carotene and June drop %were lowered. Silty loam soil was the best on affecting trees growth followed by loamy sand whereas sandy soil was the lowest. Adding poultry manure led to an increase in soil N,NH_4 and P, whereas , using chemical fertilizers led to an increase in soil NO_3 . Applying cattle manure led to an increase in soil K and Fe. The main observation was that using Town waste compost led to an increase in soil Zn and Cu.

Key words: Valencia, orange trees, sources of organic fertilizers, different types of soil

INTRODUCTION

Organic manure can play an important role in modern agriculture. The application of these materials is an important aspect to sustain soil productivity and to maintain beneficial soil biological, chemical and physical properties **(Abou Seeda, 1987).** Egyptian soils are low in organic matter about 2% **Balba, (1976).** Now with increasing the cost of mineral fertilizers there is renewed interest in organic recycling to improve soil fertility and productivity. So, organic wastes compost may be utilized in soil as source of nutrients for production **Warr and Hormick, (1990).** Poultry manure was used as organic fertilizer. **Unemya and Sekiya, (1985)** pointed out that

N,P,K,Ca and Mg of soil increase by the application of Poultry manure. Organic matter improve the nutritional status of most soils, In particular sandy soil. **El- Aila *et. al.,(*2001). Fliessbach *et. al.,* (2000).** found that organic manure application increased the transfer elements between the solid phase and soil solution, They also reported that organic soil management improved the soil structure by increasing soil activity, thus reducing the risk of soil erosion and promoted the development of earth worms and aboveground arthropods. This action can improve the growing condition for the trees.

Concerning the effect of organic manure, **Abou- Sayed, (1997).** on Balady mandarin stated that trees fertilized with compost chicken manure showed significant increase in growth, **Abdel-Nasser and Harhash(2000)** found that organic manure had positively affect on soil water- holdin capacity which led to increase leaf water contents. **Chokha, *et. al.,* (1993).** on sweet orange trees mentioned that using organic manure gave satisfactory increase in yield and fruit quality of the trees. **El-Kobbiaobbia, (1999).** on Navel orange trees stated that flowering parameters were promoted in the presence of organic fertilizer. **Grassi, *et. al.,* (1999).** On Rangpour Lime obtained a significant increment in yield and fruit quality due to adding organic manure**. Motskobili, (1984).** on Satsuma mandarin observed that applying manure significantly increased shoot length, leaves number per shoot ,leaf area and yield**. Huang, *et. al.,* (1995).** on Satsuma mandarin trees reported that all organic fertilizers treatments produced the highest number of fruits as well as the highest yield, contained significant increment in N-P contents comparing with NPK fertilizers. **Helail, *et. al.,* (2003).** on Washington navel orange trees in response to organic manure as compared to mineral fertilizer treatments suggested that, under organic system fruit of citrus trees had more Vitamin C. and increased the amount of total sugars. Thus, the aim of this research was to study the effect of adding various organic manure fertilizers compared with mineral fertilizers on vegetative growth, leaf water content, leaf pigment and mineral contents, fruit set%, June drop%, fruiting%, yield and fruit quality besides, the residue of total nitrogen, NH_4 and NO_3 in soil . In addition studying the effect of organic manure in improving the available soil nutrients i.e. P,K,Fe, Zn, Mn and Cu at the end of the experiment was also achieved.

MATERIALS AND METHODS

The investigation was carried out during two successive seasons 2008 and 2009 on Valencia orange trees twenty years old, budded on sour orange rootstock at three types of soil i.e, silty loam of a private citrus orchard of Belbais, Sharkia governorate, loamy sand of a private farm of Abshway, Fayoum Governorate and sandy soil at El- Horia farm at El-Nobaria sector, El-Behera governorate to study the effect of different sources of organic manure fertilizers i.e. (poultry manure, sheep manure, cattle manure, sewage sludge compost and town waste compost to comparing with mineral fertilizer on vegetative growth, leaf (water, pigment and mineral) contents, fruiting parameters (fruit set, June drop and fruiting) percentage, yield and fruit quality. In addition to study the amount of N,NH_4, NO_3,P,K,Fe, Mn, Zn and Cu that remained in each studied soil at the end of the experiment. Trees were planted at 5x5 meters apart, nearly similar in their growth as possible. The treatments of the experiment were arranged in a complete randomized block design and each treatment was replicated three times with three trees per each replicate. NPK

chemical fertilizer [800gm ammonium sulphate 20.5%N, 400gm Calcium super phosphate 15.5%P_2o_5 and 400gm Potassium sulphate 48%K_2O] per tree was applied as control. The amount of ammonium sulphate was divided into three doses and added each dose to the soil in January, March and August. While, calcium super phosphate added as one dose in January, whereas, potassium sulphate was divided into two equal doses and added in March and August. Anyhow, the amount of organic manure fertilizer was applied at the rate of 12 Tons per feddan (168 trees) i.e., 71.4 kg/tree. Organic manure was soaked in 30 liter of water for 24 hrs. before using and mixed with the surface of soil layer (0-20)cm. All organic manure were divided into three doses and added in January, March and August. Organic fertilizers were analyzed and presented in Table (1). Rock phosphate (24.5%P_2O_5) was the source of phosphate fertilizer and was added at the rate of 200 gm /tree at January, Felspar (7.9%K_2O) was the source of potassium which divided into two equal batches and was applied at March and August.

Table (1): Chemical analysis of organic manures used during the experiment.

Organic manure	Organic matter (%)	N (%)	P (%)	K (%)	Fe (%)	Mn (PPm)	Zn (PPm)	Cu (PPm)
Poultry manure	73.2	2.53	1.35	0.75	0.84	196	174	125
Sheep manure	65.4	1.99	1.20	0.61	1.21	187	200	100
Cattle manure	60.7	1.01	0.80	0.70	1.33	264	98	87
Sewage sludge	45.6	1.63	1.09	0.38	1.09	219	224	239
Town Waste	42.3	0.85	0.69	0.42	0.92	180	163	140

The trees had received nearly the same other management practices.

Studied parameters:-

1-Vegetative growth: Shoot length (cm), leaves number per shoot and leaf area (cm2) according to **Watson,(1985).**

2-Leaf analysis:

a-Leaf water contents was determined according to **Weatherly (1950)** method.

b-Leaf pigments: Chlorophyll(a&b) and carotene contents were determined using the method described by **Holden(1965).**

c-Leaf mineral contents: Leaf N content using the method described by **Pregl (1945),** d-Leaf P content using the method described by **Jackson(1958).**

e-Leaf K content using the method described by **Brown & Lilleland (1946).**

f-Leaf Fe,Zn and Mn content using the method described by **Capman and Pratt(1961)**.

3-Fruiting parameters: Fruit set%, fruit drop % and fruiting % calculated according to the equations given by **Vyvyan (1946).**

4-- yield: At harvesting time (mid April) fruits of each treatment were harvested then yield was recorded including number of fruits per tree and fruit weight (gm) were recorded, estimated yield as kg/tree , Tons per feddan was also concerned as yield kg/treex168tree in feddan.

5- Fruit quality: Ten fruits were sampled from each tree to determine certain fruit characteristics as follow: Fruit weight (gm), fruit size (cm^3)and juice percentage, Total soluble solids (T.S.S.%) in fruit juice using a hand refractometer Abbe, Total acidity% and Ascorbic acid (mg/100ml juice) content were determined according to **A.O.A.C.(1975).** In addition, T.S.S./ acid ratio was also calculated.

6- Soil analysis: Soils were sampled at the depth of 60 cm of the three studied soils to determine total N, NO3, NH_4,P,K, Fe, Zn, Mn and Cu according to **Jackson (1958)** and **Wilde *et. al.,(*1985).**at the starting (Table2) and at the end of the experiment (Tables11&12).

7- Statistical analysis: The obtained data of each season were statistically analyzed using the procedure outlined by **Snedecor and Cochran (1985).** Mean separation

Table (2) Physical and Chemical analysis of the three types of soil.

Soil texture	E.C. ms/cm	pH	Mechanical analysis				
			Sand%	Silt%	Clay%	O.M.%	$CaCo_{3\%}$
Silty loam	0.62	8.45	7.3	72.59	17.7	1.86	0.55
Loamy sand	0.92	8.01	61.46	23.0	8.8	0.80	5.94
Sandy	1.7	7.85	86.56	2.6	3.1	0.04	7.70
		Chemical analysis					
		mg/kg soil					
		Total N		NO_3		NH_4	
Silty loam		39.9		14.9		8.10	
Loamy sand		19.1		6.90		3.4	
Sandy		7.1		3.30		1.70	
		Available soil nutrients, mg/kg soil					
		P	K	Fe	Zn	Mn	Cu
Silty loam		21.4	22.5	2.4	0.8	1.9	0.33
Loamy sand		18.3	23.2	3.8	1.6	2.9	1.1
Sandy		5.6	16.19	1.14	0.41	0.16	0.8

RESULTS AND DISCUSSION

Growth parameters and leaf water content (%):

It is clear from Table (3) that supplying Valencia orange trees with all organic sources was significantly improved shoots length (cm), number of leaves per shoot, leaf area (cm^2) and leaf water content (%), results indicated that organic fertilizers were more effective in increasing vegetative growth and leaf water content than mineral ones in all types of soil due to improving water- holding capacity of soil. The highest values were obtained by adding poultry manure. On the other hand, applying sewage sludge and town waste composts had little vegetative growth and leaf water content than control. The lowest value of growth was obtained by adding town waste due to the poor contents of macro and micro nutrients. Vegetative growth characters increased by using poultry manure could be interpreted that it contains twice amount of nitrogen and much P and K than others.

Similar results were reported by many investigators such as **Chokha, *et. al*., (1993).** on sweet orange trees mentioned that using organic manure gave satisfactory increase in vegetative growth and leaf water contents. **Abdel-Nasser and Harhash (2000)** found that organic manure had positively affect on soil water- holdin capacity which led to increase leaf water contents.

Table 3

Leaf pigment and mineral contents:

Leaf chlorophyll (a & b) contents, Table (4) respond statistically by the different sources of organic fertilizers and recorded an increase while, decreased leaf carotene content. It is quite evident from Table (5) that leaf N,P,K content were significantly affected by adding organic fertilizers. The results also indicated the improving effect of organic sources on leaf N,P and K. It could be arranged in the following descending order, N (poultry manure, cattle manure& sewage sludge, sheep manure, mineral fertilizer (control) & town waste. P (cattle manure, sewage sludge, poultry manure, sheep manure town waste, mineral fertilizer (control). It is clear from data of Table (6) that leaf Fe content was the largest when cattle manure source was applied which occupied the first rank, then sewage sludge compost, poultry manure, sheep manure and town waste in descending order. While, control had the lowest values. Leaf Zn content as a results of treated organic manure fertilizers were the largest when sewage sludge compost was applied, followed by sheep manure, town waste, poultry manure, cattle manure, town waste compost, control in descending order. Leaf Mn on the other hand, affected with source of organic compost and had the largest content by fertilizing with cattle manure, whilst, the lowest result was achieved by using town waste. These results were true in the three soil experiments. The values of these parameters were greater in silty loam, sandy loam and sandy soil in descending order. The same conclusion was observed by **Huang *et. al*, (1995)** and **Abou- Sayed (1997).**

Table (4): Leaf chlorophyll (a & b) and carotene (mg/100gm fresh weight of Valencia orange trees as affected by different sources of organic fertilizer at different soil types.

Leaf pigment contents		Chlorophyll(a)			Chlorophyll(b)			Carotene		
Soil type (A)	Fertilizer source (B)	2008	2009	mean	2008	2009	mean	2008	2009	mean
Silty loamy	Poultry manure	143.7	145.9	144.80	76.1	76.2	76.15	26.3	26.2	26.25
	Sheep manure	125.0	127.1	126.05	68.9	69.1	69.00	27.6	27.4	27.50
	Cattle manure	138.8	140.0	139.40	79.7	81.9	80.80	27.4	27.2	27.30
	Sewage sludge	118.6	119.7	119.15	50.9	51.1	51.00	39.7	39.5	39.60
	Town waste	115.0	116.1	115.55	47.3	47.5	47.40	36.6	36.4	36.50
	Control(NPK)	123.3	123.9	123.60	64.9	65.0	64.95	28.6	28.4	28.50
	Mean	127.4	128.63	128.01	64.53	65.13	64.88	31.03	30.85	30.94
Loamy sand	Poultry manure	139.0	141.0	140.0	72.8	72.9	72.85	26.5	26.3	26.40
	Sheep manure	119.8	121.0	120.40	67.1	67.4	67.25	27.8	27.6	27.70
	Cattle manure	133.7	130.8	134.25	68.9	69.1	69.00	27.7	27.4	27.55
	Sewage sludge	113.0	113.9	113.45	47.4	47.9	47.65	40.4	40.3	40.35
	Town waste	109.4	110.3	109.85	43.8	43.9	43.85	37.3	37.2	37.25
	Control(NPK)	117.8	118.9	118.35	61.9	62.1	62.0	29.5	29.2	29.35
	Mean	122.12	123.32	122.72	60.32	60.88	60.60	31.53	31.33	31.43
Sandy	Poultry manure	128.6	129.6	129.10	67.6	68.7	68.15	27.2	23.9	25.55
	Sheep manure	108.7	109.6	109.15	64.8	65.1	64.95	28.3	27.8	28.05
	Cattle manure	123.6	124.5	124.05	66.2	67.1	66.65	28.2	27.6	27.90
	Sewage sludge	102.2	103.2	102.70	45.2	46.1	45.65	42.6	41.3	41.95
	Town waste	98.0	99.1	98.55	41.0	42.2	41.60	39.5	38.2	38.85
	Control(NPK)	107.6	108.7	108.15	59.6	60.1	59.85	30.7	30.5	30.60
	Mean	111.45	112.45	111.95	57.4	58.22	57.80	32.75	31.55	32.15
L.S.D. at 5%	Soil type (A)	0.114	0.112		0.03	0.06		0.004	0.003	
	Fertilizer source (B)	0.235	0.249		0.26	0.28		0.015	0.019	
Interaction	(A)X(B)	0.671	0.731		0.45	0.58		0.111	0.117	

Table (5): Leaf N,P and K (%) contents of Valencia orange trees as affected by different sources of organic fertilizer at different soil types.

Leaf NPK contents(%)		N			P			K		
Soil type (A)	Fertilizer source (B)	2008	2009	mean	2008	2009	mean	2008	2009	mean
Silty loamy	Poultry manure	2.90	3.00	2.95	0.62	0.64	0.63	1.96	1.75	1.85
	Sheep manure	2.70	2.80	2.75	0.55	0.57	0.56	1.82	1.62	1.72
	Cattle manure	2.80	2.90	2.85	0.74	0.76	0.75	1.71	1.42	1.56
	Sewage sludge	2.80	2.90	2.85	0.63	0.66	0.65	1.75	1.41	1.58
	Town waste	2.60	2.70	2.65	0.52	0.53	0.52	1.68	1.34	1.51
	Control(NPK)	2.61	2.66	2.63	0.42	0.44	0.43	1.60	1.48	1.54
	Mean	2.74	2.83	2.78	0.58	0.60	0.59	1.75	1.50	1.63
Loamy sand	Poultry manure	2.60	2.70	2.65	0.49	0.51	0.50	1.74	1.49	1.61
	Sheep manure	2.40	2.50	2.45	0.32	0.34	0.33	1.52	1.38	1.45
	Cattle manure	2.50	2.60	2.55	0.52	0.54	0.53	1.41	1.26	1.34
	Sewage sludge	2.50	2.55	2.52	0.50	0.51	0.50	1.35	1.25	1.30
	Town waste	2.30	2.40	2.35	0.39	0.41	0.40	1.28	1.18	1.23
	Control(NPK)	2.40	2.43	2.42	0.28	0.29	0.29	1.38	1.28	1.33
	Mean	2.45	2.53	2.49	0.42	0.43	0.43	1.45	1.31	1.38
Sandy	Poultry manure	2.50	2.60	2.55	0.52	0.53	0.53	1.44	1.32	1.38
	Sheep manure	2.30	2.40	2.35	0.34	0.36	0.35	1.22	1.18	1.20
	Cattle manure	2.40	2.50	2.45	0.56	0.58	0.57	1.21	1.15	1.18
	Sewage sludge	2.43	2.59	2.52	0.53	0.54	0.54	1.19	1.15	1.17
	Town waste	2.21	2.30	2.25	0.42	0.46	0.43	1.12	1.08	1.10
	Control(NPK)	2.32	2.35	2.33	0.29	0.31	0.30	1.90	1.80	1.85
	Mean	2.36	2.46	2.41	0.44	0.46	0.45	1.35	1.28	1.31
L.S.D. at 5%	Soil type (A)	0.22	0.29		0.07	0.09		0.08	0.07	
	Fertilizer source (B)	0.34	0.53		0.10	0.13		0.11	0.13	
Interaction	(A)X(B)	0.81	0.88		0.22	0.24		0.27	0.32	

Fruiting :

1-Fruit set%:

It is clear from Table (7) that Valencia orange trees had the highest fruit set% when fertilized with poultry manure while, town waste had the lowest affect, these results were recorded in all soil types. Silty loam soil had the best percentage in this concern.

2-June drop%:

Table (7) on the other hand, revealed that June drop% increased by adding town waste fertilizer in sandy soil while, poultry manure fertilizer had the lowest fruit June drop% in silty loam soil.

3-Fruiting%:

The same Table (7) cleared that trees planted in silty loam soil and fertilized with poultry manure fertilizer had the largest fruiting percentage while, the opposite was true in sandy soil especially when adding town waste or sewage sludge fertilizer.

These results are confirmed by the findings of **Chokha, *et. al*., (1993).** on sweet orange trees, **Abou- Sayed, (1997).** on Balady mandarin and **El- Kobbiaobbia, (1999).** on Navel orange trees mentioned that using organic manure gave satisfactory increase in fruit set % and fruiting and decrease June drop% of the trees.

Table (6): Leaf Fe, Zn and Mn (ppm) contents of Valencia orange trees as affected by different sources of organic fertilizer at different soil types.

Leaf Fe, Zn and Mn (ppm)		Fe			Zn			Mn		
Soil type (A)	Fertilizer source (B)	2008	2009	mean	2008	2009	mean	2008	2009	mean
Silty loamy	Poultry manure	145	140	143	30	31	30.5	43	44	34.5
	Sheep manure	139	150	144	36	37	36.5	38	39	38.5
	Cattle manure	370	375	373	29	30	29.5	52	54	53.0
	Sewage sludge	181	183	182	43	45	44.0	47	49	48.0
	Town waste	124	131	128	31	32	31.5	32	34	33.0
	Control(NPK)	120	122	121	28	29	28.5	43	44	33.5
	Mean	180	184	182	33	34	33.4	42.5	44	43.3
Loamy sand	Poultry manure	123	128	126	27	28	27.5	29	31	30.0
	Sheep manure	117	138	128	23	34	33.5	24	26	25.0
	Cattle manure	340	350	345	26	28	27.0	38	39	38.5
	Sewage sludge	167	168	168	40	41	40.5	33	36	34.5
	Town waste	102	109	106	29	30	29.5	23	25	34.0
	Control(NPK)	101	104	103	25	26	25.5	30	32	31.0
	Mean	158	166	162	30	31	30.6	29.5	30	29.8
Sandy	Poultry manure	111	117	114	21	22	21.50	23	25	24.0
	Sheep manure	106	127	117	27	28	27.5	18	21	19.5
	Cattle manure	324	327	326	20	22	21.0	32	34	33.0
	Sewage sludge	143	146	145	34	37	35.5	27	29	28.0
	Town waste	93	96	95	23	24	34.5	16	19	17.5
	Control(NPK)	91	92	92	20	21	20.5	24	26	25.0
	Mean	145	151	148	24	28	24.9	23.3	25.7	24.5
L.S.D. at 5%	Soil type (A)	17.1	18.3		10.7	11.3		3.6	3.7	
	Fertilizer source (B)	21.4	22.3		11.8	11.9		3.9	3.8	
Interaction	(A)X(B)	26.2	26.4		13.4	14.9		4.9	4.7	

Table (7): Fruit set (%), June drop (%) and fruiting (%)of Valencia orange trees as affected by different sources of organic fertilizer at different soil types.

Fruiting parameters		Fruit set (%)			June drop (%)			Fruiting (%)		
Soil type (A)	Fertilizer source (B)	2008	2009	mean	2008	2009	mean	2008	2009	mean
Silty loamy	Poultry manure	28.9	29.1	29.00	66.5	65.1	65.80	1.49	1.51	1.50
	Sheep manure	27.8	27.9	27.85	69.1	68.8	69.00	1.34	1.36	1.35
	Cattle manure	28.0	28.2	28.10	68.8	68.5	68.65	1.38	1.39	1.38
	Sewage sludge	24.7	24.9	24.80	72.1	71.5	71.80	1.28	1.29	1.29
	Town waste	24.3	24.0	24.15	77.5	76.2	76.85	1.24	1.26	1.25
	Control(NPK)	25.8	25.9	25.85	70.3	69.9	70.10	1.32	1.34	1.33
	Mean	26.6	26.7	26.65	70.72	70.00	70.36	1.34	1.36	1.35
Loamy sand	Poultry manure	26.8	27.0	26.90	69.6	68.1	68.85	1.45	1.48	1.47
	Sheep manure	25.7	25.9	25.80	72.2	71.1	71.65	1.29	1.31	1.30
	Cattle manure	25.9	26.1	26.00	71.7	70.5	71.10	1.33	1.35	1.34
	Sewage sludge	22.6	22.8	22.70	75.1	74.2	74.65	1.23	1.26	1.24
	Town waste	22.2	22.4	22.30	79.1	77.3	78.20	1.19	1.21	1.20
	Control(NPK)	23.7	23.9	23.80	73.3	71.4	72.35	1.27	1.29	1.28
	Mean	24.9	24.7	24.80	73.5	72.1	72.80	1.29	1.32	1.31
Sandy	Poultry manure	22.5	22.7	22.60	71.5	70.3	70.90	1.40	1.42	1.41
	Sheep manure	21.4	21.6	21.50	74.1	73.2	73.65	1.25	1.28	1.27
	Cattle manure	21.6	21.8	21.70	73.4	72.5	72.95	1.29	1.32	1.31
	Sewage sludge	18.1	18.7	18.40	77.1	75.2	76.10	1.19	1.21	1.20
	Town waste	18.3	18.9	18.60	82.1	79.4	80.75	1.15	1.19	1.17
	Control(NPK)	19.4	20.2	19.80	75.4	73.2	74.30	1.23	1.26	1.24
	Mean	20.22	20.65	20.44	75.6	73.9	74.80	1.25	1.28	1.27
L.S.D. at 5%	Soil type (A)	0.29	0.31		0.21	0.23		0.07	0.06	
	Fertilizer source (B)	0.43	0.49		0.34	0.41		0.09	0.11	
Interaction	(A)X(B)	0.84	0.76		0.87	0.93		0.43	0.44	

Yield:

Results concerning yield (fruit number per tree, kgs per tree and Tons per feddan) are shown in Table (8). The obtained data revealed that fertilizing Valencia orange trees with organic and mineral fertilizers were most effective in increasing yield. The main observation is that treating trees with poultry manure fertilizer had the bigger yield than those treated with other fertilizer sources. Moreover, second season gave higher yield than the first season in all organic or mineral fertilizers. Nevertheless, there were significant differences between fertilizer sources as well as between soil types in yield. Also, the interaction between fertilizer sources and soil types was significant.

These results were agreed with **Motskobili, (1984).**and **Huang, *et. al*., (1995).** On Satsuma mandarin trees mentioned that using organic manure gave satisfactory increase in yield

Table (8): Yield of Valencia orange trees as affected by different sources of organic fertilizer at different soil types.

Yield parameters		Fruit No. /tree			Yield/tree(kg)			Yield/feddan (Ton)		
Soil type (A)	Fertilizer source (B)	2008	2009	mean	2008	2009	mean	2008	2009	mean
Silty loamy	Poultry manure	326	329	328	81.21	82.81	82.01	13.12	13.64	13.38
	Sheep manure	315	317	316	70.91	70.37	70.64	11.82	11.91	11.87
	Cattle manure	320	322	321	74.21	75.79	75.00	12.46	12.73	12.60
	Sewage sludge	300	302	301	60.69	62.94	61.81	10.19	10.54	10.37
	Town waste	290	297	293	56.84	59.69	58.19	9.55	10.03	9.78
	Control(NPK)	305	307	306	66.79	67.85	61.41	11.22	11.39	11.30
	Mean	309	312	311	68.44	69.91	69.18	11.49	11.61	11.55
Loamy sand	Poultry manure	320	323	321	76.22	77.55	76.89	12.80	13.03	12.91
	Sheep manure	309	311	310	66.15	67.52	66.84	11.11	11.34	11.22
	Cattle manure	314	317	315	69.33	70.98	70.15	11.65	11.92	11.78
	Sewage sludge	294	298	296	56.30	57.99	57.14	9.45	9.74	9.60
	Town waste	284	288	286	52.27	54.48	53.38	8.78	9.15	8.96
	Control(NPK)	299	301	300	62.19	63.51	62.85	10.45	10.66	10.55
	Mean	303	306	305	63.74	65.34	64.54	10.71	10.97	10.84
Sandy	Poultry manure	318	320	319	74.13	76.54	75.34	12.45	12.86	12.65
	Sheep manure	307	309	308	64.19	65.53	64.86	10.77	11.01	10.89
	Cattle manure	313	315	314	67.57	69.07	68.32	11.35	11.60	11.47
	Sewage sludge	292	295	293	54.46	56.02	55.24	9.15	9.41	9.28
	Town waste	282	286	284	50.76	52.94	51.85	8.53	8.89	8.71
	Control(NPK)	297	301	299	60.29	62.94	61.62	10.13	10.57	10.35
	Mean	302	304	303	61.90	63.84	62.87	10.39	10.72	10.56
L.S.D. at 5%	Soil type (A)	2.9	2.8		2.7	2.6		0.15	0.19	
	Fertilizer source (B)	2.7	2.6		2.5	2.4		0.21	0.24	
Interaction	(A)X(B)	2.99	3.11		2.66	2.69		0.43	0.49	

Fruit Quality:

1-Fruit physical properties:

Data presented in Table (9) cleared that the studied parameters including fruit weight (gm), fruit size (cm^3) and juice % had significant differences in all fertilizers sources. Trees received organic fertilizers such as Poultry manure, cattle manure, sheep manure , chemical fertilizer, sewage sludge, town waste, respectively improved fruit physical properties. Trees treated with town waste had the lowest fruit physical properties. The interaction between fertilizer sources and soil types was significant.

Table (9): Some fruit physical properties of Valencia orange trees as affected by different sources of organic fertilizer at different soil types.

Some fruit physical properties		Fruit weight (gm)			Fruit size(cm^3)			Juice (%)		
Soil type (A)	Fertilizer source (B)	2008	2009	mean	2008	2009	mean	2008	2009	mean
Silty loamy	Poultry manure	249.1	251.7	250.4	199.0	201.0	200.0	57.0	53.0	55.0
	Sheep manure	225.1	222.0	223.5	192.0	194.0	193.0	54.0	51.0	54.5
	Cattle manure	231.9	235.4	233.7	196.0	197.0	196.5	55.0	52.0	53.5
	Sewage sludge	202.5	208.4	205.5	188.0	189.0	188.5	52.0	49.0	50.4
	Town waste	196.0	201.0	198.5	184.0	185.0	184.5	48.0	44.0	46.0
	Control(NPK)	219.0	221.0	220.0	190.0	191.0	190.5	53.0	49.0	51.0
	Mean	220.6	223.3	221.9	192.9	192.8	192.9	53.2	49.7	51.6
Loamy sand	Poultry manure	238.2	240.1	239.1	196.o	198.0	197.0	55.0	51.0	53.0
	Sheep manure	214.1	217.1	215.6	190.0	191.0	190.5	52.0	48.0	50.0
	Cattle manure	220.8	223.9	222.4	193.0	194.0	193.5	53.0	49.0	51.0
	Sewage sludge	191.5	194.6	193.1	184.0	185.0	184.5	50.0	46.0	48.0
	Town waste	185.1	189.2	187.1	181.0	182.0	181.8	46.0	41.0	43.5
	Control(NPK)	208.0	211.0	209.5	188.0	189.0	188.5	51.0	48.0	49.5
	Mean	209.6	212.7	211.2	188.6	189.8	189.2	51.2	47.2	49.2
Sandy	Poultry manure	233.1	239.2	236.1	193.0	194.0	193.5	54.0	50.0	52.0
	Sheep manure	209.1	212.1	210.5	188.0	189.0	188.5	51.0	47.0	48.0
	Cattle manure	215.9	219.3	217.6	191.0	190.0	190.5	52.0	58.0	55.0
	Sewage sludge	186.5	189.9	188.2	182.0	180.0	181.0	49.0	45.0	47.0
	Town waste	180.0	185.1	182.5	179.0	180.0	178.5	45.0	41.0	43.0
	Control(NPK)	203.0	209.1	206.1	185.0	186.0	185.5	50.0	46.0	48.0
	Mean	204.6	209.1	206.9	186.3	186.5	186.4	50.2	47.8	49.0
L.S.D. at 5%	Soil type (A)	1.7	1.5		1.8	1.7		0.28	0.31	
	Fertilizer source (B)	1.9	1.8		1.9	1.8		0.35	0.48	
Interaction	(A)X(B)	1.44	1.49		1.22	1.37		0.74	0.79	

2- Fruit chemical properties:

Data illustrated in Table (10) showed that the studied parameters i.e., T.S.S.%, T.S.S./ acid ratio and ascorbic acid (mg/100ml juice) were increased by fertilizing with organic or mineral sources but organic manure sources were effective in this respect. The improvement in fruit quality in response to application of organic manure and mineral fertilizers could be arranged in descending order as follows: poultry manure, cattle manure, sheep manure, chemical fertilizer, sewage sludge and town waste was noticed. These results were recorded in all studied soil types and the interaction between fertilizer sources and soil types was significant. These results agree with those obtained by **Motskobili, (1984).** on Satsuma mandarin, **Chokha, *et. al.*, (1993).** on Sweet orange trees, **Huang, *et. al.*, (1995).** on Satsuma mandarin trees, **El- Kobbiaobbia(1999).** on Navel orange trees, **Grassi, *et. al.*, (1999).** on Rangpour Lime, and **Helail, *et. al.*, (2003).** on Washington navel orange trees mentioned that using organic manure was improving fruit quality and fruits had more T.S.S.% and ascorbic acid.

Table (10): Some fruit chemical properties of Valencia orange trees as affected by different sources of organic fertilizer at different soil types.

Some fruit chemical properties		T.S.S. (%)			Acidity (%)			T.S.S./acid ratio			Ascorbic acid (mg/100ml juice)		
Soil type (A)	Fertilizer source (B)	2008	2009	mean	2008	2009	mean	2008	2009	mean	2008	2009	mean
Silty loamy	Poultry manure	12.7	12.8	12.75	1.1	1.2	1.15	11.54	10.67	11.11	46.0	48.0	47.00
	Sheep manure	12.1	12.3	12.20	1.1	1.1	1.10	11.00	11.18	11.09	40.1	40.8	40.45
	Cattle manure	12.4	12.6	12.50	1.1	1.1	1.10	11.27	11.45	11.36	43.0	44.0	43.50
	Sewage sludge	11.8	11.9	11.85	1.1	1.1	1.10	10.73	10.82	10.78	36.0	37.0	36.50
	Town waste	11.6	11.8	11.70	1.2	1.2	1.20	9.66	9.83	9.75	34.4	35.1	34.75
	Control(NPK)	11.9	12.1	12.00	1.1	1.1	1.10	10.82	11.00	10.91	39.2	41.0	40.10
	Mean	12.08	12.25	12.17	1.1	1.1	1.10	10.89	10.99	10.94	39.8	40.9	40.38
Loamy sand	Poultry manure	12.5	12.7	12.60	1.1	1.1	1.10	11.36	11.54	11.45	45.0	45.2	45.10
	Sheep manure	11.9	12.2	11.05	1.1	1.1	1.10	10.81	11.09	10.95	39.3	40.1	39.70
	Cattle manure	12.2	12.5	12.35	1.1	1.1	1.10	11.09	11.36	11.23	42.1	42.7	42.40
	Sewage sludge	11.6	11.7	11.65	1.0	1.0	1.00	11.60	11.70	11.65	35.2	35.9	35.55
	Town waste	11.4	11.6	11.50	1.2	1.2	1.20	9.50	9.67	9.59	33.1	33.8	33.45
	Control(NPK)	11.7	11.9	11.80	1.1	1.1	1.10	10.64	10.64	10.63	37.9	38.4	38.15
	Mean	11.9	12.1	12.00	1.1	1.1	1.10	10.83	10.99	10.91	38.8	39.4	39.1
Sandy	Poultry manure	12.1	12.4	12.25	1.1	1.1	1.10	11.00	11.27	11.14	43.8	44.2	44.0
	Sheep manure	11.5	11.8	11.65	1.1	1.1	1.10	10.45	10.73	10.59	38.1	38.8	38.45
	Cattle manure	11.8	12.1	11.45	1.1	1.1	1.10	10.73	11.00	10.87	41.2	41.7	41.45
	Sewage sludge	11.2	11.6	11.40	1.0	1.1	1.05	11.20	10.54	10.86	34.0	34.8	34.40
	Town waste	11.0	11.4	11.20	1.1	1.2	1.15	10.00	9.50	9.75	32.1	32.5	32.30
	Control(NPK)	11.3	11.5	11.40	1.1	1.1	1.10	10.27	10.45	10.36	36.3	36.9	36.60
	Mean	11.5	11.8	11.70	1.1	1.1	1.10	10.61	10.58	10.60	37.6	38.2	37.90
L.S.D. at 5%	Soil type (A)	0.7	0.6		0.04	0.05		0.5	0.04		0.29	0.32	
	Fertilizer source (B)	0.8	0.9		0.06	0.08		0.13	0.17		0.34	0.42	
Interaction	(A)X(B)	1.02	1.04		0.11	0.14		0.22	0.24		0.73	0.79	

Soil content of different nitrogen fractions:

Table (11) cleared that total nitrogen (N) and (NH_4) remained in the soil was positively affected by the source of N fertilizer (Organic or mineral). The highest Total N values were obtained by organic manure i.e. poultry manure, cattle manure, sheep manure, mineral fertilizer, sewage sludge and town waste in descending order. Soil No_3 content as a results of fertilization, chemical fertilizer was positively affected than organic manure while, NH4 values were obtained by using poultry manure, sheep manure , cattle manure, sewage sludge, mineral and town waste in descending order. Soil fertilized with poultry manure had the largest No_3 in organic fertilizers followed by sheep & sewage manure then town waste whereas, soil treated with cattle manure recorded the lowest No_3 These results were true in all studied soils. The values of these results were greater in silty loam, sandy loam and sandy soil in a descending order.

The superiority of organic manure fertilizer may be due to slow leaching from soil which lead to higher efficiency. Besides, the favorable effects of poultry manure may be associated with its action reducing soil PH and subsequently enhancing the uptake of nutrients. The beneficial effect of organic manure on amending the trees with their requirements from N at longer period in addition to the lower loss of N applied of organic fertilizers could explain the present results. So, exhibits total N remained in the soil for a long time.

Table 11

Some soil physical and chemical properties:

Data of Table (12) indicated that organic fertilizers were more effective than chemical fertilizer in improving the soil characteristics. Soil organic matter content (OM) significantly increased, while, the soil PH were decreased as a results of organic fertilizers addition. The decrease in soil pH is due to organic acids produced during organic manure decomposition and its effects on solubility of some soil minerals or due to releasing the nutrients through organic manure decay by micro-organism activity. Data presented in the same Table revealed that applying of organic manure significantly increased the level of available nutrients in soil. These increase due to the increase of acidity produced by adding of the organic manures decomposition and its effects on solubility of some soil minerals. The high level of soil N, and P were found with the addition of poultry manure while, using cattle manure led to increase soil (K, Fe and Mn) contents. Adding sewage sludge compost to the soil led to increase the soil (ZN and Cu) contents than the other fertilizers.

Data cleared also, that silty loam soil had the highest contents of nitrogen and phosphorus as a results of treatments, while, loamy sand recorded the highest values of K,Fe,Zn, Mn and Cu. Sandy soil had the lowest contents of these elements.

Table (12): Soil OM ,PH and some available nutrients at different soil types as affected by different sources of organic fertilizer at the end of experiment.

		OM (%)	PH	Available soil nutrients (mg/kg soil)					
Soil type (A)	Fertilizer source (B)			P	K	Fe	Zn	Mn	Cu
available nutrients before addition		1.86	8.45	21.4	22.5	2.4	0.8	1.9	0.33
Silty loamy	Poultry manure	2.31	8.20	25.4	35.9	3.3	1.3	2.8	0.90
	Sheep manure	2.12	8.28	22.3	35.6	3.9	1.5	2.7	0.90
	Cattle manure	1.94	8.32	20.1	37.2	4.3	1.1	3.4	0.80
	Sewage sludge	1.94	8.32	20.5	35.4	3.7	1.6	3.0	1.20
	Town waste	1.96	8.40	19.3	35.9	3.5	1.2	2.6	1.00
	Control (NPK)	1.93	8.00	18.2	24.7	3.2	1.1	2.5	0.90
	Mean	2.03	8.20	20.9	34.1	3.7	1.3	2.83	0.95
available nutrients before addition		0.80	8.01	18.3	23.2	3.8	1.6	2.9	1.1
Loamy sand	Poultry manure	2.08	7.83	22.3	45.9	3.9	1.7	3.2	1.0
	Sheep manure	1.89	7.89	19.2	43.8	4.5	1.8	3.1	1.0
	Cattle manure	1.71	7.93	17.0	44.5	4.9	1.4	3.8	0.9
	Sewage sludge	1.71	7.91	17.4	42.7	4.3	1.9	3.4	1.3
	Town waste	1.63	7.96	16.2	43.2	4.1	1.5	3.0	1.1
	Control(NPK)	1.50	7.77	15.1	32.0	3.8	1.4	2.9	1.0
	Mean	1.75	7.88	17.9	42.0	4.3	1.6	3.2	1.06
available nutrients before addition		0.04	7.85	5.6	16.19	1.14	0.41	0.16	0.8
Sandy	Poultry manure	1.71	7.72	18.1	32.5	3.1	1.1	2.4	0.8
	Sheep manure	1.52	7.74	15.0	32.2	3.7	1.3	2.5	0.8
	Cattle manure	1.34	7.78	12.8	33.8	4.1	0.9	3.2	0.7
	Sewage sludge	1.33	7.77	13.2	32.0	3.5	1.4	2.8	1.1
	Town waste	1.26	7.81	12.0	32.4	3.2	1.0	2.4	0.9
	Control(NPK)	1.13	7.68	11.9	21.3	3.0	0.9	2.3	0.8
	Mean	1.38	7.75	13.8	30.7	3.4	1.1	2.6	0.9
L.S.D. at %	Soil type (A)	0.77	0.7	0.04	0.06	0.09	0.05	0.26	0.38
	Fertilizer source (B)	0.83	0.8	0.07	0.07	0.14	0.16	0.31	0.46
Interaction	(A)X(B)	1.07	1.09	0.18	0.16	0.27	0.28	0.74	0.81

These results are in harmony with those obtained by **Abou seeda (1997), Fliessbach *et al;* (2000)** and **Abdel Nasser and Harhash (2000**). They concluded that, applying organic manure to soil for reducing soil pH led to increase N, P, K, Fe, Zn and Mn soil contents. Moreover, organic manure improves the water holding capacity, cation exchange capacity and stabilizes the properties of sandy soils.

Organic matter also improves the nutritional status of all the soil types and sandy soil in particular. Finally, they suggested that organic manure application increased the transfer of elements between solid phase and soil solution by the higher microbial activity.

CONCLUSION:

Egyptian soils are poor in organic matter. Using organic manure as a source of N requirements for trees production reduced fertilization costs and decreasing the losses in total N that can cause by leaching of nitrate or reduction of nitrate resulting in the formation of gaseous nitrogen that loss by volatilization when using chemical fertilizers. Thus, using organic manure considered as an alternative source of trees nutrients as well as a soil amendment to improve the soil physical properties that enhance the tree production.

Generally, it could be concluded that there is a strong positive correlation between using organic fertilizer and the improving of vegetative growth leaf water, chlorophyll and mineral contents. Significant decrease of June drop which led to significant increase in yield/tree are also obtained..

Conclusively, adding organic fertilizer plays an active and important role for improving the soil organic matter and nutrients.

Finally, poultry manure addition attained great significant effect on tree growth, higher yield and better fruit quality (T.S.S ,T.S.S/acid ratio and ascorbic acid content). In conclusion, the presented investigation demonstrated the validity of producing Valencia orange trees using organic manure as the sole nutrients supplier, The composted sources, generally showed better growth and increase in leaf pigments and mineral contents as well as greater fruit set and fruiting which led to greater yield, fruit weight, size and improved most fruit quality components as compared with NPK fertilizers. The addition of organic manure improved the organic matter and decreased pH which led to releasing the nutrient and increase N, P, K, Fe, Zn ,Mn and Cu soil contents.

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أستجابة أشجار البرتقال الفالنشيا لبعض مصادر الأسمدة العضوية تحت أنواع مختلفة من التربة

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**** قسم الأراضى وأستغلال المياة - المركز القومى للبحوث - الدقى - جيزة**
***** قسم تغذية النبات - المركز القومى للبحوث – الدقى – جيزة.**

أجريت هذه الدراسة فى موسمين ٢٠٠٨و ٢٠٠٩ فى ثلاث أنواع من التربة (السلتية الطمية) بالشرقية، (الطميية الرملية) بأبشواى الفيوم و(الرملية) بالنوبارية لدراسة تأثير بعض مصادر الأسمدة العضوية (سماد الدواجن- سماد الغنم- سماد الماشية- سماد مخلفات المجارى وسماد مخلفات المدن مقارنة بالسماد الكيماوى على النمو ومحتوى الأوراق من المياه والصبغات وعناصر النتروجين، الفوسفور، البوتاسيوم، الحديد، والزنك، المنجنيز وعلى العقد والتساقط والأثمار والمحصول وجودة الثمارفى أشجار البرتقال الفالنشيا عمرها عشرون سنة مطعومة على أصل النارنج وكذلك على التغير فىpH, OM. ومحتوى التربة من (N, NH4, No3, P, K, Fe, Mn, Zn and Cu)

أستخدم السماد العضوى بمعدل ١٢ طن للفدان بما يعادل حوالى٤و٧١ كج/ شجرة تقسم على ثلاث دفعات متساوية وتضاف فى يناير، مارس وأغسطس كما أضيف صخر الفوسفات بمعدل ٢٠٠جرام/ شجرة تضاف فى يناير وكدلك أضيف الفلسبار كمصدر للبوتاسيوم بمعدل ٤٠٠ جرام /شجرة تقسم على دفعتين تضاف الأولى فى مارس والثانية فى أغسطس. أما السماد المعدنى فكان سلفات النشادر كمصدر للنتروجين بمعدل ٨٠٠ جرام/ شجرة تقسم على ثلاث دفعات متساوية وتضاف فى يناير، مارس وأغسطس، سوبر فوسفات كمصدر للفوسفور بمعدل ٤٠٠جرام/شجرة تضاف فى يناير وسلفات البوتاسيوم بمعدل ٤٠٠جرام /شجرة تقسم على دفعتين متساويتن تضاف فى مارس وأغسطس.

وكانت أهم النتائج المتحصل عليها كالاتى:

١- أوضحت النتائج زيادة معنوية فى معظم صفات النمو باستخدام سماد الدواجن ودلك فى صورة زيادة طول الأفرع- عدد الأوراق/ فرع- مساحة الورقة- محتوى الأوراق من المياة والكلوروفيل وبينما يقل محتوى الأوراق من الكاروتين وكان ترتيب الأسمدة من حيث الزيادة تنازليا (سماد الدواجن- سماد الماشية- سماد الغنم- السماد الكيماوى- سماد مخلفات المجارى- مخلفات المدن

٢- كانت الأشجار النامية فى التربة السلتية الطميية الأحسن فى النمو الخضرى وأوراقها الأعلى فى محتواها من المياه و العناصر تليها التربة الرملية السلتية ثم التربة الرملية الأقل.

٣- سجلت الأوراق الناتجة من الأشجار المعاملة بسماد الدواجن أعلى محتوى من النتروجين والبوتاسيوم فى حين كان الأعلى فى المحتوى من الفوسفور والحديد والمنجنيز هو الناتج من اضافة سماد الماشية فى حين أعطت المعاملة بسماد مخلفات المجارى أعلى القيم فى المحتوى من الزنك.

٤- الأشجار المعاملة بسماد الدواجن كانت الأعلى فى نسبة العقد والأثمار و الأقل فى التساقط والأكبر فى المحصول ووزن الثمرة وحجمها ونسبة العصير فى الثمار ومحتوى العصير من المواد الصلبة الدائبة والمواد الصلبة الدائبة/ الحموضة وحمض الأسكوربيك.

٥- يتضح من تحليل التربة فى نهاية التجربة الأتى:

أحتوت التربة المعاملة بسماد الدواجن على أعلى نسبة من النتروجين والأمونيا و الفوسفور فى حين كانت المعاملةبالسماد الكيماوى الأعلى فى النترات بينما تلك المسمدة بسماد الماشية الأعلى فى البوتاسيوم والحديد فى حين التربة المعاملة بسماد مخلفات المدن الأعلى فى محتواها من الزنك والنحاس.

٦ - حدثت زيادة فى محتوى التربة من المادة العضوية (OM)، نقص فى (pH).

٧- من النتائج المتحصل عليها ينصح باستخدام الأسمدة العضوية للحصول على أفضل النتائج من حيث تحسين النمو الخضرى والمحصول وصفات الجودة للثمار وتحسين خواص التربة خاصة سماد الدواجن.