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The Effect of Compost Tea Application on some Soil Characteristics

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Abstract: ***Compost is the best overall soil amendment growers can use to increase the quality and health of soil. Good compost provides soil with nutrients, organic matter, and beneficial microorganisms, which can improve crop health, growth, quality, and yields. Compost also improves a soil's structure and long-term nutrient availability, which helps plants better tolerate drought and suppress disease. However, the time, space, and equipment needed to make and apply compost can make it prohibitive for some farmers. Compost tea offers some of the benefits of compost in a more manageable package. For centuries, farmers have soaked "tea bags" full of compost in tubs of water, and then used the resulting liquid (compost tea) to fertilize and improve the health of their crops. This study was conducted to study the effect of compost tea application on the some soil characteristics to periods of treatment compost is divided into three groups: compost tea, compost, control. Best treatment was obtained in compost tea. Soil sample was collected from (0-30) cm from Alsilait Agricultural Scheme, Khartoum North, air dried under room temperature for 24 hours, ground, sieved (2mm) and stored in sampling sacs for further analysis. The soil samples were analyzed using the methods described by Page et.al. (1986). Results of soil analysis showed very low nitrogen content of the studied samples, clay loam texture, neutral alkalinity and salinity within acceptable range. Results of compost tea of Bagasse & Mango is revealed the increase in extract pH after dilution from acidic to alkaline for Bagasse and Mango compost tea, respectively.***
Keywords: amendment, organic fertilizer, soil characteristics, compost tea, nitrogen content.

I. INTRODUCTION

In today's world there are concerns with accumulating waste, limited amounts of freshwater and fossil fuels, decreasing biological diversity, and world hunger. To meet our increasing food needs we have developed various methods of agriculture. Agriculture is a major culprit in all of the previously mentioned categories (Morris 2002). Modern agriculture produces sustenance for our people and animals, yet it has some environmental consequences. Release of nutrients to the environment can lead to many negative effects. Hydroponics is an efficient way of producing food with maximum efficiency of nutrient uptake by plants as the solution is completely controlled. Compost extract or ''compost tea'' is a liquid extract of compost obtained by mixing compost and water for a defined period of time.

Compost tea contains nutrients and a range of different organisms and is applied to the soil or directly to plants with the principal aim of suppressing certain plant diseases. In addition, the application of compost tea supplies nutrients and organic matter to the soil (Carballo *et.al*. 2008). Compost tea has been used for centuries; evidence indicates that it has been used since the Roman Empire (Ingham 2002).

Compost teas are a sustainable, economic, and feasible way to efficiently utilize nutrients from pre and post consumer food waste and vegetative wastes from modern agriculture. Compost tea is an umbrella term referring to a nutrient and/or microorganism rich solution prepared by releasing compost nutrients and microbiology into solution. Recently, compost teas have been recognized for their ability to suppress several foliar diseases as well as seed and root rot (Scheuerell 2004). A compost tea can be tailored to its desired use. For example a compost tea can be specifically brewed for use as a soil organic matter builder, a disease suppressant, or a nutrient source (Ingham 2002).

Little work has been done to assess the nutritional benefits of compost teas on plant growth (Pant 2009). Strawberry yields were increased with the application of an aerated compost tea compared to a control solution (Welke 2005). Vermicompost tea increased plant production and mineral nutrient content in pak choi (*Brassica rapa*cv. Bonsai Chinesis group; Pant 2009). The aim of this work I assess the effect of compost tea on the soil characteristics.

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II. MATERIALS & METHODS

A. Soil Sampling, Preparation

Soil sample was collected from (0-30) cm from Alsilait Agricultural Scheme, Khartoum North, air dried under room temperature for 24 hours, ground, sieved (2mm) and stored in sampling sacs for further analysis. The soil samples were analyzed using the methods described by Page *et.al.* (1986).

1) *Soil Extract Preparation:* Soil extract (1:5) was prepared by adding 100 ml distilled water to 50 gm soil sample, shaking for 30 minutes and then filtered.
2) *Soil Ph:* Soil pH was measured as described by using pH meter Hanna model 211
3) *Soil Electric Conductivity (EC):* Soil EC (dS/m) was measured as described by using EC meter Hanna model 214
4) *Soluble Calcium (Ca) and Soluble Magnesium (Mg), Meq/l:* Soluble Ca and Mg were estimated by titrating 5 ml of soil extract against HCl concentrated and calculated as follows:

Soluble cation meq/l = V1XN1/ V2

Where;

V1= Volume of EDTA

N1= Normality of EDTA

V2= Volume of sample

5) *Soluble Sodium (Na) and Soluble Potassium (K), ppm:* Sodium and potassium concentrations were measured in soil extract using Phlame Photometry model
6) *Organic Carbon (OC) and Organic Matter (OM), %:* Organic carbon was measured by titrating 2 gm of soil sample amended with potassium dichromate against concentrated sulphuric acid and calculated as follows:

OC % = (VB-VS) X 0.3X0.5X1.334

OM % = OC X 1.743

Where;

VB = Blank volume

VS = Sample volume

7) *Soil Texture:* Soil texture was measured by using the hydrometer method described by to estimate the particle size distribution. The percentages of soil particles were calculated as follows:

After 40 seconds hydrometer reading:

Silt + Clay % = (SR-BR) - (T-19.4) X 0.36 X 100/sample oven dry weight

After 2 hours hydrometer reading:

Clay %= (SR-BR) - (T-19.4) X 0.36 X 100/sample oven dry weight

Where;

SR = Sample hydrometer reading

BR = Blank Hydrometer reading

T = Solution Temperature

8) *Initial Moisture Content (IMC) %*

Soil sample (10gm) was dried in an oven 105C for 24 hours and IMC % was estimated as follows:

IMC %= (W2-W1)X 100/W2

Where;

W1= sample weight before drying

W2= sample weight after drying

9) *Ash %*

Soil sample was dried in furnace 500C for 6 hours and the sample ash was estimates as follows:

Ash % = (W3-W2)X 100/W2

Where;

W2 = sample weight after drying

W3 = samples weight after ashing

B. Compost Tea (CT) Preparation

In the experiment two types of compost (table 2) were used to prepare compost tea; Bagasse Compost (B) and Mango Leaves Compost (M).

1) *Stock Solution Preparation:* 50 gm from compost (B) and compost (M) was diluted with 500 ml of distilled water, shaken for 3 hours under aerobic conditions and then filtered. The solutions (SB &SM) were analyzed for pH & EC values and then kept in refrigerator.
2) *Treatment Solutions Preparation*

From the stock solutions, two treatment solutions were prepared as follows:

a) B1 & M1 solutions: 50 ml of stock solution was diluted to 250 ml with distilled water (1:5 ratio)
b) B2 & M2 solutions: 25 ml of stock solution was diluted to 250 ml with distilled water (1:10 ratio).

III. RESULTS AND DISCUSSION

A. Soil Sample Analysis

Results of soil samples analysis was shown in table (1).

Table (1): Results of soil samples analysis, 0-30 cm depth

Parameter	Ph	EC dS/m	Sand %	Silt %	Clay %	OC %	N %
Sample	7.70	0.71	20.46	50.0	29.54	0.36	0.163

Results of soil analysis showed very low nitrogen content of the studied samples, clay loam texture, neutral alkalinity and salinity within acceptable range.

B. Compost Samples Analysis Results

Analysis of the compost used to prepare compost tea was shown in table(3).

Table (2): Compost samples analysis results

Compost	pH	ECdS/m	OM%	N%	IMC%
Bagasse	7.05	2.8	44.47	0.75	4.86
Mango	7.46	1.6	15.56	1.2	5.52

Where;

N % = Total nitrogen
OM % = organic matter
IMC %= Initial moisture content
EC dS/m = Electric conductivity.

C. Analysis of Compost Tea (CT) Results

Results of compost tea of Bagasse & Mango is represented in table (3). Results revealed the increase in extract pH after dilution from acidic to alkaline (figure 1) & (figure 2) for Bagasse and Mango compost tea, respectively.

Different results were obtained with EC value as it decreases with dilution.

Compost Tea	pH	ECdS/m
Stock B	6.75	1.44
B1	7.21	0.29
B2	7.09	0.13
Stock M	6.06	1.66
M1	6.41	0.32
M2	6.44	0.15

These results could be explained by the fact that, the application of compost and compost tea; activated the microorganisms even to attack the soil organic matter, which is known as “Priming Effect” where microorganisms feed on original organic matter that adversely affect soil quality.

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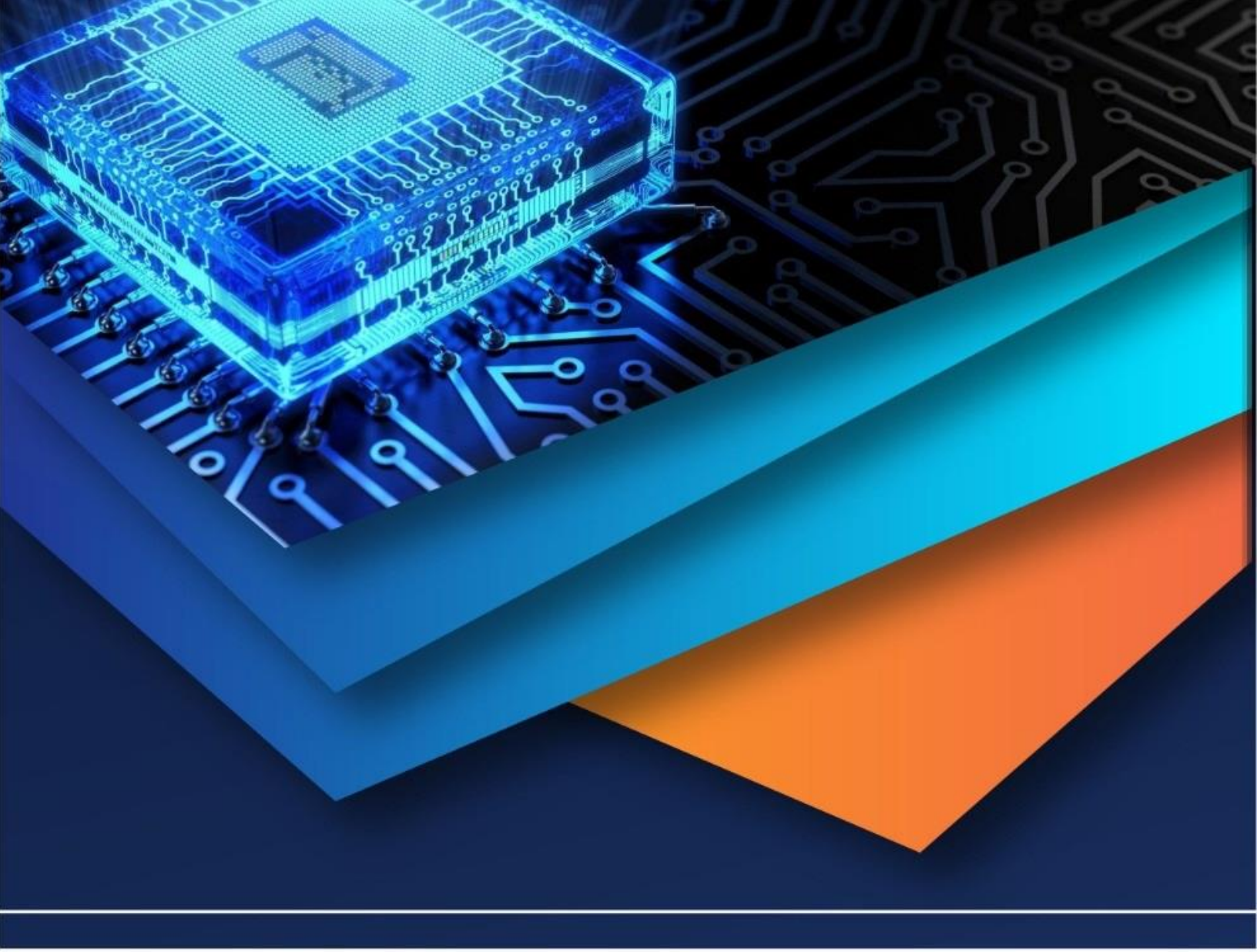

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