EFFECT OF COMPOST AND COMPOST TEA ON RHIZOSPHERE MICROFLORA, GROWTH AND CHEMICAL COMPOSITION OF *SANCHEZIA NOBILIS*, Hook.f.

By

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ABSTRACT

In two successive seasons of 2007 and 2008, pot experiments were conducted at the Experimental Farm of the Faculty of Agriculture, Kafr El-sheikh University to detect the efficiency of substituting peat moss as a traditional materials used for the growth of Golden zebra (*Sanchezia nobilis*) by compost and compost tea supplemental with PGPR (Azotobacter, Azosprillium, *Bacillus polymexa*, Serratia and *Trichoderma viride*). One year old transplants were transplanted to plastic pots (30 cm diameter) filled with different ratios of compost and peat moss as well as equal volumes of vermiculite and sand. All plants were fertilized with constant dose of ammonium nitrate (33.5% N) at the rate of 3g/ pot and that contain compost only sprayed four times with compost tea beginning from March 15th with two weeks intervals.

Rhizosphere biology including the survival and activities of major groups of microorganisms were studied. Growth characteristics of vegetative growth of shoots and roots as well as the chemical composition of leaves were also determined. The obtained results showed that the incorporation of compost instead of peat moss (5C +0P) was found to be stimulative to bacterial growth but was inhibitive to fungi in *Sanchezia nobilis* rhizosphere exhibiting antagonisms towards phytopathogenic fungi. Actinomyces showed inconsistent pattern but growth medium of (1C +4P) showed proportional increase. Plants grown in pots containing compost, peat moss, vermiculite and sand at ratios of (5:0:1:1) or (1:4:1:1) were the best combinations that achieved optimum growth of vegetative and root characters as well as chemical composition of leaves.

Taken together, the role of compost (local product), and compost tea supplemented with PGPR, suggesting that this combination could be used safety and highly recommended as alternation growth medium for growing *Sanchezia nobilis* plants instead of imported peat moss.

Keywords: *Sanchezia nobilis*, compost media and compost tea.

INTRODUCTION

Golden zebra (*Sanchezia nobilis*, Hook.f.) belongs to family Acanthaceae. It is an attractive foliage shrub grows up to 6 ft tall with deep green leaves and linear yellow, ivory, or white veins and flowers not showy appear in early summer. It can thrive in full sun or partial shade and suitable for pot plant or border plant. Recently, it is well recognized world wide that bio-organic farming and biological products is continuously gained ground as a practice that conductive of booster soil fertility and increase crop production without causing environmental hazards that result from the use of traditional fertilizers. Imported peat moss is usually used as a growth medium for growing, not only golden zebra plants but also for most different crops. Researching for a new local product as alternative of peat moss for sustainable agriculture. It will augment additionals yield and monetary returns to the farmers, for which the incremental input cost is low.

One of the most important natural fertilizer that attractive pay attention is compost. Decomposition of compost is accomplished by enzymatic digestion of plant and animals by soil microorganisms followed by process of oxidation, reduction and hydrolysis then the products at various stages are used by microorganisms for further breakdown. The chelating effect of humic acid that are manufactured in the process of composting acts as safe deposit box or an excellent vehicle carrying micronutrients, protected them from leaching in irrigation water yet available to plants in assimilated form. It doles out these nutrients slowly when plants are small at greater rates as soil temperature warm up and the crops major growth period begin.

Also, application of compost tea (solution obtained by extracting microorganisms and nutrient s from compost). Supplemented with some organisms of PGPR that can fix atmospheric nitrogen, solubilize phosphorus, produces growth regulators biocontrol agents will be environmentally benign approach for proper management for nutrient of seedling plants and ecosystem function. Composition of plant rhizosphere can affect the growth of seedling plants. It is known as a narrow zone of soil surrounding the root that is under the immediate influence of the root system. This zone is rich in nutrients due to the accumulation of variety of organic compounds released from roots by exudation, secretion and deposition. The survival and growth of microorganisms are greatly affected by rhizosphere composition.

Compost has beneficial effects such as increasing the cation exchange capacity of soils thus increasing the availability of certain nutrients as Ca, Mg and K. It also helps neutralize and buffers soil pH (A Grower's Guides, 1999).

The objective of this study was to determine the feasibility of replacing all or part of the peat moss in growth media of *Sanchezia nobilis* with compost.

MATERIALS AND METHODS

A pot experiment was carried out during the two successive seasons of 2007 and 2008 at the Experimental Farm of the Faculty of Agriculture, Kafr El- Sheikh University to study the effect of compost and compost tea on growth, chemical composition and microorganism's activities in rhizosphere of *Sanchezia nobilis*.

One year-old transplants of *Sanchezia nobilis* were transplanted to plastic pots of 30 cm diameter filled with a mixture of compost, peat moss, vermiculite and sand at the ratios tabulated in Table (A) on February 15th as every pot had one plant.

Table (A): The different levels of growing-media combinations.

Treatments	Compost	Peat moss	Vermiculite	Sand
0C+5P+1V+1S	-	5	1	1
1C+4P+1V+1S	1	4	1	1
2C+3P+1V+1S	2	3	1	1
3C+2P+1V+1S	3	2	1	1
5C+0P+1V+1S	5	-	1	1

C= Compost, P= Peat moss, V= Vermiculite and S= Sand.

The plants were foliar sprayed four times with compost tea beginning from March 15th with two weeks interval. Aerated compost tea, at least five to eight days fermentation time are carried out. For aerated compost tea, 24 to 48 hours of fermentation is considered sufficient. Once brewed, compost tea should be applied promptly. The plants were fertilized with a constant dose of ammonium nitrate (33.5% No_3) at rat of 3g/ pot. The common agricultural practices i.e. watering, weeding control, etc. were done whenever plants needed

The experimental design was a completely randomized block with three replicates.

Table (B): Main characteristics of compost tea produced by aerated method and some additives.

Character	Value
pH	8.20
EC (ds/m)	3.51
Total-N (ppm)	148.50
Total-P (%)	0.11
NH_4-N (ppm)	69.9
No_3-N (ppm)	33.80
Total soluble-N (ppm)	103.7
Available-P (ppm)	19.80
DTPA extractable-Fe (ppm)	176.9
DTPA extractable-Mn (ppm)	23.10
DTPA extractable-Zn (ppm)	41.30
DTPA extractable-Cu (ppm)	9.50
E_4/ E_6 ratio	3.12
Seed germination test (%)	91.20
Total count of bacteria (cfu/ml)	8.7×10^7
Total count of fungi (cfu/ml)	1.3×10^6
Total count of actinomycetes (cfu/ml)	1.2×10^6

Measurements:

1-Total count of bacteria, fungi and actinomycetes in plant rhizosphere were determined using soil extract agar medium (Page *et al.*, (1982)), Rosebengal, sheptonyium agar (Martin, 1950) and Jensen's medium, respectively.

2-vegetative growth:

Plant height (cm), branch number/ plant, leaf area (cm^2), shoots fresh and dry weights /plant (g), root length (cm), roots fresh and dry weights /plant.

3-Chemical composition:

Total carbohydrates in plant leaves(mg/g D.W.) was determined according to Herbert *et al.* (1971),Total green color (SAPD), total nitrogen (%) according to Blake (1965), phosphorus (%) according to Snell and Snell (1967), potassium (%) according to Jackson (1967), Fe, Mn, Zn and Cu by atomic absorption spectrophotometer.

Means between treatments were compared with Duncan's multiple range test according to Snedecor and Cochran (1982).

RESULTS AND DISCUSSION

1 Effect of different combinations of compost and peat moss on some groups of microorganisms:

Data presented in Table (1) clearly indicated that that microbial counts is greatly affected by growth media of rhizosphere. Rhizosphere composition that contain full dose of compost (5C) and free from peat moss (OP) stimulate the propagation of bacteria and showed high densities in total bacterial counts which recorded 12.5 x 10^6 c.f.u/ gram of rhizosphere mixture. On contrary the rhizosphere that contain the maximum level of peat moss (5P) with no compost showed the densities of 6 x 10^6 c.f.u/ gram. Such results indicated that incorporation of compost in growth medium enhance the growth of bacteria, this could be observed from the striking differences between the two treatments (0C+ 5P and 5C + 0P) as the number of bacterial cells raised from 6 x 10^6 to 12.5 x 10^6 c.f.u. on another hand fungal densities decreased progressively with increase levels of compost indicating the inhibitive effect of compost towards fungi. This could be observed in plant rhizosphere of treatments of 0C + 5P and 3C + P. changes in actinomycetes in rhizosphere is not greatly affected by growth medium of rhizosphere except that (1C + 4P) followed by the treatment that contain full dose of compost and free from peat moss Substantially more microorganisms are present near plant root surfaces than in bulk soil. This "rhizosphere effect" is caused by the release of exudates from growing root tissues and the lyses of cells of older root parts (Lynch and Whipps 1991).

Bacteria rapidly colonize growing root tips, using simple sugars, organic acids and amino acids as nutrients, whereas saprophytic fungi are more prevalent on older root parts where cortical cells are being degraded. Numerous strains of bacteria can be isolated from plants roots with, in most cases, little specificity being apparent. However, release of selected nutrients from roots that are preferentially utilizable by specific bacterial strains favors selective colonization by the latter (Bowen, 1991; Flores *et al.*, 1999). Composts do not stimulate the growth of all microorganisms in the rhizosphere. They do affect the species composition of the rhizosphere (Boehm *et al*., 1993) thus causing a shift in specific groups of microorganisms, such as antagonists in suppressive composts (Chen *et.al*., 1987) and/or functional groups of rhizobacteria (Pera *et al.,* 1983.).

Table (1): Effect of compost and compost tea on microorganism's number in rhizosphere of plants.

Treatment	Mean No. of cells (c.f.u)		
	Bacteria (10^6)	Actinomycetes (10^5)	Fungi (10^4)
0C+5P+1V+1S	8.9	1.4	6.6
1C+4P+1V+1S	9.2	3.8	4.6
2C+3P+1V+1S	8.0	1.4	4.7
3C+2P+1V+1S	8.5	1.9	3.6
5C+0P+1V+1S	12.5	2.2	4.3

C= Compost, P= Peat moss, V= Vermiculite and S= Sand.

Microbial activity in soils was low in a peat-based growing medium, but highest in media prepared from composted materials, and was highest in a medium containing 50% chipboard waste (Carlile *et al.,* 2004). The suppressive effect of certain compost-peat mixes is best explained by microbiostasis (Boehm *et al.,*. 1993) and this is consistent with our findings. Research on the factors that are responsible for a compost effect is necessary if manipulations to exploit the compost effect are to take place in the future. In addition enriched compost devised better environmental conditions in plant rhizosphere beside its role in increasing the level of supply in available from of nutritional elements required at trace levels both by the plant and by microorganisms.

2. Effect on growth characters:

It appeared from data presented in Table (2) that incorporation of enriched compost even at low levels in growth media enhanced the growth of *Sanchezia nobilis* transplants. The effect of different combinations of compost and peat moss on plant height could be arranged in descent orders as follow (average of the two experimental seasons) 1C + 4P (49.24) > 2C + 3P (44.02) > 5C + 0P (43.00) > 3C + 2P (39.78) > 0C + 5P (33.48).

The corresponding values of number of branches per plant were

3C + 2P (11.30) > 2C + 3P (8.18) > 5C + 0P (6.83) > 1C + 4P (5.87) > 0C + 5P (5.34). Branches thickness reveal a similar trend to that observed in case of its number and indicate that the growth medium of 3C + 2P superior in achieving highest values of branches number and its thickness.

Table (2): Effect of compost and compost tea on plant height (cm), branches No./ plant and branch diameter (cm) of *Sanchezia nobilis*.

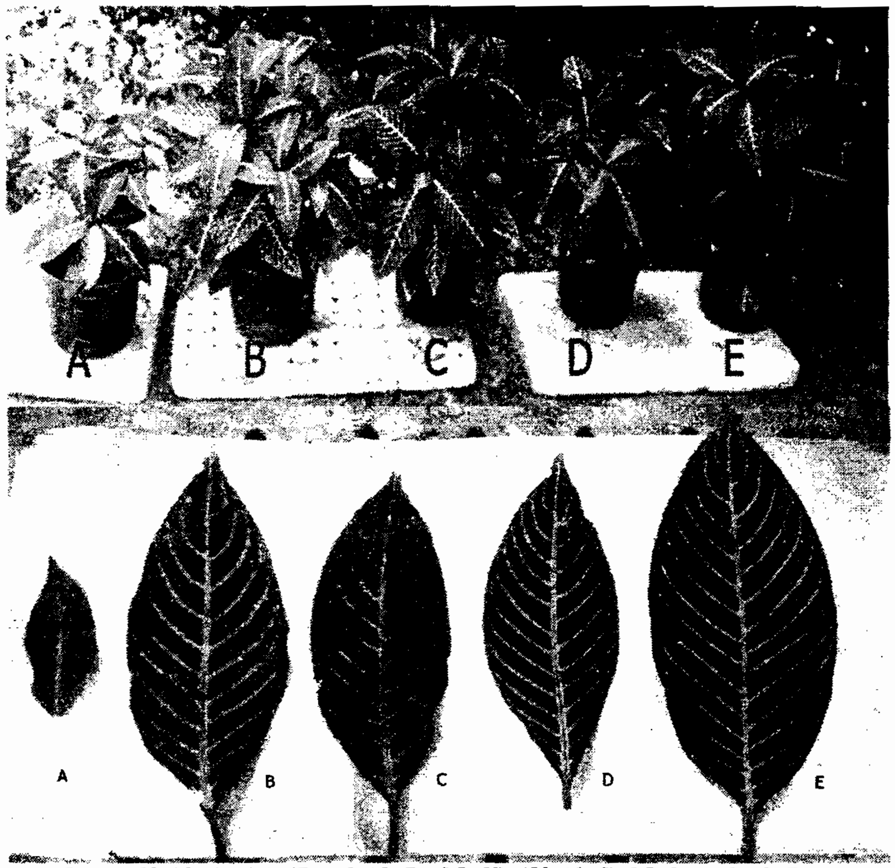
Treatment	Plant height (cm)	Branches No. / plant	Branch diameter (cm)
0C+5P+1V+1S	32.27e	5.34c	0.43c
1C+4P+1V+1S	45.67a	4.38d	0.40d
2C+3P+1V+1S	41.50b	7.03b	0.49b
3C+2P+1V+1S	39.22d	9.30a	0.62a
5C+0P+1V+1S	40.54c	5.33c	0.44c
0C+5P+1V+1S	34.69e	5.33e	0.47e
1C+4P+1V+1S	52.81a	7.35d	0.52d
2C+3P+1V+1S	46.53c	9.33b	0.60b
3C+2P+1V+1S	40.33d	13.30a	0.71a
5C+0P+1V+1S	47.45b	8.32c	0.54c

C= Compost, P= Peat moss, V= Vermiculite and S= Sand.

Growth promotion through direct stimulation of plant development is more difficult to demonstrate. In radish several rhizobacterial strains strongly increased average plant weight under non-sterile conditions, but faild to do so in a gnotobiotic system in which bacteria were introduced into sterilized soil (Klopper and Schroth, 1981)

Leaf area:

Data presented in Table (3) show that the increase in both leaf area and root surface is known to increase the transpiration rate, inherently water and nutrient translocation by roots. This finding in agreement with Poorter and Remkes (1990), who found that the balance between the amount of roots and leaf area could influence leaf water status and hence the rate of photosynthesis in correlation with the total organic nitrogen N in leaves.



0C+5P+1V+1S (A), 1C+4P+1V+1S (B), 2C+3P+1V+1S(C), 3C+2P+1V+1S (D) and 5C+0P+1V+1S (E).

Photo (1): Effect of compost and compost tea on some vegetative characters of *Sanchezia nobilis*.

Fresh and dry weights of shoots:

with regard to the effect of different ratios of compost and peat moss on leaf area, fresh and dry weights of shoots, Data presented in Table (3) showed that the lowest values of those parameters were recorded for plant grown in growth medium free of compost but contain the highest level of peat moss (0C + 5P). This findings are completely different for plants grown in mixture of (5C + 0P). Such results indicate a clear recovery were obtained in growth characters by decreasing the level of peat moss and substituted by gradual increase of enriched compost up to 5 rate (5C + 0P). This could airdinced by estimating the relative effect (percentage of increase of two seasons) between the first 0C + 5P) and last (5C + 0P) treatments. The percentage of increase was on the average 173.3, 115.8 and 171.7%, respectively for leaf area, fresh and dry weights of shoots.

Table(3): Effect of compost and compost tea on leaf area (cm^2), shoots F.W./plant (g) and shoots D.W./plant (g) of *Sanchezia nobilis*.

Treatment	Leaf area (cm^2)	Shoots F.W. /plant (g)	Shoots D.W. /plant (g)
First season			
0C+5P+1V+1S	26.84e	55.08e	14.16c
1C+4P+1V+1S	79.49b	118.74b	32.29a
2C+3P+1V+1S	65.02c	93.90c	23.98b
3C+2P+1V+1S	38.65d	72.23d	18.91b
5C+0P+1V+1S	83.15a	134.21a	34.76a
Second season			
0C+5P+1V+1S	28.66e	58.40e	15.33e
1C+4P+1V+1S	56.25b	95.86b	22.48b
2C+3P+1V+1S	50.34c	69.17d	19.23d
3C+2P+1V+1S	41.28d	78.31c	20.68c
5C+0P+1V+1S	68.51a	110.70a	28.19a

C= Compost, P= Peat moss, V= Vermiculite and S= Sand.

Root characters:

It is quite evident from the obtained results presented in Table (4) that growth media of treatments (5C + 0P) and (1C + 4P) still showed the superiority in developing higher number of roots/ plant as well as root length. The positive effect is also extended to their fresh and dry weight. The corresponding values were on the average 16.04, 17.51, 7.39 and 1.88, respectively. Other combinations of compost and peat moss showed different response, but with less magnitude, the lowest values of root length and number were formed on plants grown in treatment of (2C + 3P) while treatments of (0C + 5P) exhibited the least effect on fresh and dry weights of roots. The parallel values were on the average 12.24, 12.98, 5.95 and 1.42, respectively.

Table(4): Effect of compost and compost tea on root No./plant, root length (cm), roots F.W./plant (g) and roots D.W./plant (g) of *Sanchezia nobilis*

Treatments	Roots No. /plant	Root length (cm)	Roots F.W. /plant (g)	Roots D.W. /plant (g)
First season				
0C+5P+1V+1S	13.44d	15.21c	5.06e	1.57c
1C+4P+1V+1S	15.33b	18.32d	6.12b	1.65b
2C+3P+1V+1S	12.81e	13.54e	5.77c	1.52d
3C+2P+1V+1S	13.72c	14.71d	5.41d	1.43e
5C+0P+1V+1S	16.44a	16.71b	7.25a	1.90a
Second season				
0C+5P+1V+1S	12.29c	14.22c	4.84d	1.27e
1C+4P+1V+1S	14.38b	16.70d	7.81a	2.04a
2C+3P+1V+1S	11.67e	12.42e	6.55c	1.55d
3C+2P+1V+1S	12.20d	13.33d	6.55c	1.68c
5C+0P+1V+1S	15.64a	16.25b	7.52b	1.86b

C= Compost, P= Peat moss, V= Vermiculite and S= Sand

The present work revealed that the total biomass (shoots and roots) of golden zebra plants is stimulated by substituting peat moss present in growth media by enriched compost even at low levels. It was therefore important to find out the interacting effect of every component of growth environment, namely peat moss compost, compost tea, as well as the role of PGPR (Azotobacter, Azospirillum, *Bacillus polymexa*, Serratia and Trichoderm). The naturally occurring of high nutritional values and the presence of significant amount of macro and micro elements in compost are released slowly at a rate of which the plants can use them most profitably for optimum growth. Thus it can be recalled that compost is not only a source of nutrients but also a storehouse for them.

The positive effect of root system (root number and length and fresh and dry weight) could be mainly related to application of PGPR group mixed in compost or sprayed with compost tea. The results obtained herein showed an average increase of about 31.05, 34.90, 49.30 and 32.39% of root number and length, fresh and dry weights of shoots, respectively. Such results are greatly corresponding to the work of many investigations. They suggested that that PGPR stimulate the plant growth by facilitating the uptake of minerals N, P and K or secretes of phytohormons resulting in increase of the volume of root system as reflected by increased root number, thickness and length (Smith et al., 1984 and Mogensten and Oken, 1987). Umali-Garcia et al. (1980) found that uptake of P and Fe are related to thicker roots and high uptake of P increased root hairs, while phytohormons increase root dry weight.

3- Effect on chemical compositions:

Total green color and total carbohydrates:

Data presented in Table (5) clear that there was a gradual increase in total green color from the treatment of 0C+5P+1V+1S to 5C+0P+1V+1S.in both season. The highest values resulted from the treatment of 5C+0P+1V+1S in both seasons as recorded 63.78 and 68.21 SPAD, respectively. As for total carbohydrates, data in Table (5) show that the highest contents in both seasons resulted from the treatments of 1C+4P+1V+1S and 5C+0P+1V+1S as gave 33.24 and 32.41 mg/g D.W.in the first season and 34.26 and 32.61 mg/g D.W. in the second one. The lowest carbohydrates contents in both seasons resulted from the treatment of 0C+5P+1V+1S as gave 22.60 and 23.44 mg/g D.W., respectively. Compost amendment shared with available macronutrients i.e. nitrogen and phosphorus and also micronutrients i.e. Fe, Mn and Mg in chlorophyll synthesis. Similar results were reported by Milad (2003).

N, P and K contents:

It was clear from data in Table (6) that, the treatments of 1C+4P+1V+1S and 0C+5P+1V+1S surpassed other treatments in nitrogen and potassium contents in both seasons as gave 6.19 and 6.10 N% and 3.55 and 3.25 K% in the first season and in the second one the corresponding values were 6.18 and 6.22 N% and 4.12 and 3.80 K%, respectively. However, the highest values for phosphors contents resulted from the treatment of 3C+2P+1V+1S followed by 2C+3P+1V+1S in both seasons as recorded 0.47 and 0.45% in the first season and 0.52 and 0.50% in the second one.

Some bacteria solubilize organic phosphate by secreting phosphatase or inorganic phosphate from soil particles by releasing organic acids, and this could make phosphorus as well as micronutrients more readily available for plant growth in some soils (Klopper *et al.*, 1989). Free-living nitrogen-fixing bacteria, particularly of the genera Azobacterium, Azospirillum and Clostridium, are present in most soils and in plant rhizosphere. Also, some *Pseudomonas* spp. have the ability to fix nitrogen, However, it has been suggested that the contributions of bacterially fixed nitrogen to plants is minimal and that enhanced growth by an inoculated plant does not necessarily mean that the bacteria associated with the roots do fix nitrogen or pass the products of nitrogen fixation to plant (James and Olivares, 1997).

Table(5): Effect of compost and compost tea on total green color (SPAD) and total carbohydrates (mg/g D.W.) of *Sanchezia nobilis*.

Treatments	Total green color (SPAD)	Total carbohydrates (mg/g D.W.)
First season		
0C+5P+1V+1S	52.93e	22.60e
1C+4P+1V+1S	53.37d	33.24a
2C+3P+1V+1S	55.07c	30.05c
3C+2P+1V+1S	58.30b	28.31d
5C+0P+1V+1S	63.78a	32.41b
Second season		
0C+5P+1V+1S	48.52e	23.44e
1C+4P+1V+1S	62.57b	34.26a
2C+3P+1V+1S	57.39c	29.92c
3C+2P+1V+1S	55.46d	25.76d
5C+0P+1V+1S	68.21a	32.61b

C= Compost, P= Peat moss, V= Vermiculite and S= Sand.

Fe, Mn, Zn and Cu contents:

Data in Table (7) show that the treatment of 5C+0P+1V+1S gave the highest Fe contents in the first season while in the second one was the treatment of 1C+4P+1V+1S as recorded 264 and 258ug/g. The best results for Mn and Zr were obtained from the treatment of 5C+0P+1V+1S followed by 2C+3P+1V+1S in both seasons as gave 40.6, 39.6; 9.1 and 38.1 ug/g Mn in the first and second seasons respectively and 37.8, 35.6; 40.2 and 36.7 ug/g Zn in the first and second seasons, respectively.

Table (6) Effect of compost and compost tea on N, P and K(%) of *Sanchezia nobilis*.

Treatments	N	P	K
	%		
First season			
0C+5P+1V+1S	4.20e	0.43c	2.88e
1C+4P+1V+1S	6.19a	0.40d	3.55b
2C+3P+1V+1S	5.88c	0.45b	3.20c
3C+2P+1V+1S	5.23d	0.47a	3.15d
5C+0P+1V+1S	6.10b	0.42c	3.25a
Second season			
0C+5P+1V+1S	4.25e	0.36e	3.10e
1C+4P+1V+1S	6.18b	0.42d	4.12a
2C+3P+1V+1S	5.48d	0.50b	3.61c
3C+2P+1V+1S	6.14c	0.52a	3.45d
5C+0P+1V+1S	6.22a	0.46c	3.80b

C= Compost, P= Peat moss, V= Vermiculite and S= Sand.

As for Cu contents the treatments of 1C+4P+1V+1S and 0C+5P+1V+1S gave the highest values in both seasons as recorded 14.5, 13.8; 15.6 and 15.2 ug/g Cu in the first and second seasons, respectively. Most microorganisms produce siderophores when iron availability in the environment is low, these are low-molecular-weight metabolites with a high affinity for Fe^{3+} (Höftel, 1993).

It is noticed from our research data that, most growth characters and chemical constituents increased gradually with increasing compost level in growth media of *Sanchezia nobilis*. The promotion effects for various growth characters, chemical constituents and suppress of plant diseases with applying compost were recorded by many researchers, Robertson (1993) mentioned that, the first efforts should be to demonstrate partial replaceability of the peat with good quality mature compost. Also, Raviv (1994) stated that, the promotion of plant growth in respect to compost application may be rendered to the releasing of nutrients in a slow rate, the adaptation of soil pH and by increasing the natural use of water efficiency. Moreover, compost may cause more excretion of direct enzymatic or hormonal effect on plant root and various parameters of growth.

Table(7) Effect of compost and compost tea on Fe, Mn, Zn and Cu contents (ug/g) of *Sanchezia nobilis*.

Treatments	Fe	Mn	Zn	Cu
	ug/g			
First season				
0C+5P+1V+1S	240e	25.8e	25.6e0	10.3e
1C+4P+1V+1S	260b	35.2d	30.20d	14.5a
2C+3P+1V+1S	258c	39.6b	35.6b	13.2c
3C+2P+1V+1S	255d	37.3c	31.5c	12.5d
5C+0P+1V+1S	264a	40.6a	37.8a	13.8b
Second season				
0C+5P+1V+1S	237e	28.2e	24.0e	9.4e
1C+4P+1V+1S	258a	37.5c	35.5c	15.6a
2C+3P+1V+1S	250c	38.1b	36.7b	14.1c
3C+2P+1V+1S	249d	35.4d	31.8d	13.7d
5C+0P+1V+1S	255b	39.1a	40.2a	15.2b

C= Compost, P= Peat moss, V= Vermiculite and S= Sand.

Klock-Moore (2001) reported that, *Impatiens walleriana* plants grown in 30, 60, and 100% compost were larger with more flowers than plants grown in 0% compost. For each growing substrate, plant size and number of flowers per plant were greatest for plants watered every day and lowest for plants watered every three days. It appears that the larger plants produced in the substrates containing compost performed better in the post-production phase but that all plants, regardless of growing substrate, need to be watered daily to maintain optimum plant quality. The desirable effect of compost tea may be attributed to its content of diverse microorganisms and soluble nutrients.

Microorganisms in compost tea are believed to fight disease by competing with pathogens for colonization sites and nutrient supplies, secreting antibiotic or anti-fungal substances, or directly parasitizing pathogens, while soluble nutrients improve plant health and bolster natural defense mechanisms (Scheuerell, 2003). Likewise, Naguib *et al.* (2007) stated that, high compost levels had a pronounced effect on vegetative and flowering growth of *Tagetes erecta* than the low ones. Also, Raviv (2008) stated that many compost types suppress a large range of soil-borne diseases such as those caused by *Sclerotium, Rhizoctonia, Pythium* and *Fusarium*.

REFERANCES

A Grower's Guides (1999). Compost production and unitization. California Department of Food and Agriculture, California Univ., U.S.A.

Badran, F.S. and M.S. Safwat (2004). Response of fennel plants to organic manure and bio-fertilizers in the replacement of chemical fertilization. Egypt. J. Agric.. Res., 82:247-255.

Blake, C. A. (1965). Methods of Soil Analysis. Part 1 and 2. soil Sci. Amer. Soc. Inc. Publ., Madison, Wisc. U.S.A.

Boehm. M. J.; L., V. Madden and H. A. J. Hoitink (1993). Effect of organic matter decomposition level on bacterial species diversity and composition in relationship to *Pythium* damping-off severity. Appl. Environ. Microbiol., 59:4171-1173.

Bowen, G.D. (1991) Microbial dynamics in the rhizosphere: possible strategies in managing rhizosphere populations. In: Keister DL, Cregan PB (eds) The Rhizosphere and Plant Growth. Kluwer, Dorderecht, P25-32

Carlile, W.R.; K. Dickinson; B Alsanius; P. Jensen and H. Asp (2004). Dehydrogenase as an indicator of microbial activity in growing media. Acta Hortic., 644:517-523.

Chen, W., H. A. J. Hoitink, and A. F. Schmitthenner (1987). Factors affecting suppression of *Pythium* damping-off in container media amended with composts. Phytopathology, 77:755-760.

Flores, H.E.; J.M. Vivanco and V.M. Loyola-vargas (1999) ' Radicle' biochemistry: the biology of root-specific metabolism. Trends Plant Sci, 4:220-226

Herbert, D.; P.T. Phipps and R. E. Stronge (1971). Determination of total carbohydrates. Methods in Microbiology, 5(B): 290-344.

Höftel, M. (1993) Classes of microbial siderophores. In: Barton LL, Hemming BC (eds) Iron Chelation in Plants and Soil Microorganisms. Academic Press, San Diego, p 3-26

Jackson, M. L. (1967). Soil Chemical Analysis. Prentice. Hall of India Private Limited New Delhi. P.115.

James, E.k. and F.L. Olivares (1997) Infection of sugar cane and other graminaceousplants by endophytic diazotropha. Crit Rev Plant Sci 17:77-119

Klock-Moore, K.A. (2001). Post-production performance of Impatiens plants grown in substrates containing compost. Acta Hort., (ISHS) 543:127-133

Kloepper, J.W. and M.N. Schroth (1981) Plant growth-promoting rhizobacteria and plant growth under gnotobiotic conditions. Phytopathology, 71:642-644.

Klopper, J.w.; R. Lifshitz and R.M. Zablotowicz (1989). Free living bacterial inocula for enhancing crop productivity. Trends Biotechno,l 7:39-43.

Lynch, J.M. and J.M. Whipps (1991) Substrate flow in the rhizosphere. In: Keister DL, Cregan PB (eds) The Rhizosphere and Plant Growth. Kluwer, Dordrecht, p 15-24

Martin, J.P. (1950). Use of acid rose bengal and sterptomyem in the plate method for estimating soil fungi. Soil fungi Soil sci. 69: 215-232.

Milad, S.M.N. (2003). Astudy of some agricultural practices affecting growth, yield and chemical composition of roselle (*Hibisicus sabdariffa* L.) Ph.D This, Fac. of Agric. Cairo Univ., Egypt.

Morgenstren, E. and B. Oken (1987). The effect of Azospirillum sp on root morphology in seed of sorghum bicolor and sorghum sudanense. Arid. Soil Res. Rehabil. 1: 115-127.

Naguib, N.Y.; S. E. El-Sherbeny; M.Y. Khalil and M.S. Hussein (2007). Effect of radiation on vegetative growth, stimulation of flowering and chemical constituents of *Tagetes erecta* cultivated under compost fertilization. Bull. Fac. Agric., Cairo Univ., 58: 46-56.

Page, A. L.; R. H. Millex and D. R. Keeny (1982). Methods of Soil Analysis. Chemical and Microbiological Properties. 2nd ED Madison, Wisconisin, USA.

Pera, A.; G. Vallini; I. Sireno; M. L. Bianchin and M. de Bertoldi (1983). Effect of organic matter on rhizosphere microorganisms and root development of sorghum plants in two different soils. Plant and Soil 74:3-18

Poorter, H. and C. Remkes (1990). Leaf area ratio and net assimulation rate of 24 wild species differing in relative growth. Oecologia, 53:553-559

Raviv, M. (1994). Horticultural uses of compost material. Acta Hort., 469: 225-234.

Raviv, M. (2008). The use of compost in growing media as suppressive agent against soil-borne diseases. Acta Hort. (ISHS), 779:39-50.

Robertson, R.A. (1993). Peat, horticulture and environment. Biodiversity and Conservation. 2: 541-547.

Scheuerell, S. (2003). Understanding how compost teas can control disease. BioCycle, 44(2):20-30.

Smith, R.L.J.; S.C.J. Schanank; I.R. Milam and A.A Baltensperger (1984). Response of sorghum and pennisetum species to the into fixing. App. Environ. Microbial. 47:1331-1336.

Snedecor, G. W. and W.G. Cochran (1982). Statical Methods. 6 ed., The Iowa State Univ. Press, Ames, Iowa USA.

Snell, F.D. and C.T. Snell (1953). Colorimetric Methods of Analysis Including Some Tudibimetric and Nephalometric Methods.O. Van Nostrand Company. Inc. Princeton New Jersey Toronto, New York, London.

Umali-Garcia, M., Hubbel, D. H., and Gaskins, M. H., and Dazzo, F.B. (1980). Association of Azospirillum with grass roots. Appl. Environ. Miccrobiol. 39: 219-226.

الملخص العربي

تأثير الكمبوست ومستخلص الكمبوست على الكائنات الدقيقة في محيط الجذور والنمو والتركيب الكيماوي لنبات السانكيزيا نوبيليز

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اجري هذا البحث بالمزرعة البحثية بكلية الزراعة جامعة كفر الشيخ خلال موسمي ٢٠٠٧ ، ٢٠٠٨ لدراسة تأثير الكمبوست ومستخلص الكمبوست على الكائنات الدقيقة في محيط الجذور والنمو والتركيب الكيماوي لنبات السانكيزيا نوبيليز (الحمار الوحشي الذهبي) عمر سنة.

* نقلت الشتلات عمر سنة إلى أصص بلاستيك قطر ٣٠سم ملئت بمخلوط من الكمبوست والبيت موس والفرمكوليت والرمل بنسب مختلفة.
* تم رش هذه النباتات أربع مرات بواقع مرة كل أسبوعين بمستخلص الكمبوست ابتداء من منتصف مارس. استخدمت أربع نسب تجارية لدراسة تأثيرها على النمو والتركيب الكيماوي على الكائنات الدقيقة في محيط الجذور لنبات السانكيزيا.
* سمدت جميع النباتات بجرعة ثابتة من نترات الامونيوم (٣٣,٥% ن) بمعدل ٣جم \ أصيص.
* تم تقدير كل من أعداد الميكروبات في محيط الجذور، ارتفاع النبات، عدد وقطر الأفرع، المساحة الورقية، الوزن الطازج والجاف للنموات الخضرية، طول الجذور والوزن الطازج والجاف للجذور.