Journal of Biodiversity and Environmental Sciences (JBES)
ISSN: 2220-6663 (Print) 2222-3045 (Online)
Vol. 5, No. 2, p. 318-328, 2014
http://www.innspub.net

RESEARCH PAPER OPEN ACCESS

Utilizing compost tea as a nutrient amendment in open filed cowpea seed production system

A.Z. Hegazi[1*], A.M. Algharib[2]

[1]*Horticulture Research Institute, Agricultural Research Center, Giza, Egypt*

[2]*Environment & Bio-Agriculture Department, Faculty of Agriculture, Al-Azhar University, Cairo, Egypt*

Article published on August 11, 2014

Key words: Compost tea, cowpea, seed yield.

Abstract

This study examined the effects of compost tea (CT) different applications (foliar spray or soil drench) on growth characters of cowpea plants. Tow field trials were conducted at horticulture research station Kaha, Kalyiobia governorate, Egypt, during the 2012 and 2013 summer seasons to investigate the effects of organic (CT) and inorganic, and its combinations on cowpea [*Vigna unguiculata* (L.)]. Cowpea plants were fertilized with seven fertilizer treatments: (1) 100% NPK (control); (2) 75% NPK+25% compost tea foliar (CTF); (3) 50% NPK+50% CTF; (4) 25% NPK+75% CTF; (5) 75% NPK+25% compost tea soil drench (CTS); (6) 50% NPK+50% CTS; and (7) 25% NPK+75% CTS. Compost tea was prepared by mixing compost with tap water at a ratio of 1:2 (Vol/ Vol), and storing this mixture at room temperature for about 24h. Cowpea plants were treated with two equal doses of compost tea; one month after sowing, and two months after sowing. Application of compost tea as soil drench was better than as a foliar spray in all studied traits, i.e. vegetative growth, seed yield, seed quality and mineral content of cowpea seeds. The best results obtained with 25% NPK+75% CTS followed by 50% NPK+50% CTS. Also compost tea as a foliar spray in the treatment 25% NPK+75% CTF gave better significant results than other foliar spray treatments. Obtained results highlight the prospects and potentials of using compost tea as renewable natural fertilizers for cowpea seed production.

***Corresponding Author:** A. Z. Hegazi ✉ hegaziamal@gmail.com

Introduction

Cowpeas are leguminous seeds widely produced and consumed in most developing countries of sub Saharan Africa (Ocloo *et al.*, 2012). The world production of the cowpea was nearly 5.7 million tons in 2012, on the other hand, Africa accounts for about 94.7% of the world production. The cowpea is grown in an area of 10.6 million hectares in warm and hot areas (Fao stat, 2013). The seeds are a major source of plant proteins and vitamins for man, feed for animals, and also a source of cash income. The young leaves and immature pods are eaten as vegetables (Dugje *et al.*, 2009). Efforts are continuing to develop better performing cultivation with high yield potential using low inputs application to adopt the farmer's demands. Organic and chemical fertilizers applied to the soil supply plant nutrients for crop growth and affect the plant's physiological processes, which serve as important instruments in yield development (Amujoyegbe *et al.*, 2007). Using chemical fertilizers in agricultural production contaminates the soil and underground water. The movement of Agrochemicals through soil to groundwater or their discharge to surface waters represents an ecological risk (Allinson *et al.*, 2000). It is also accumulated in food chain causing hazard effects (Hegazi *et al.*, 2010). Many solutions were suggested to reduce the previously mentioned problems, out of them using organic fertilizers such as compost which are low in cost and friendly environmental amendments. Compost applied to the soil, improve its quality by altering its chemical and physical properties, increasing organic matter content, water holding capacity, the overall diversity of microbes, providing macro- and micro-nutrients essential for plant growth and suppressing diseases, which indirectly contribute to plant growth enhancement (Heather *et al.*, 2006). Compost may be extracted with water at widely ranging ratios of 1:1 (dry w/w) to 1:60 (dry w/w). Such extracts are sometimes treated with additional ingredients and/or diluted before application (Shrestha *et al.*, 2011). The resulting extract (or tea) is applied to plants or soil for putative fertility and disease control benefits (Scheuerell and Mahaffee 2004, Litterick *et al.*, 2004). The researchers defined compost tea as fermented watery extracts of composted materials that are used for their beneficial effects on plants, including antimicrobial activities (Dionne *et al.*, 2012). Other researchers defined it as consists of aqueous suspensions of microorganisms and organic and inorganic compounds extracted from composts usually through an aerobic fermentation (Pane *et al.*, 2012). These extracts could also be used also as foliar fertilizers (Zaller 2006). Generally, Compost tea has increased leaf Na compared to compost amendments which suggested that raspberries preferentially take up Na via foliar applications compared to root Na applications (Jennifer *et al.*, 2008). Lahoz *et al.* (2009) demonstrated that lettuce marketable yield was significantly higher in compost amended plots than those minerals fertilized. The application of organic amendments can potentially stimulate crop growth and development through the actions of plant growth-promoting hormones, including cytokinins, auxins, and gibberellins (Quilty and Cattle 2011). The compost tea quality and its effect on plant may be predicted based on compost quality (Pant *et al.*, 2012). The compost tea industry, although small, is estimated to be growing at 25% per year (Carpenter-Boggs 2005). As conclusion, the use of solid organic materials and compost teas, in some cases, enhanced the plant yield and quality, and reduced the input costs. Application of organic materials reduced soil acidity, and improved the organic matter and available nutrients of the soil (Sanwal *et al.*, 2006). The main objectives of the current study were to assess (1) whether the spraying and soil treatment of compost tea can affect the growth and influence the morphological and chemical quality of cowpea in the open field and (2) whether foliar spraying or soil treatment (drench) is more efficiency to cowpea plants in terms of vegetative growth characters and seed yield.

Materials and methods

This study was carried out at the Horticulture research station at Kaha, Kalyiobia governorate,

Egypt, during 2012/2013 summer seasons to evaluate the response of cowpea (*Vigna unguiculata* var. Kafr El_Shekh) plants for organic and inorganic fertilizers under open field conditions. The experiment was conducted in a clay soil. The soil was analyzed in department of soil and water, Faculty of Agriculture, Al-Azhar University, Egypt. Its chemical and physical characteristics are presented in Table 1. The seeds were sown in 15 April in both seasons.

Type of fertilizers and their application

Mineral Fertilizers

control plants received full recommended dose of NPK as: 100 Kg/fed of ammonium sulfate (20.6% N), 150 Kg/fed of superphosphate (15.5% P_2O_5) and 100 Kg/fed of potassium sulfate (48% K_2O).

Organic Fertilizers

Composted manure was obtained from SEKEM Farm, Cairo–Belbes desert road, Egypt. It was prepared from plant farm wastes (60%) + cattle dung (30%) + chicken manure (10%). Composted manure samples were analyzed for its chemical properties and presented in Table 2.

Preparation of compost extracts

Aqueous extracts were prepared by mixing compost with tap water at a ratio of 1: 2 (Vol/Vol), and storing this mixture at room temperature for about 24 h (Zaller 2006). Solutions were freshly prepared and were filtered before applications with a hand sprayer. Spraying of a similar amount of tap water served as control treatment. The compost tea (CT) as organic fertilizers was added in each season on two equal doses. The first application was added one month after sowing, whereas the second one was applied two months after sowing.

Experimental design

The experiment was in complete randomized block design with three replicates. The seeds were planted 15 cm apart in a single row. Each row was 4.5 m long and 0.75 m width. Each plot contains 6 rows. Thus, the area of each plot was 20 m^2. Other agricultural practices such as weeding and pest control were carried out as recommended for the conventional cowpea planting. The seven fertilizer treatments of mineral NPK fertilizers and two types compost tea (CT) either foliar (F) or soil drench (S) was as follows:

1) 100% NPK without CT
2) 75% of NPK + 25 % CTF
3) 50% of NPK + 50 % CTF
4) 25% of NPK +75 % CTF
5) 75% of NPK + 25 % CTS
6) 50% of NPK + 50 % CTS
7) 25% of NPK + 75 % CTS

Measurements

Vegetative growth characters

The following growth attributes were measured after six weeks of sowing, using ten random plants from each treatment: plant height (cm), number of leaves/plant, leaf area (cm^2) / plant, plant fresh weight (g) and plant dry weight (g).

Seed yield and its components

At harvest, samples of 10 random plants from each treatment were used to record the following characters: number of pods/plant, pod length (cm), number of seeds/pod, pods weight/plant (g), seeds weight/plant (g), and total seed yield (kg/ plot).

Chemical contents

At the end of harvesting stage, seeds of each treatment were grinded for mineral determination. Total nitrogen, phosphorus and potassium were determined according to A.O.A.C. (2000).

Seed quality

Three random samples (100 seeds each) were used from each treatment for calculating the following records; weight of 100 seeds (g), germination percentage (%), germination rate, seedling and root length (cm), and fresh and dry weight of seedling (g). The germination rate was calculated according to the following equation;

$$\text{Germination rate} = \frac{(G_1 \times N_1) + (G_2 \times N_2) + \ldots\ldots\ldots\ldots\ldots\ldots (G_n \times N_n)}{G_1 + G_2 + \ldots\ldots\ldots\ldots\ldots\ldots G_n}$$

Where: G = Number of germinated seeds in certain day, N = Number of this certain day

Statistical Analysis

The obtained data were subjected to statistical analysis of variance and the treatments means were compared using the Duncan Multiple Range test as published by Duncan (1965).

Results and disscussion

Effect of compost tea different application on vegetative growth of cowpea

Data represented in table 3 indicated that plant height and number of leaves/ plant improved as plants received 25% of mineral NPK+75% of compost tea as a soil drench (CTS) in both season. In addition, leaves area/plant, fresh wt. / plant and dry wt./plant increased in the second season with the previous treatment. While, applied 25% of mineral NPK+75% of compost tea as a foliar spray (CTF) gave better increase in first season with leaves area/ plant, fresh wt./plant and dry wt./ plant. The presence of highest number of leaves in a plant indicates that the yield in that particular plant would be higher (Taura and Fatima 2008). This result indicated that combination of NPK and compost tea as soil treatment is a better nutrient source. This may be due to the fact that the inorganic fertilizer composition of the mixture provided early nutrient to the growing crops during the early vegetative growth stage, while the organic component provided nutrient at the later stage of the crop development. It takes some time for the mineralization (Amujoyegbe *et al.*, 2007). The results are in agreement with those reported by El-Shinawy *et al.* (1999), who found that fresh mass of lettuce was influenced positively by organic manure. Plant dry weight may provide the best estimate of fertilizer efficiency response (Gourley *et al.*, 1994). Xu *et al.* (2005) also, showed that vegetables grown with higher levels of organic manures grew better than those grown on lower amounts together with those grown using inorganic fertilizers. The increments in leaf dry weight may be due to a combination of nitrogen with plant matter produced during photosynthesis such as glucose, ascorbic acid, amino acids and protein (Takebe *et al.*, 1996). Nitrogen stimulates plant vegetative growth and increases leaf area; as a result increments in leaf area increase the rate of plant photosynthesis and thus higher dry matter production (Boroujerdnia and Ansari 2007). Magkos *et al.* (2003) evaluated the dry matter content of several leaf vegetables such as spinach, lettuce, chard, and white cabbage and found that organically cultivated crops had higher dry matter content as compared to those produced inorganically.

Table 1. Physical and chemical properties of the experimental soil.

Mechanical analysis					
Sand%	Silt%	Clay %	Texture		
19.27	29.98	50.74	C		
Chemical properties					
pH*	Total Salt	O.M %	P_2O_5 kg/da**	K_2O kg/da	$CaCO_3$ %
8.64	0.14	0.17	0.89	58.27	12.30

*Soil suspension 1: 2.5 Soil: water.

Effect of compost tea different application on seed yield of cowpea

All seed yield attributes of cowpea plants in table 4 were improved when used 75% compost tea as a soil drench + 25% of mineral NPK. These improvements were significant over the control in both seasons for seed wt/ plant and seed wt/ plot and for pod length in first season and for no. of seeds/ pod in second season. The second best treatment was 50%NPK+50%CTS for number of pods/plant and

number of seeds/pod in both season and in second season only for pod length and seed weight/ plot. On the other hand, using 75% of compost tea as a foliar spray (CTF) +25% NPK gave better results in the first season for pod length and seed weight/ plant. The result showed that a combination of compost tea and NPK fertilizer significantly increased the seed yield of cowpea, over application of NPK alone and suggest that adding compost teas as a soil drench treatment better than as a foliar treatment for getting better recorded seed yield characters. The use of combination plays an important role in cowpea production, because each organic and inorganic fertilizer has its own function to perform (Taura and Fatima 2008). The results are in agreement with those reported by Khaled *et al.* (2012) who found that a combined application of organic fertilizers (compost, compost tea, humic acid) or with the different mineral N fertilizer rates markedly increased number of sesame capsules/ plant, seed weight/ plant, seed yield kg/fed., and weight of 1000 seeds (g). The enhancement might be due to the stimulation of growth by directly improving the nutrient availability, or indirectly by promoting the cation exchange capacity of plants (Ingham 2005). Marketable lettuce yield was significantly higher in compost amended plots than those minerals fertilized (Lahoz *et al.*, 2009). As a conclusion, Sanwal *et al.* (2006) stated that the use of solid organic materials and compost teas, in some cases, enhanced the yield and quality, and reduced the input costs. Application of organic materials reduced soil acidity, and improved the organic matter and available nutrients of the soil. The use of organics in vegetable production appears to provide an alternative to conventional methods.

Table 2. Compost analysis.

Wight of 1 m^3	688 Kg	Organic matter	23.55 %
Humidity	20 %	Organic carbon	13.65 %
PH	7.83	Ash	76.45 %
EC	3.86 dS/m	C: N ratio	1:12
Total Nitrogen	1.13 %	Total phosphorus	0.37 %
Ammonium Nitrogen	375 ppm	Total potassium	0.71 %
Nitrate Nitrogen	25 ppm	Weed seeds	Non

Table 3. a. Effect of compost tea different application in combination with mineral fertilizers on Plant height (cm), No. of leaves/ plant and Leaf area/ plant (cm^2) of cowpea during two successive summer seasons 2012and 2013.

Characters	Plant height (cm)		No. of leaves/ plant		Leaf area/ plant (cm^2)	
Treatments	1st season	2nd season	1st season	2nd season	1st season	2nd season
100%NPK (Control)	57.33 B	46.00 B	46.67 BC	41.00 ABC	3050 AB	2565 CD
75%NPK+25%CTF	55.50 B	45.00 B	43.50 C	38.10 C	2700 B	2272 D
50%NPK+50%CTF	56.67 B	48.00 AB	45.33 BC	40.10 BC	2772 B	2690 BCD
25%NPK+75%CTF	58.33 AB	49.00 A	53.60 AB	42.00 ABC	3966 A	2937 ABC
75%NPK+25%CTS	58.00 AB	46.67 B	48.83 BC	38.17 C	2752 B	3058 ABC
50%NPK+50%CTS	60.50 AB	49.00 A	52.97 AB	43.17 AB	3253 AB	3136 AB
25%NPK+75%CTS	62.67 A	49.33 A	58.07 A	45.33 A	3331 AB	3228 A

CTF: compost tea as a foliar treatment, CTS: compost teas as a soil drench treatment. Values within the same column followed by the same letters are not significantly different at 5% level (Duncan's multiple range tests).

Table 3. Continued.

Characters	Fresh wt./ plant (g)		Dry wt./ plant (g)	
Treatments	1st season	2nd season	1st season	2nd season
100%NPK (Control)	250.0 AB	254.7 B	50.0 B	42.90 BC
75%NPK+25%CTF	249.7 AB	222.0 C	48.5 B	38.63 C
50%NPK+50%CTF	265.3 AB	251.0 BC	51.0 B	42.17 BC
25%NPK+75%CTF	358.0 A	275.0 B	63.9 A	44.30 B
75%NPK+25%CTS	225.3 B	267.3 B	56.0 AB	43.63 BC
50%NPK+50%CTS	245.3 AB	280.3 B	58.8 A	46.97 B
25%NPK+75%CTS	273.3 AB	312.3 A	62.0 A	53.57 A

CTF: compost tea as a foliar treatment, CTS: compost teas as a soil drench treatment. Values within the same column followed by the same letters are not significantly different at 5% level (Duncan's multiple range tests).

Effect of compost tea different application on seed quality of cowpea

Concerning seed quality parameters (Table 5) treatment number 7 (25%NPK+75%CTS) gave the better significant results over the control in both seasons for weight of 100 seeds, germination % and seedling length. But in the first season for germination rate, i.e. mean days to complete germination, better significant results over control obtained from treatment number 4 (25%NPK+75%CTF) and in second season from treatment number 7. In a study done by Ajinath *et al.* (2011) it was concluded that the comparative performance of the treatments revealed the superiority of compost tea in enhancing tomato seed germination, seedling length and biomass. Among other treatments, compost tea provided significantly better fungi control and hence reduce disease severity and fungal load and thus enhance tomato seedling parameters. Pradeep *et al.* (2012) stated that different bio-composts could enhance seed germination and seedling vigour in four different crops such as maize, green gram, soybean and okra.

Table 4. a. Effect of compost tea different application in combination with mineral fertilizers on number of pods/plant, pod length (cm), and number of seeds/pod of cowpea during two successive summer seasons 2012and 2013.

Characters	Number of pods/plant		Pod length (cm)		Number of seeds/pod	
Treatments	1st season	2nd season	1st season	2nd season	1st season	2nd season
100%NPK (Control)	50.83 AB	48.00 AB	16.10 B	16.17 AB	10.46 AB	10.10 B
75%NPK+25%CTF	47.33 B	46.00 B	16.17 B	15.33 B	10.42 AB	10.00 B
50%NPK+50%CTF	50.50 AB	48.33 AB	17.00 AB	16.50 AB	10.45 AB	10.17 B
25%NPK+75%CTF	51.67 AB	55.00 AB	17.64 A	16.67 AB	10.58 AB	10.17 B
75%NPK+25%CTS	47.33 B	48.50 AB	16.54 B	17.00 A	10.00 B	10.33 AB
50%NPK+50%CTS	56.17 AB	56.00 A	17.33 AB	17.17 A	10.75 AB	10.67 A
25%NPK+75%CTS	60.50 A	57.66 A	18.05 A	17.33 A	11.78 A	11.17 A

CTF: compost tea as foliar treatment, CTS: compost teas as soil drench treatment. Values within the same column followed by the same letters are not significantly different at 5% level (Duncan's multiple range tests).

Table 4. Continued.

Characters	Seed weight/ plant (g)		Seed weight/ plot (g)	
Treatments	1st season	2nd season	1st season	2nd season
100%NPK (Control)	54.67 B	48.00 B	4.42 BC	4.51B
75%NPK+25%CTF	57.00 AB	47.50 B	4.34 C	4.45 B
50%NPK+50%CTF	60.00 AB	51.00 A	4.43 ABC	4.50 B
25%NPK+75%CTF	64.00 AB	49.57 A	4.70 AB	4.57 AB
75%NPK+25%CTS	54.66 B	44.57 C	4.53 ABC	4.46 B
50%NPK+50%CTS	59.17 AB	45.80 C	4.61 ABC	4.60 AB
25%NPK+75%CTS	66.17 A	50.80 A	4.77 A	4.72 A

CTF: compost tea as foliar treatment, CTS: compost teas as soil drench treatment. Values within the same column followed by the same letters are not significantly different at 5% level (Duncan's multiple range tests).

Table 5. a. Effect of compost tea different application in combination with mineral fertilizers on weight of 100 seeds (g), and germination % of cowpea seeds during two successive summer seasons 2012and 2013.

Characters	Weight of 100 seeds (g)		Germination %	
Treatments	1st season	2nd season	1st season	2nd season
100%NPK(Control)	19.95 B	18.21 B	93.33 BC	91.33C
75%NPK+25%CTF	19.93 B	18.10 B	92.67 C	91.33C
50%NPK+50%CTF	20.03 B	19.23 AB	93.67 ABC	92.00 BC
25%NPK+75%CTF	20.13 B	19.87A	94.33ABC	92.67BC
75%NPK+25%CTS	20.27 AB	20.03A	94.00ABC	93.33AB
50%NPK+50%CTS	20.27 AB	20.00 A	95.33AB	94.67A
25%NPK+75%CTS	20.57A	20.10 A	95.33A	94.67A

CTF: compost tea as a foliar treatment, CTS: compost teas as a soil drench treatment. Values within the same column followed by the same letters are not significantly different at 5% level (Duncan's multiple range tests).

Table 5. Continued

Characters	Germination rate		Seedling length (cm)	
Treatments	1st season	2nd season	1st season	2nd season
100%NPK(Control)	1.68 A	1.59 BC	37.67 C	37.90 DE
75%NPK+25%CTF	1.68 A	1.73 A	37.00 C	37.17 E
50%NPK+50%CTF	1.59 AB	1.60 B	37.83 BC	38.33 CD
25%NPK+75%CTF	1.40 B	1.57 BC	38.13 BC	39.00 BC
75%NPK+25%CTS	1.62 AB	1.54 C	39.23 AB	39.73 B
50%NPK+50%CTS	1.53AB	1.48 D	39.70 A	40.53 A
25%NPK+75%CTS	1.50 AB	1.38 E	40.00 A	40.85 A

CTF: compost tea as a foliar treatment, CTS: compost teas as a soil drench treatment. Values within the same column followed by the same letters are not significantly different at 5% level (Duncan's multiple range tests).

Effect of compost tea different application on mineral content (NPK) of cowpea seeds

All compost tea application as a soil drench gave the highest significant N % content in the first season (Table 6). But in the second season the best results obtained from treatment no. 7 (25%NPK+75%CTS) followed by 25%NPK+75%CTF then 50%NPK+50%CTF. N is the main yield factor and considered as the characteristic constituent of functional plasma, an integral part of chlorophyll molecules, proteins, amino acids, nucleic acids (RNA and DNA), nucleotides, phosphotides, alkaloids, enzymes, coenzymes, hormones, and vitamins (Castellanos *et al.*, 2000). Wolkowski (2003) reported that relatively high applications of composted waste should be added to supplement crop N needs and produce yields similar to those found with recommended doses of commercial fertilizer. Regarding to P content in cowpea seeds (table 6) treatment number 7 was the best in both seasons. Then in the first season P content in the control (recommended dose) exceeded other applications, but in the second season treatments no. 4, 3 (25%NPK+75%CTF, 50%NPK+50%CTF) gave better results, respectively, than the control. Organic fertilizers are used for their organic matter contribution and nutrients, mainly P (Fuente *et al.*, 2006). The availability of nutrients in organic fertilizers does not depend on its total content of the material, but on the dynamics of the process; thus, some elements can become more available because of pH, moisture, and aeration, or in composting for the temperature allowing the development of specialized organisms. Likewise, the earthworm's action can

affect, in one way or another, the availability of an element (Melgarejo *et al.*, 1997). From data represented in table 6, it can be noticed that compost tea application couldn't affect seed potassium content in the first season, but in the second season most compost tea application either as a soil drench or as a foliar spray gave better results than the control except treatment no. 2 (75%NPK+25%CTF). Some researchers reported that concentrations of K in leaf and fruits were significantly lower in compost tea treated raspberries (Jennifer *et al.*, 2008). However, Scharenbroch (2011) reported that the aerated compost teas were being able to increase soil microbial biomass and potassium (K) content. In addition, the greatest yield and leaf tissue potassium (K) in tomato were obtained using the greatest level combinations of compost and foliar tea spray, and this was significantly greater than conventional nitrogen-phosphorus-potassium (NPK) fertilizer yield (Radin and Warman 2011). On the other hand, some researchers reported that, the combined application of compost with mineral fertilization recorded the highest K contents (EL-Hefnawy *et al.*, 2008). This effect could be attributed to the role of mineral fertilization in increasing the absorption and accumulation of potassium in the plant organs (Jacoub 1999**Error! Reference source not found.**). Also the organic manure improved the soil microbial biomass and activity, as well as potassium dissolving bacteria, and consequently the available K for the plant (Christoph 2003). So, using combination of mineral fertilizer and organic manure unified these advantages (EL-Hefnawy *et al.*, 2008).

Table 6. Effect of compost tea different application in combination with mineral fertilizers on mineral content of cowpea seeds during two successive summer seasons 2012and 2013.

Characters	N %		P %		K %	
Treatments	1st season	2nd season	1st season	2nd season	1st season	2nd season
100%NPK(Control)	3.23 B	3.34 BC	0.228AB	0.357 BCD	0.674 A	0.762 B
75%NPK+25%CTF	3.00 B	3.36 BC	0.207D	0.350 CD	0.535BC	0.760 B
50%NPK+50%CTF	3.13 B	3.52 AB	0.210 D	0.367ABC	0.619 C	0.833 A
25%NPK+75%CTF	3.60 B	3.54 AB	0.214 D	0.375 AB	0.647B	0.850 A
75%NPK+25%CTS	4.53 A	3.33 C	0.221 C	0.340 D	0.646 B	0.777 B
50%NPK+50%CTS	4.67 A	3.36BC	0.222BC	0.353CD	0.647 B	0.833 A
25%NPK+75%CTS	4.67 A	3.55 A	0.233 A	0.380 A	0.675 A	0.857 A

CTF: compost tea as foliar treatment, CTS: compost teas as soil drench treatment. Values within the same column followed by the same letters are not significantly different at 5% level (Duncan's multiple range tests).

Conclusion

From obtained results it was concluded that using of aqueous compost teas as foliar treatment, or as a soil drench treatment has the potential to improve cowpea plant nutrient status, and enhance plant growth. Moreover, using compost tea as soil drench was superior for its application as foliar spray. Perhaps more importantly, results indicate that both different applications can reduce mineral fertilizers amount up to 75%. These results suggest that the use of compost should be considered more in organic farming because it is not only an environmentally sound substitute for peat in horticultural growth media, but may also have potential for foliar nutrient application and thus may be considered an alternative fertilizer for organic crop production.

References

A.O.A.C. 2000. Official Methods of Analysis of the Association of Official Agricultural Chemists. 17th Ed, Washington. D.C., USA.

Allinson G, Stagnitti F, Salzman SA, Dover KJ, Venner JP, Thwaites LA. 2000. Behavior of

"Organic" and "Synthetic" Fertilizer Nutrients When Applied to Irrigated, Unsaturated Soil, Bull. Environ. Contam. Toxicol **64,** 644-650.

Amujoyegbe BJ, Opabode JT, Olayinka A. 2007. Effect of organic and inorganic fertilizer on yield and chlorophyll content of maize (*Zea mays* L.) and sorghum (*Sorghum bicolour* (L.) Moench). African Journal of Biotechnology **6(16),** 1869-1873.

Hegazi AZ, **Mostafa SSM**, **Ahmed HMI**. 2010. Influence of Different Cyanobacterial Application Methods on Growth and Seed Production of Common Bean under Various Levels of Mineral Nitrogen Fertilization. Nature and Science **8(11),** 183-194.

Ajinath SD, Radha P, Sunil CD, Lata N, Vidhi C, Rajendra S, Anil KS. 2011. Evaluating novel microbe amended composts as biocontrol agents in tomato. Crop Prot **30(9),** 436-442.

Boroujerdnia M, **Ansari NA**. 2007. Effect of Different Levels of Nitrogen Fertilizer and Cultivars on Growth, Yield and Yield Components of Romaine Lettuce (*Lactuca sativa* L.). Middle Eastern and Russian Journal of Plant Science and Biotechnology **1(2),** 47-53.

Carpenter-Boggs L. 2005. Diving into Compost Tea. Biocycle **46,** 61-62.

Castellanos JZ, Uvalle-Bueno JX, Aguilar-Santelises A. 2000. Manual de interpretacion de analisis de suelos, aguas agricolas, plantas ECP. 2ª ed.INIFAP, Chapingo, Mexico.

Christoph E. 2003. Sewage sludge and compost application in agriculture, and its effects on soil quality. Report on the consultancy stay on the occasion of the UNDP – RDA program: Developing and Promoting Support System and International Cooperation on Environment – friendly Agriculture Suwon, Korea.

Dionne A. Tweddell RJ, Antoun H, Avis TJ. 2012. Effect of non-aerated compost teas on damping-off pathogens of tomato. Canadian Journal of Plant Pathology **34(1),** 51-57.

Dugie IY, Omoisui LO, Eketeneme F, Kamara AY. 2009. Farmers Guide to Cowpea production in West Africa, 46-48.

Duncan DB. 1965. Multiple Range and Multiple F. Test. Biometrics 11, 1-42.

EL-Hefnawy NN, **Shalaby AS**, **Ghanem KM**, **Algharib AM**. 2008. Effect of Conventional and Organic Agriculture Systems on Growth and Chemical Composition of Oregano. The First International Conference On Environmental Studies and Research, Environmental Studies and Research Institute, Minufiya University, Egypt, 7 – 9 April 2008, 94-107 p.

El–Shinawy MZ, Abd–Elmoniem EM, Abou–Hadid AF. 1999. The use of organic manure for lettuce plants grown under NFT conditions. Acta Hortic **435,** 315 – 318.

FAO stat 2013. http://faostat.fao.org/site/291/default.aspx.

Fuente BN, Bolan R, Naidu y, Mora M. 2006. Phosphorus in organic waste-soil systems. Revista de la Ciencia del Suelo y Nutrición Vegetal **6(2),** 64-83.

Gourley CJ, Allan DL, Russelle MP. 1994. Plant nutrient efficiency: a comparison and suggested improvement. Plant Soil **158,** 29-37.

Heather MD, Alexandra GS, Richard PD. 2006. Compost and manure mediated impacts on soilborne pathogens and soil quality. Soil Sci. Soci. Amer. J. 70, 347–358.

Ingham ER. 2005. The compost tea brewing manual. 5th ed., Soil Foodweb Inc, Corvallis ,Oregon.

Jacoub RW. 1999. Effect of Some Organic and Non-Organic Fertilizers on Growth, Oil Yield and Chemical Composition of *Ocimum basilicum* L. and *Thymus vulgaris* P. Plants. Ph.D. Thesis, Fac. Agric, Cairo Univ.

Jennifer H, Adl M, Warman Si, Philip R, Rupasinghe H, Vasantha P. 2008.The effects of organic amendments on mineral element uptake and fruit quality of raspberries. Plant & Soil **308(1-2),** 213-226.

Khaled AS, Mona GAE, Zeinab MK. 2012. Effect of soil amendments on soil fertility and sesame crop productivity under newly reclaimed soil conditions. Journal of Applied Sciences Research, 1568-1575.

Lahoz E, Caiazzo R, Morra L, Carella A. 2009. Suppression of lettuce drop caused by Sclerotinia sclerotiorum in the field using municipal solid waste compost and fungistatic effect of water extract. (Special Issue: Compost II). Dynamic Soil, Dynamic Plant **3,** 99-102.

Litterick AML, Harrier P, Wallace CA, Wood M. 2004. The role of uncomposted materials, composts, manures ,and compost extracts in reducing pest and disease incidence and severity in sustainable temperate agricultural and horticultural crop production: A Review. Crit Rev Plant Sci. **23(6),** 453-479.

Magkos F, Arvaniti F, Zampelas A. 2003. Organic food: Nutritious food or food for thought? A review of evidence. Int. J. of Food Sci. Nutri. **54,** 357-371.

Melgarejo MR, **Ballesteros MI**, **Bendeck YM**. 1997. Evaluación de algunos parámetros fisicoquímicosy nutricionales en humus de lombriz y compost derivados. Revista Colombiana de Química **26(2),** 1-11.

Ocloo FCK, **Darfour B**, **Ofosu DO**, **Wilson DD**. 2012. Effects of irradiation on physical and sensory characteristics of cowpea seed cultivars (*Vigna unguiculata* L. Walp).Radiation Physics and Chemistry **81(1),** 77-81.

Pane C, Villecco D, Ronga D, Celano G, Zaccardelli M. 2012. The compost-tea on tomato for more yield and better quality. [Italian] Original Title Il compost-tea su pomodoro da piu resa e migliore qualita. Informatore Agrario **68(7),** 43-45.

Pant AP, Radovich T, Hue NV, Paull RE. 2012. Biochemical properties of compost tea associated with compost quality and effects on pak choi growth. Scientia Horticulturae **148,** 138–146.

Pradeep SM, Deshpande VK, Jagadeesh KS. 2012. Evaluation of phytotoxicity of matured biocomposts obtained from pressmud and spentwash on seed germination and seedling vigour in different crops. Research on Crops **13(2),** 726-730.

Quilty JR, Cattle SR. 2011. Use and understanding of organic amendments in Australian agriculture: a review. Australian Journal of Soil Research 49(1), 1-26.

Radin AM, Warman PR. 2011. Effect of municipal solid waste compost and compost tea as fertility amendments on growth and tissue element concentration in container-grown tomato. Communications in Soil Science and Plant Analysis **42(11),** 1349-1362.

Sanwal SK, Laxminarayana K, Yadav DS, Rai N, Yadav RK. 2006. Growth, yield, and dietary antioxidants of broccoli as affected by fertilizer type. Journal of Vegetable Science **12(2),** 13-26.

Scharenbroch BC, Catania M, Treasurer W, Brand V. 2011. Lab assays on the effects of aerated compost tea and fertilization on soil biochemical

properties and denitrification in A and Bt horizon soils. Arboriculture and Urban Forestry 37:269-276.

Scheuerell SJ, Mahaffee WF. 2004. Compost tea as a container medium drench for suppressing seedling damping-off caused by P. ultimum. Phytopathol. **94 (11),** 1156–1163.

Shrestha KP, Shrestha EM, Adetutu KB, Walsh KM, Ball AS. 2011. Changes in microbial and nutrient composition associated with rumen content compost incubation. Bioresour Technol. **102,** 3848–3854.

Takebe MN, Satou K, Ishii T, Yoneyama. 1996. Effect of slow-releasing nitrogen fertilizers on the contents of oxialic acid, ascorbic acid, sugars and nitrate in spinach (*Spinacia oleracea* L.).Japanese Journal of Soil Science and Plant Nutrition **67(2),** 147-154.

Taura DW, Fatima MS. 2008. Effects of organic and inorganic fertilizers on the vegetative and reproductive parts of some selected varieties of cowpea (*Vigna unguiculata*). African Journal of General Agriculture **4(2),** 79-86.

Wolkowski RP. 2003. Wisconsin corn and soybean responses to fertilizer placement in conservation tillage systems. Proc. Wis. Fert., Aglime, and Pest Mgmt. Conf. **42,** 99-106.

Xu HL, Wang R, Xu RY, Mridha MAU, Goyal S. 2005. Yield and quality of leafy vegetables grown with organic fertilizations. Acta Hort **627,** 25-33.

Zaller JG. 2006. Foliar Spraying of Vermicompost Extracts: Effects on Fruit Quality and Indications of Late-Blight Suppression of Field-Grown Tomatoes, Biological Agriculture and Horticulture **24,** 165–180.