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EFFECT OF SOME ORGANIC WASTES APPLICATION ON GROWTH, CHEMICAL CONTENTS AND YIELD OF SQUASH PLANT

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ABSTRACT

Two field experiments were carried out during two successive summer seasons of 1998 and 1999 at the Experimental Farm of National Research Center at Shalakan (Qalubia Governorate).The experiments were conducted to study the independent application and the combined effects of four organic wastes namely, water hyacinth, peas, orange and chicken manure on squash growth, nutrients contents and fruit yield. Application of compost which contained water hyacinth + peas + orange + chicken manure significantly increased all growth parameters i.e., vine length, number of leaves, fresh and dry weight of branches and leaves and fruit yield.The chemical analysis of vegetative parts revealed some benefits from organic wastes due to their content of N, P and K. The chemical analysis of squash fruits revealed some beneficial increase in N,P and K due to organic manure application although, only the increase of K was significant.

INTRODUCTION

Egyptian soils are low in organic matter about 2 % (Balba, 1976). The conserve their low level of organic matter, Egyptian soils should receive about 82 million tons annually (Raid, 1982). Now with increasing the cost of mineral fertilizers and questions as to their future availability, there is renewed interest in organic recycling to improve soil fertility and productivity. So, organic wastes compost may be utilized in the soil as source of nutrients for crop production (Parr and Hormick, 1990, Abd-El-Sabour and Abou-El-Seoud, 1996). In Egypt, farmyard manure is usually used as organic fertilizer while poultry manure, water hyacinth and industrial organic residues are slightly used in soil fertilization. These organic fertilizer are very greatly in their composition (Makawi, 1978). Poultry manure should not be directly applied to soil because it leads to pensive odorous, attraction and multiplication of flies, spread of many diseases and it is inefficient for fertilizations purposes (Eastop, 1977). However, mixing with other organic material such as chicken manure could lower the high C/N ratio of water hyacinth and industrial organic wastes. Also, favorable purposes could be achieved for rapid composting to produce compost very rich in their nutrients content because the nutrients content in chicken manure is very high. (Diaz *et al.,* 1993). In addition, Unemya and Sekiya (1985) pointed out that, N, P, K, Ca and Mg of soil were increased by heavy application of poultry manure. The addition of organic wastes increased growth and yield of maize and potato plants and their nutrients content (Minhas and Anil Soo 1994). McSorley and Gallaher (1995) found that yield of squash was increased by 155 % when incorporated compost as compared with the unamended

control. Ramachandran, *et al.* (1998) found that vegetable compost addition significantly enhanced the yields and P concentration of rice plant tissues. Moreover, Abdel-El-Moez et al. (1999) evaluated three compost types sheep manure, orange residues and water hyacinth plant mixed with chicken manure. They found that application of organic composts significantly increased the yield of fennel and coriander plants and uptake of N, P, K, Ca and Mg. This study therefore was undertaken over two years to investigate the effect of some organic compost application on the growth, yield and nutrients content by squash plant during the vegetative growth as well as fruit formation. Moreover, to minimize the pollution resulted from the intensive chemical fertilization by substituting it with organic fertilizer.

MATERIALS AND METHODS

Two field experiments were performed in (1998 – 1999), at the farm of the National Research Center (Qalubia Govenorate). Some properties of soil which used in this study are shown in Table (1). Seeds of summer squash Eskandrani cultivar were sown in April of both 1998 and 1999 seasons. Each treatment consisted of four rows each row was 4 meter long, 70 cm width. Plants were spaced 40 cm apart one side of the ridges under surface irrigation.

Table (1) : Some physical and chemical properties of the experimental soil.

pH	E.C. mmhos/cm	$CaC0_3$	O.M	Total N	P	K	Ca	Mg	Fe	Mn	Zn	Cu
		%			ppm							
8.12	1.4	2.4	3.9	0.03	11.6	33.5	3.7	3.0	24	4.5	13	2.6

The different treatments which added to the soil before sowing containing 15 treatments as follows :

1. Control treatments.(60Kg N+30KgP+48KgK).
2. Water hyacinth compost (WH) were collected form the river Nile stream at El-Kanater El-Khiria.
3. Peas compost.
4. Orange compost : Orange residues from food industry of Kaha Factory (Qalubia Governorate).
5. Water hyacinth + peas.
6. Water hyacinth + orange.
7. Water hyacinth + chicken manure (CM).
8. Water hyacinth + peas + chicken manure.
9. Water hyacinth + orange + chicken manure.
10. Water hyacinth + peas + orange + chicken manure.
11. Peas + orange
12. Peas + chicken manure Peas + orange + water hyacinth
13. Peas + orange + chicken manure.
14. Orange + chicken manure.

All the plots received organic compost at the rate of 5 ton/feddan from one type or mixed with one or more than one by equal portion of other organic manure. Some properties of organic compost in this study are shown in Table (2).The treatments were arranged in complete randomized block design with three replicates.

Table (2) : Some chemical properties of organic compost.

Organic manure	N	P	K	Fe	Mn	Cu	Zn	pH	E.C mmhos/cm
	%			µg/g					
WH	2.6	0.74	0.22	1080	869.0	49.9	47.9	7.6	2.6
Peas	2.6	0.34	4.50	1275	94.0	15.0	50.0	6.4	10.7
Orange	0.8	0.06	2.50	81	5.2	5.6	6.9	3.4	2.2
CM	5.1	0.96	0.77	2449	600.0	32.0	312.0	8.0	3.0

Experimental procedures :

1. Plant growth measurements :

A random sample of three plants was chosen from each treatments, 60 days after sowing and the flowering data were recorded :

(i) Vine length (main stem).
(ii) Branches number
(iii) Leaves number
(iv) Fresh and dry weight of both branches and leaves.

2. Chemical composition :

2.1. Chlorophyll content :

Leaves disks were taken 60 days from sowing to determine chlorophyll a and b according to the method described by Wettesteine (1957).

2.2. Nutrients content :

Samples of leaves and fruits were wet digested to determine total nitrogen, phosphorus and potassium according to Cottenie *et al.* (1982).

3. Fruit measurements :

Fruits were harvested at day's intervals, upon reaching 12-15 cm length (El-Barkouki *et al*., 1975). At each harvested fruit weight and length to fruit diameter (L:D ratio) were recorded. At the termination of the experiments, fruit weight/plant was calculated. The obtained data were subjected to statistical analysis according to Snedecor and Cochran (1968).

RESULTS AND DISCUSSION

1. Plant growth characters :

The response of plant growth expressed as vine length, number of leaves and branches and fresh and dry weight of both branches and leaves as affected to various composts application are shown in Table (3a and b). As for vine length in spite of non significant differences among all treatments in the first seasons, it is clear that there was an increase trend in vine length

in both seasons resulted from addition of CM to other types of composts and the most precise results come from compost prepared from + WH + Peas + Orange+ CM.

Number of leaves followed almost the same trend as vine length. So, addition of compost contained WH + peas + orange + CM were significantly superior than other composts as well as the control, in both seasons. On the other hand, the lower number of leaves were detected in plants received WH solely and orange residues mixed with CM in 1998 and 1999 seasons, respectively.

Fresh and dry weight of leaves and Branches were significantly influenced as a result of various treatments. Addition of any type of organic manure solely decreased these characters compared with control treatment. Whereas, addition of CM manure to other organic compost (except for orange residues) significantly increased both fresh and dry weight of such organs. The maximum increase of leaves dry weight was occurred with WH + peas + orange + CM compost the percentage of increase over control were 86 and 92 % first and second season, respectively.

Table (3a): Effect of different organic compost application on the growth characters of squash plants in 1998 season.

Characters / Treatments	Vine Length cm	No. of Leaves/plant	Fresh weight Leaves gm	Fresh weight Branches gm	Fresh weight Leaves gm	Fresh weight Branches gm
Control	42.53	34.73	97.22	57.03	26.06	16.22
WH	38.41	22.18	83.15	49.12	21.18	13.54
Peas	40.22	26.91	91.82	43.10	24.86	11.04
Orange	34.66	25.22	80.03	43.42	22.51	15.22
WH+Peas	40.23	27.14	86.18	39.18	24.32	9.06
WH+Orange	40.19	34.56	93.51	65.02	27.36	18.51
WH+CM	40.13	32.51	119.56	70.16	43.56	18.57
WH+Peas+CM	44.11	39.24	181.02	86.04	48.06	23.03
WH+Orange+CM	44.32	40.51	157.01	74.18	39.04	21.06
WH+Peas+Orange+CM	46.03	42.03	183.15	88.09	48.52	24.83
Peas+Orange	41.80	38.21	114.22	54.22	38.52	14.74
Peas+ CM	40.04	31.14	121.02	68.22	34.71	19.04
Peas+Orange+WH	42.50	40.03	126.51	82.13	42.03	23.51
Peas+Orange+CM	43.17	39.18	169.02	83.22	39.79	21.98
Orange +CM	38.63	29.03	98.54	58.18	23.57	16.22
L.S.D at 5%	N.S	1.07	4.73	2.51	4.59	2.13

The response of the vegetative growth characters of squash plants to the different organic and inorganic fertilizer clarified the stimulatory effect of compost which contain WH + peas + orange mixed with CM. The addition of CM to organic wastes increased their efficient in increasing vegetative characters by increasing maintain the nutrients supply to the plants during growth period than other treatments. However, the addition of organic wastes increased the growth of maize and potato plants (Minas and Anil Soo, 1994). In this respect Attalah et al. (1997) reported that organic material applied either solely or mixed with nitrogen significantly increased all growth parameters, i.e. leaves number and weight/plant of sugar beet.

Table (3b): Effect of different organic compost application on the growth characters of squash plants in 1998 season.

Characters / Treatments	Vine length Cm	Number of Leaves /plant	Fresh weight Leaves gm	Fresh weight Branches gm	Fresh weight Leaves gm	Fresh weight Branches gm
Control	39.46	40.15	94.92	49.92	24.54	18.54
WH	32.18	29.36	90.16	43.22	20.03	16.22
Peas	37.09	30.51	92.21	37.14	21.16	14.51
Orange	34.22	27.04	86.15	38.22	19.57	15.73
WH+Peas	43.38	33.22	90.87	31.18	21.92	11.04
WH+Orange	42.27	36.03	103.51	58.21	23.04	19.51
WH+CM	38.78	36.04	114.05	73.57	32.13	22.03
WH+Peas+CM	44.20	42.04	176.02	86.03	37.15	25.17
WH+Orange+CM	44.69	40.15	152.00	69.04	34.03	28.00
WH+Peas+Orange+CM	45.24	47.10	192.14	94.71	47.13	32.19
Peas+Orange	43.15	40.14	122.03	45.09	34.41	13.07
Peas+ CM	40.53	33.22	119.26	59.03	30.52	24.11
Peas+Orange+WH	43.03	40.93	128.76	92.13	40.16	27.51
Peas+Orange+CM	42.12	40.42	158.03	94.16	34.18	28.14
Orange +CM	34.08	26.17	87.15	47.13	18.14	22.91
L.S.D at 5%	1.14	2.53	6.08	3.06	4.51	2.47

2. Chemical composition :

2.1. Chlorophyll content :

The effect of different types of organic and inorganic manures on chlorophyll a,b and a + b are shown in Table (4).

Table (4): Effect of different organic compost application on chlorophyll content in 1998 and 1999 seasons.

Characters	1998			1999		
	Chl.A	Chl.B	Chl.A+B	Chl.A	Chl.B	Chl.A+B
Treatments	mg / g			mg / g		
Control	0.154	0.324	0.478	0.163	0.403	0.566
WH	0.132	0.112	0.244	0.138	0.129	0.267
Peas	0.138	0.124	0.262	0.138	0.131	0.268
Orange	0.115	0.143	0.258	0.123	0.162	0.285
WH+Peas	0.119	0.214	0.333	0.128	0.271	0.399
WH+Orange	0.122	0.273	0.395	0.133	0.279	0.412
WH+CM	0.136	0.218	0.354	0.138	0.243	0.381
WH+Peas+CM	0.136	0.240	0.376	0.139	0.320	0.459
WH+Orange+CM	0.152	0.371	0.523	0.158	0.451	0.609
WH+Peas+Orange+CM	0.182	0.453	0.635	0.174	0.512	0.686
Peas+Orange	0.126	0.278	0.404	0.136	0.253	0.389
Peas+ CM	0.140	0.224	0.364	0.152	0.302	0.454
Peas+Orange+WH	0.142	0.293	0.435	0.152	0.310	0.462
Peas+Orange+CM	0.168	0.394	0.562	0.169	0.447	0.616
Orange +CM	0.132	0.172	0.304	0.134	0.142	0.276
L.S.D at 5%	N.S	0.132	0.234	0.081	0.176	0.312

It is obvious from such data that application of compost which contain WH + peas + orange + CM attained to have a higher chlorophyll contents a, b and a + b than other treatments as well as control plants. On the other hand, application of orange wastes solely attained the lowest values of chlorophyll a whereas, WH residues possessed the lowest values of chlorophyll b and a + b. The results were true in both growing seasons and were significant except of chlorophyll a in 1998 season.

2.2. Nutrients content :

a) Squash leaves :

In respect to N and P content data In Table (5) showed that application of compost which contain WH + peas + CM was superior and overcame other treatments as well as the control. The corresponding figures were (5.21 and 0.47 %) and (5.39 and 0.45 %) in the first and second season, respectively.

Concerning K the plants grown in mixture of WH + orange + CM gave the highest K values. The corresponding values were (6.52 and 6.24 %) in the first and second season, respectively. On the other hand, the lowest values of N was detected with compost contained WH + peas + orange + CM and Orange +CM. Whereas, WH + CM possessed the lowest values of P and K. These results were true in both growing seasons.

Table (5): Effect of different organic compost application on the percentage of N, P and K of squash leaves in 1998 and 1999 seasons.

Characters / Treatments	1998			1999		
	N %	P %	K %	N %	P %	K %
Control	3.81	0.20	5.51	3.14	0.24	4.53
WH	4.17	0.19	5.70	3.56	0.21	4.92
Peas	3.10	0.33	4.92	2.91	0.36	4.46
Orange	2.89	0.19	5.61	2.73	0.19	5.22
WH+Peas	2.68	0.24	5.21	2.04	0.27	5.54
WH+Orange	3.23	0.37	5.20	3.12	0.35	4.87
WH+CM	2.30	0.11	4.10	2.42	0.14	4.32
WH+Peas+CM	5.21	0.47	5.80	5.34	0.45	5.92
WH+Orange+CM	4.42	0.34	6.52	4.11	0.39	6.24
WH+Peas+Orange+CM	2.10	0.31	4.50	2.41	0.33	5.11
Peas+Orange	5.18	0.18	4.70	4.86	0.17	4.63
Peas+ CM	3.84	0.20	5.10	3.62	0.23	5.71
Peas+Orange+WH	2.23	0.19	5.40	2.25	0.18	5.67
Peas+Orange+CM	3.39	0.30	5.61	3.22	0.34	4.92
Orange +CM	2.10	0.31	4.50	2.41	0.33	5.11
L.S.D at 5%	1.83	0.08	1.72	1.12	0.04	1.43

b) Squash fruits :

The data in Table (6) reveal the effect of organic and inorganic fertilizer on the percentage of N, P and K in squash fruits. The data indicate

that neither organic nor inorganic fertilizer had significant effect on the concentration of N squash fruits.

Concerning P content the data reveal that the highest increase of P content was obtained with the mixture of peas + orange + CM compost. Whereas, the lowest values obtained with orange compost in the first season. The same trend was obtained in the second season but the differences were not significant.

The data also indicated that the treatment received WH + peas + orange + CM and orange + CM caused a significant increase in K concentration in the first and second season, respectively as compared with other organic compost as well as control fruits. On the other hand, applied orange residues solely significantly decreased K content of squash fruits in both seasons .Explanation for response of the chemical composition of squash plant to different organic wastes could, in fact be explained on several bases some of which are :a) release of nutrients through the decomposition of orange matter , b) effect of organic wastes in lowering of nutrients fixation through several mechanisms such as chelation and formation of complexes relatively available for plants , c) production of humates which could exchange for adsorbed anions such as phosphorus which should be available. However, when we have look towards leaves dry weight and fruit weight during the two seasons. It is quite evident that the uptake of N,P and K were elevated with the compost prepared with WH+ peas +orange + CM in leaves and fruits and these results may be due to the higher content nutrients in the used composed.

Table (6): Effect of different organic compost application on the percentage of N, P and K of squash fruits in 1998 and 1999 seasons.

Characters / Treatments	1998			1999		
	N %	P %	K %	N %	P %	K %
Control	2.00	0.25	7.60	1.73	0.22	5.80
WH	1.42	0.24	6.60	1.16	0.26	5.40
Peas	1.03	0.26	9.30	1.09	0.26	8.60
Orange	1.73	0.23	6.50	1.92	0.21	5.30
WH+Peas	1.82	0.30	11.00	1.96	0.28	9.20
WH+Orange	1.02	0.28	9.70	1.12	0.24	7.40
WH+CM	2.13	0.36	10.00	2.09	0.38	8.40
WH+Peas+CM	0.64	0.38	7.90	0.69	0.36	6.40
WH+Orange+CM	0.86	0.36	9.60	0.89	0.33	8.20
WH+Peas+Orange+CM	1.02	0.43	6.70	1.14	0.41	7.80
Peas+Orange	0.96	0.24	7.00	1.02	0.22	7.30
Peas+ CM	2.06	0.39	9.70	2.00	0.34	9.30
Peas+Orange+WH	0.76	0.26	9.60	0.92	0.26	9.20
Peas+Orange+CM	1.12	0.48	10.00	1.26	0.33	9.80
Orange +CM	1.10	0.34	10.00	1.26	0.33	9.80
L.S.D at 5%	N.S	0.07	3.14	N.S	N.S	2.73

Fruit yield :

Data presented in table (7 a & b) showed that average fruit weight was increased significantly due to mixing chicken manure (CM) with other composts (exception of WH in first season) and that increase depends on the type of organic compost. The maximum of average fruit weight occurred with WH + peas + orange + CM compost. The percentage of increase over control were 37 and 62 % in first and second season, respectively. On the other hand, the lowest value occurred with orange waste treatment in both growing seasons.

As shown in the same table fruit length/diameter (L:D ratio) did not show any significant differences due to application of organic and inorganic fertilizer either in 1998 or 1999 seasons.

Fruit yield could be considered the out put of all growth features. The data presented in Table (7a&b) clear fruit yield/plant produced by squash plants followed almost the same trend as that of the vegetative growth. The maximum increase of fruit yield/plant was occurred with WH + peas + orange + CM. The percentage of increase over control were 10.0 and 9.8 % in the first and second seasons, respectively. However, our results are in harmony with those obtained by McSorley and Gallaher, (1995). They found that yield of squash was increased by 155 % when incorporated compost as compared with the unamended control.

Table (7): Effect of different organic compost application on fruit weight , L: D ratio and fruit yield in 1998 and 1999 seasons.

Characters	Fruit weight Gm		L: D ratio cm		Fruit yield Kg/m^2	
Treatments	**1998**	**1999**	**1998**	**1999**	**1998**	**1999**
Control	97.2	84.86	2.83	2.40	6.55	6.23
WH	64.13	53.71	2.55	2.22	5.15	5.47
Peas	61.22	62.14	2.25	1.61	4.54	5.65
Orange	58.26	53.22	2.12	1.64	4.93	4.90
WH+Peas	62.09	71.14	2.57	1.87	4.50	4.50
WH+Orange	73.22	76.26	3.1	2.33	4.50	5.47
WH+CM	73.12	103.51	2.67	2.32	6.23	4.50
WH+Peas+CM	114.51	124.09	2.51	2.58	6.52	6.34
WH+Orange+CM	116.22	132.51	2.46	2.69	6.55	6.62
WH+Peas+Orange+CM	132.71	137.04	2.24	1.85	7.20	6.84
Peas+Orange	76.08	75.91	2.44	2.54	5.65	5.22
Peas+ CM	98.24	107.22	2.93	2.46	5.40	4.68
Peas+Orange+WH	81.22	80.22	2.59	1.71	5.54	5.40
Peas+Orange+CM	126.04	129.71	2.65	2.27	6.70	6.73
Orange +CM	96.12	114.51	2.40	2.33	5.40	6.30

CONCLUSION

Generally from all the results previously obtained, we can say that the used organic composts in our study, have the ability to obtain a clean food and improving fruit yield. Therefore, considering crop response it could be concluded that the best treatment was mixed chicken manure with water hyacinth + peas + orange

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تـأثير اضـافة بعض المخلفـات العضـوية علـى النمـو الخضـرى والمحتـوى الكيمـاوى ومحصول نبات الكوسة

سامى محمد شحاتة
قسم البساتين -المركز القومى للبحوث

أجريت تجربتان حقليتان بمزرعة المركز القومى للبحوث بشلقان (محافظة القليوبية) لدراسة تاثيرالأضافة المنفردة اوخليط من مكمورة بعض المخلفات العضوية كورد النيل والبسلة ومخلفات ثمار البرتقال وكذلك سماد الدواجن ومقارنتهم بالسماد المعدنى الموصى بة .وقد ادى استخدم المخلوط المكون من ورد النيل والبسلة والبرتقال وسماد الدواجن الى زيادة معنوية فى صفات النموالخضرى كطول النبات وعدد الأوراق والوزن الطازج والجاف للافرع و الاوراق وكذلك محصول النبات . وقد اثرت المعاملأت المختلفة على المحتوى الكيماوى للاوراق والثمار حيث زاد تركيز النتروجين والفسفور والبوتاسيوم معنويا نتيجة لاضافة المخلفات العضوية كما زاد تركيز العناصر فى الثمار وكانت النتائج معنوية مع البوتاسيوم.وقد ادى إستخدام المخلوط المكون من ورد النيل والبسلة و البرتقال و سماد الدواجن للحصول على أكبر وزن للثمار وأعلى محصول كلى. ويمكن التوصية باستخدام ذلك المخلوط للحصول على منتج نظيف و أعلى محصول من ثمار الكوسة.