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Effect of Composting Site on Surrounding Soils and Vegetation

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Abstract: Composting is regarded as profitable and ecological way to lessen the biodegradable waste dumping in landfills.. In this study, the effects of pit (1 cu yd) composting at Composting Site of CEES, PU on properties of adjoining soil, guava (*Psidiumguajava*) and Kachnar (*Bauhiniavariegata*) trees; assessed on the basis of selected soil properties and morphological features of trees. The results showed that the compost prepared by pit composting at the composting site had following properties: bulk density 0.75±0.06g/cm3, water holding capacity 38.67±7.72 %, pH 8.49± 0.31 and electrical conductivity 1.43±0.58, total Kjeldahl nitrogen 3.18±0.99, total organic carbon 0.39±0.12, organic matter 0.67± 0.06, calcium 1.04± 0.31, sodium 0.25±0.15, and potassium 130.11±6.94. All the quality parameters of compost were in the typical range of standard set by U.S Composting Council. The soil in the adjoining areas of composting site showed significant improvement in the quality than soils located far away from the composting time. It was mainly because of flow of runoff from pit composting site, as well as, due to lateral flow of compost tea from the compost pit to the surrounding soils. Both guava and kachnar trees showed highly significant increase in plant growth as compared to similar trees growing at soils far away from the composting site.

Keywords: Landfills, Pit Compositing, Lateral Flow, Growth, Biodegradable, Dumping, Morphological

Introduction and Review of Literature

According to World Health Organization, solid waste comprises of discarded and vain components from different sectors like domestic, trade, commercial, industrial, agricultural and public etc. The manufacturing and discarding of huge amounts of fractions of organic waste is considered as the cause of depletion of Earth's resources. Landfilling i.e. storing waste in large digs could be helpful for longer storage of waste but not for actual disposal. By segregating organic waste material from Municipal Solid waste stream, there is a chance to reduce mixing of waste with landfills by 50% in progressing countries and this waste can be recycled and reused as a valuable product like compost.

Composting is a treatment process that requires time, knowledge, experience, equipment and effort. The benefits of establishing a composting process must be balanced against some of the drawbacks of the process and the product. Organic by-products or residuals that are difficult to store, apply to fields uniformly, are unstable or non-uniform are good candidates for composting. Manures, bio-solids and food processing residuals are produced daily but often cannot be used on a daily basis and, therefore, must be stored periodically. Composting transforms manures for example to a drier, more uniform and biologically stable product with many uses other than just land application. Composted manures as such have a greater value than untreated manures to the farmer or feedlot owner. Non-uniform materials such as yard trimmings are transformed by degradation and mixing during composting into homogeneous organic mulch. Wet materials such as bio-solids become drier as composts and are therefore more easily land applied. By-products that contain human or plant pathogens are safer after the high temperature treatment of composting. Compost products generally have a higher carbon to nitrogen ratio than the original by-product and therefore act as a slow release fertilizer.

Composting is effective only if we have a constant supply of raw material to work with. This method is most suitable for composting scrapings from common house-holds. One can begin with the small amount of waste and some soil and keep on adding more waste to it with time. Ingredients of newly added waste will mix with the old ones which is the advanced stage of decomposition.

Unfortunately, in many developing countries like Pakistan, main hurdle in the implementation of important changes is the non-availability of sufficient resources. As far as solid waste management in the educational institutions of Pakistan is concerned the fate of organic waste from the institutes is landfill only. Existing solid waste management system in PU is: total number of four vehicles (trolley) collect the

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waste from 23 dumping/transfer station situated within the campus generates approximately 1-1.5tons/day of waste and transfers it to Saggian dumping site at 10km of campus. In this existing system total number of 143 labors involved with total wage of 9000 to 14000/person/month while the duty hours remains 6:30am to 12:00pm. Fuel consumption of each waste carrier vehicle is 8 litters/day with maintenance cost of 10000/vehicle/month.

Institutional waste can be managed in a way that yields organic product (Composting) in shorter period and with less resource consumption. The process of composting has different approaches and sometimes compost seed/activator is used. The compost activator make easy to make certain the process of composting successful with a unique combination of microorganisms, pH balancers, and the sources of energy. However, compost could be made without a compost activator; it is used to speed up the process to minimize the duration. If growing season is short, a compost activator helps to make compost in shorter period of time.

In the process of composting organic material biologically decomposed in the controlled environment. (Pace et al., 1995; pace et al., 2003) In compost, organic material from biodegradable waste is microbially decayed, which results in the form of a final product containing stabilized carbon (C), nitrogen (N) and nutrients in the form of organic fraction, where stability, depending on the maturity of the compost (Zwart, 2003).Materials used for composting are generally one of three categories i.e., 1) clippings, leaves, wheat sprouts, dry plant material, food processing and waste based materials such as plants, 2) domestic and industrial sewage sludge as bio-solids derived from municipal solid waste, and 3) animal manure based fertilizers. All three sources are high in organic matter; content is measured as macro and micro nutrients. Compost for fertilizer price also depends on the process used to create compost organic material from the same raw material and fertilizer. Plant-based compost is usually lower in nitrogen (N) than bio-solid-based compost. Composites made of bio-solids generally contain a higher N and Phosphorus (P) content than those made from animal fats and site protection. (Alexander, 2001).

Soil organic matter level of soil can be sufficiently increased by applying compost, especially produced from the biomass wastes. However quantity, type of compost, the soil properties and management are the essential influencing factors for Soil organic matter enrichment. Compost which is mature contain higher level of the stable carbon (C) causes increase in soil organic matter (SOM) (Bouajila and Sanaa, 2011 and Daniel and Bruno, 2012). The higher the amount of the organic matter the higher will be the amount of the carbon in soil and the amount of the organic carbon will be higher in uncultivated soil rather than cultivated soil because the cultivation of the plants causes increase in the degradation of the osil organic matter in cultivated soil . (Soheil et al. 2012).

Essential nutrients are presents in the organic form and have lesser rate leaching as compared to the inorganic fertilizer. (Larney et al., 2008). Compost extracted from the biogenic household and gardens whenever applied to soils they increases soil carbon (C) and nitrogen (N) concentrations. (Leifeld et al., 2002; Mylavarapu and Zinatt,2009).

By applying compost the soil structure effects positively ass as it decreases soil density because of the mixing of the organic matter of low density with the fractions of mineral soil. Later effect has been observed many times in the cases, link with porosity increase because of the interaction of the organic fraction and inorganic fraction. (Amlinger et al., 2007). It has been observed by Brown and Cotton (2011) that soil bulk density worked on the predictable pattern that when the compost rate increases the bulk density decreases having inverse relation. If the bulk density is lower it shows that pore spaces are increased sand indicate improved soil tilth. (Liu et al., 2007). Also that in soil the organic fraction has more light weight rather than the mineral fraction. So as the result, if the fractions of organic increases then the bulk density and total weight will decreases. (Brown and Cotton, 2011).

According to Brown and Cotton (2011) compost contain concentrations of comparable plants nutrient complexes available compared to soil fertilized and increases conventional concentrations of macro and micronutrients compared to control soil. Gamal (2009) also experimented and apply compost of 0 ton, 5 ton, and 10 ton ha-1 rates and tested the nutrient content. In his experiment he observe that increase in the nitrogen, phosphorus and potassium nutrients content in all compost received plots and the increase was highest in those plots which receives compost of 10 ton ha-1. And according to micronutrients, copper , manganese and zinc amounts increases were report (Amlinger et al., 2007). Bouajila and Sanaa (2011) also reported that by applying more dung and waste household compost results in an increase amount of the nitrogen (organic) significantly. However, the complete content of the nutrient of the compost is not obtainable at the same time. (Tayebeh et al., 2010). The effect of fertilization is prolog because of the steady release of the nutrients (Seran et al., 2010). However, there is more desirable avoidance from the leaching with compost rather than dissolvable mineral fertilizers. Mostly the nitrogen fertilization effect of compost is finite because of lower rate of mineralization and microbial immobilization

(Tayebeh et al., 2010)

Figure 1: study area

In the light of reviewed literature, the current study is aimed at assessing the effect of composting site of CEES on surrounding soils and vegetation. For this purpose, trees of Guava (*Psidiumguajava)* and Kachnar (*Bauhinia variegate*) were analyzed statistically on basis of their growth parameters. The soil samples were also taken from the study site to analyze the effects of compost and soil quality was then characterized on basis of selected soil parameters.

Materials and Methods

Sampling site

The analysis was conducted at the backyard of the College of Earth and Environmental Sciences (CEES), University of the Punjab, Lahore. The study area was of length 625.48ft. The study was basically conducted to study the effect of composting on two plant species namely Guava (*Psidiumguajava)* and Kachnar (*Bauhinia variegate*). These were planted in 2013 at different intervals in the specified area. From the total study area, an area of 37ft was selected as compost site and then was provided with compost since March 2013. The purpose of providing the compost was to study its effects on the plant growth and soil properties at the compost site, areas nearby compost site and the areas far away from compost site. The total area on which the study was conducted was 625.48 ft. The compost site comprised an area of 37 ft. Area before the compost site was 140.32 ft., while the area present between the compost site and parking was 49.17 ft. The area after parking, present far away from the compost site, where the kachnar trees were planted comprised 214 ft., while the parking area was consisting of 184.99 ft. The study area can be visualized from the following image.

Plant Measurement

During the plant analysis at the study site, the mean diameter, mean height, stem width, branch width, approximate number of branches and approximate number of leaves of all the trees were taken to estimate the effect of composting on their growth. The Guava trees at the study site were named as G # S1A, G # S1B, G # S1C, G # S1D, G # S1E, G # S2B, G # S3B, and G # S3Cin the order as they were planted while the Kachnar trees were named as K # S2A, K # S2C, K # S3A, K # S3D, K # S3E, K # S3F, K # S3G, K # S3H, K # S3I, K # S3J, and K # S3Kin the order of their plantation. The required plant parameters were then analyzed.

The number of branches and leaves determined in the study were based on approximation of stem width, branch width, height and diameter of the plants by taking measurements with measuring tape. The mean height and diameter of the trees were also recorded. In order to study the effects of composting on growth of Kachnar (*Bauhinia variegate*) trees, the height of each tree was taken by considering it in two halves. Using measuring tape, the height of first half (H1) was measured for each tree and the height of second half (H2) was taken by approximation. The approximate diameter of each tree was also taken from four different angles with the help of measuring tape **(Table 1).**

As in case of Kachnar (*Bauhinia variegate)*, the height of each Guava (*Psidiumguajava)*tree was taken by considering it in two halves. Using measuring tape, the height of first half (H1) was measured for each tree and the height of second half (H2) was taken by approximation. The approximate diameter of each tree was also taken from four different angles with the help of measuring tape **(Table 2).**

Collection of soil samples

The soil was collected from 9 spots i.e. three from the compost site three from the left side of the compost site and remaining three from the right side of the compost site, all the samples were collected from the depth of 2 feet.

Soil analysis

pH

For pH of soil, 30 gram of soil was taken in a beaker and 30mL distilled water was added and stir them with the stirrer. The mixture was filtered through the filter paper 125mm and the extract was taken in the beaker whose pH was measured by using EUTECH Instrument (pc510).

Electrical conductivity (EC)

For measuring the electrical conductivity of soil, 30 gram of soil was taken in a beaker. Then, 30mL distilled water was added and stirred with the help of stirrer. The mixture was filtered through the filter paper 125mm and the extract was taken in the beaker whose electrical conductivity was measured by using EUTECH Instrument (pc510).

Total organic carbon (TOC)

In order to measure the total organic carbon of soil, 2.5 gram of oven dried soil which is crushed by pastel and mortar, for each sample was taken in separate 9 beaker. 2mL of KMnO4 and 18mL of distilled water was added in the 2.5 gram of soil for each sample. It was shaken for 2 minutes and then left for 5 to 10 minutes in order to get settled. Then 0.5mL supernatant was taken with the pipette in separate beaker and 45.5mL of distilled water was added. The total volume was made up to 50mL. 9 samples were prepared by this method. Initially, the spectrophotometer was run with the distilled water as blank afterwards each sample was run in spectrophotometer at 550nm.

Total kjeldahl nitrogen (TKN)

For measuring TKN of soil, 2 gram of Copper Sulphate (CuSO4) and 20 gram of Potassium Sulphate (K_2SO_4) were mixed together for the preparation of catalyst. 2 gram from the prepared catalyst was added in 0.5 gram of soil in all 9 samples. 8mL of concentrated sulphuric acid (H_2SO_4) was added in all the 9 samples stirred and left for a minute till the evaporation of the fumes. All the 9 samples were placed on the hot plate for 2 hours. After 2 hours, 1mL of H_2O_2 was added in each sample and left them for half an hour. After half an hour, 1mL of H_2O_2 was added again and all the 9 solution were then digested. After digestion 20mL of distilled water was added and filtered through the filter paper 125mm and added in the bottle.

Water holding capacity (%)

Gravity's effect on the capacity of soil to absorb water againstdrainage was determined by the procedure of Trautmann and Krasny (1997). 100ml of air dried soil was put in specialized funnel with the lining of filter paper, tubes at bottom side and clamp to close it. 100 ml tap water was added to soil in funnel with closed clamp till saturation of sample. Water present in classified cylinder was then measured. Calculation of % WHC was done by using equation:

$$Soilwaterholdingcapacity = \frac{waterretained\ (mL)}{100mLofsample} \times 100$$

Bulk Density

Soil present in six inches metal ring for infiltration test (given in section 4.1.4.1.2) was taken for the determination of soil bulk density, as given by Arshad et al. (1996). Ring was removed from its place such that no soil loss occurred and then extra soil was eliminated using flat-bladed knife. Soil present in that ring was transferred to the zip-lock bag and sent to the laboratory where soil was weighed along with the bag.Some of the sample was placed in pre-weighed china dish and weighed again. China dish was then placed in oven at 100 ˚C for 5 min and was again weighed. Bulk density was then calculated as follows: Placed the soil in labeled zip-lock bag and transported the soil sample into the laboratory.

$$\textit{Bulk density } (g/cm^3) = \textit{Dry soil weight } (g) / \textit{Soil volume } (cm^3)$$

Determination of Ca, Na&K in soil

For Ca, Na & K determination, 500 mL soil was taken in 100 mL beaker and 500 mL deionized water was added in it. It was mixed with spatula until became saturated and left it for 12 hour. It was mixed again by adding a little amount of deionized. When it became saturated, it was put into the assembly. Water was extracted from suction pump in order to find out the quantity of Ca, K and Na.

Soil organic matter (SOM)

Loss on ignition (LOI) was used for the determination of SOM using procedure of Cornell Nutrient Analysis Laboratory (CNAL) (Gugino et al. 2009). From mixture of sample 50g was taken and dried in oven for 5 hours at 105 ˚C and put in muffle furnace for 24 hours at 500 ˚C. Percentage LOI was converted to percentage organic matter by using formula:

SOM (%) = (% LOI × 0.7) – 0.23

Analysis

Vegetation analysis

The vegetation in the study area was mainly the trees of Guava (*Psidiumguajava)* and Kachnar (*Bauhinia variegate*). For the study, 8 trees of Guava (*Psidiumguajava)* and 11 trees of Kachnar (*Bauhinia variegate*) were analyzed carefully to study the effects of composting on their growth.

Response of Kachnar (*Bauhinia variegate)*

The K # S2C showed maximum height (694.94cm), followed by K # S2A with height (664.46cm), K # S3A (633.98cm), K # S3D (487.68cm), K # S3I (475.48cm), K # S3H with height (448.05cm), K # S3J (371.86cm), K # S3K (341.36cm), K # S3F (310.9cm), K # S3E (304.8cm), and then being the least in K # S3G with height (231.65cm), as given in table 4.1.1.1.1. The K # S2 showed maximum diameter (624.84cm), followed by K # S2A with diameter (543.76cm), K # S3A (387.01cm), # S3D (346.71cm), K # S3 (284.22cm), K # S3 (247.65cm), K # S3I (233.93cm), K # S3K (208.79cm), K # S3H (194.32cm), K # S3F (126.49cm), and then being the least in K # S3G with height (109.73cm), as followed by table 1

Study on humus shows that under suitable conditions of minerals, plant biomass shows good results (Chen ,Aviad).

Table 1. Mean ± Standard deviation valuation of Kachnar (*Bauhinia variegate*) at spot 1, 2 and 3 with respect to composting site.

Tree	Mean height(cm)	Mean diameter(cm)
K # S2A	664.46 ± 332.23	543.76 ± 45.08
K # S2C	694.94 ± 347.47	624.84 ± 45.72
K # S3A	633.98 ± 339.85	387.01 ± 19.52
K # S3D	487.68 ± 243.84	346.71 ± 12.56
K # S3E	304.8 ± 152.4	247.65 ± 15.75
K # S3F	310.9 ± 155.45	126.49 ± 7.92
K # S3G	231.65 ± 115.82	109.73 ± 9.88
K # S3H	448.05 ± 224.02	194.32 ± 18.34
K # S3I	475.48 ± 237.74	233.93 ± 8.72
K # S3J	371.86 ± 185.93	284.22 ± 49.68
K # S3K	341.36 ± 170.68	208.79 ± 17.84

Response of Guava (*Psidiumguajava)*

The G # S1E showed maximum height (573.02cm), followed by G # S2B with height (554.73cm), G # S3C (390.14cm), G # S3B (381.0cm) G # S1C (341.38cm), G # S1D (320.04cm), G # S1B (304.8cm), and then being least in G # S1A (274.32cm), as given in Table 4.1.1.2.1. The G # S1E showed maximum diameter (523.49cm), followed by G # S2B with diameter (509.78cm), G # S3C (429.0cm), G # S3B (427.48cm), G # S1C (406.14cm), G # S1D (374.90cm), G # S1B (337.56cm), and then being the least in G # S1A with diameter (277.37cm), as given in table 2

After the test of different procedures except control method, an increase was observed by the leaf. Electrical conductivity, organic carbon and soil NPK was enhanced whereas pH of soil was reduced in performed experiments. According to study, vegetative growth, flowering, fruiting, fruit yield and quality, soil productivity and leaf nutrient of guava were improved by vermin-compost than organic sources or poultry manure and leaf litter (M.H. Naik, R. Sri HariBabu).

Table 2 Mean ± Standard deviation valuation of guava (*Psidiumguajava*) at spot 1, 2 and 3 with respect to composting site

Tree	Height (cm) Mean ± Standard deviation	Diameter (cm) Mean ± Standard deviation
G # S1A	274.32 ± 15.24	277.37 ± 15.39
G # S1B	304.8 ± 15.24	337.56 ± 31.18
G # S1C	341.38 ± 3.05	406.14 ± 54.62
G # S1D	320.04 ± 7.62	374.90 ± 55.08
G # S1E	573.02 ± 18.29	523.49 ± 60.89
G # S2B	554.73 ± 3.05	509.78 ± 114.76
G # S3B	381.0 ± 7.62	427.48 ± 36.41
G # S3C	390.14 ± 3.05	429.0 ± 39.06

Biomass determination

The Kachnar (*Bauhinia variegate)* and Guava (*Psidiumguajava)*trees present in the study area were deeply analyzed. To study the effects of compost on their growth, different plant parameters like diameter (n=4), height (n=2), approximate number of branches and leaves, stem width (n=2) and approximate height of each branch (n=3) of a tree were taken carefully. The measured plant parameters are given below in table 4.1.1.3.1. Above-ground biomass was observed two times greater on loam (4–8 Mg ha^{-1}) than on sand (2–6 Mg ha^{-1}) on pure soil substrate (indicated by the intercept of the regression equation, Table 2). Above-ground mass can be improved by using composted biochar.

Table 3 Biomass of guava and kachnar as affected by the composting site of CEES PU Lahore

Tree	No. of Branches (approx.)	Stem Height (cm)	Branch Height (cm)	No. of Leaves
G # S1A	8	16.51	5.59	2840
G # S1B	11	27.94	5.33	3850
G # S1C	17	36.83	6.60	4828
G # S1D	12	34.29	5.33	3984
G # S1E	20	45.72	6.86	8820
G # S2B	10	40.64	10.16	3640
G # S3B	9	33.53	8.64	7632
G # S3C	13	46.99	8.64	4485
K # S2A	11	35.56	11.43	13750
K # S2C	25	60.96	15.24	30500
K # S3A	10	21.08	11.68	12200
K # S3D	16	31.75	10.67	20160
K # S3E	6	20.32	10.41	2856
K # S3F	3	15.24	8.38	2250
K # S3G	3	20.32	6.60	693
K # S3H	4	20.32	10.16	1568
K # S3I	9	30.48	11.18	3627
K # S3J	6	30.48	11.43	3940
K # S3K	3	27.94	6.3	1497

Soil analysis

To study the effects of composting on different soil parameters, soil samples were collected from the compost site and its surrounding area included in the study. The soil samples were taken from 9 spots in the study area in order to know about their physical, chemical and biological health.

TKN, pH & EC in soil

The TKN showed maximum value4.95in S # 2C, followed by S #3C, S # 1C,S # 3B, S # 1B, S # 2B, S # 2A, S # 3A,having value 4, 3.95, 3.85, 3, 2.45, 2.4, 2.2respectively, and being the least value 1.8 in S # 1A, as given in table 4.1.2.1.1. The pH showed maximum value 9.2 in S # 3C, followed by 8.8 in S # 1B, followed by 8.6 in S # 3B, followed by the same value 8.4 in S # 2C, S # 3A and S # 1A, followed by 8.3 in both S # 2A and S # 2B, and then being the least 8.0 in S # 1C, as given in table 4.1.2.1.1. The EC showed maximum value 2.8 in S #3C, followed by 2.1 in S # 1B, followed by 1.4 in S # 3B, followed by 1.3 in S # 2A, followed by 1.2 in S # 1C, followed by 1.1 in both S # 2B,and S # 2C, followed by 1.0 in S # 3A, and then being the least 0.9 in S # 1A.

The impact on pH of soil after compost addition is not clear as pH should be neutral and alkaline. Compost can both enhance or lessen the pH of soil and also can buffer the pH (Busutler et a1.,2008; Johnson et al., 2006). Factors like metal solubility, plant nutrient transfer, plant development, microbial activity and many other attributes and reactions depend on the pH of soil (Garcia-Gil et a1.,2004).

Table 4.. Mean ± Standard deviation valuation and the effect of compost on chemical properties of soil at spot 1, 2 and 3 with respect to compost site.

Spot	Total Kjeldahl Nitrogen	pH (potential of hydrogen)	Electrical conductivity	Soil texture
S # 1A	1.8	8.4	0.9	Loam
S # 1B	3	8.8	2.1	Loam
S # 1C	3.95	8.0	1.2	Loam
S # 2A	2.4	8.3	1.3	Loam
S # 2B	2.45	8.3	1.1	Loam
S # 2C	4.95	8.4	1.1	Loam
S # 3A	2.2	8.4	1.0	Loam
S # 3B	3.85	8.6	1.4	Loam
S #3C	4	9.2	2.8	Loam

Mean ± Standard deviation of TKN = 3.18 ± 0.99
Mean ± Standard deviation of pH = 8.49 ± 0.32
Mean ± Standard deviation of EC = 1.43 ± 0.58

TOC, SOM, Bulk density in soil

The S #1B showed maximum value (0.528) for TOC, followed by S #3B (0.523), followed by S #3C (0.522), followed by S #3A (0.492), followed by S #2B (0.361), followed by S #2C (0.311), followed by S #2A (0.281), followed by S #1A (0.256), and then being the least in S #1 (0.217). The S #2B showed maximum value (0.78) for SOM, followed by S #1B and S #3B having value 0.70, followed by S #1A and S #2C having value 0.68, followed by S #3C (0.67), followed by S #1C (0.65), followed by S #2A (0.63), and then being the least inS #3A (0.55). The S #2A showed maximum value (0.899) for bulk density, followed by S #2B having value 0.777, followed by S #3C having value 0.770, followed by S #3B having value 0.758, followed by S #1C having value 0.732, followed by S #3A having value 0.714, followed by S #1A having value0.710, followed by S #2C having value 0.71, and then being the least in S #1B having value 0.691.

The use of organic fertilizers is preferred over inorganic/chemical fertilizer, because the former option improves biological and physico-chemical properties of soils in an eco-friendly manner (Palm et al., 1997). Few reports suggest that organic fertilizer especially EM compost improves the nutritional quality and antioxidant content in plants along with improving the soil health (Xu et al., 2000; Toor et al., 2006 ; Ncube et al., 2011).

A reduction in soil bulk density occurs when the volume of void space (i.e., porosity) increases and/or the fractions of the mineral of soil are diluted because of the presence of organic matter (Hill and James, 1995; Cogger, 2005). Cultivation typically alters soil bulk density by increasing soil void space while the addition of organic matter lowers bulk density by reducing the portion of mineral particles present in the soil. An additional consequence of adding organic matter to soil is that it usually also increases the proportion void spaces present within the soil (Pagliai et al., 1981; Giusquiani et al., 1995).

Table 5 Mean± Standard deviation valuation and the effect of compost on different soil parameters at spot 1, 2 and 3 with respect to compost site.

Spot	Total organic carbon	Bulk Density= Dry soil weight / soil volume	Soil organic matter	Soil texture
S #1A	0.256	0.710	0.68	Loam
S #1B	0.528	0.691	0.70	Loam
S #1C	0.217	0.732	0.65	Loam
S #2A	0.281	0.899	0.63	Loam

S #2B	0.361	0.777	0.78	Loam
S #2C	0.311	0.71	0.68	Loam
S #3A	0.492	0.714	0.55	Loam
S #3B	0.523	0.758	0.70	Loam
S #3C	0.522	0.770	0.67	Loam

Mean ± Standard deviation of TOC = 0.39 ± 0.12
Mean ± Standard deviation of bulk density = 0.75 ± 0.06
Mean ± Standard deviation of SOM = 0.67 ± 0.06

Ca, Na & K in soil

The S #3C showed maximum value (1.8) for Ca, followed by S #2B having value 1.3, followed by S #1A, S #2A, and S #2C, having same value 1, followed by S #1B having value 0.9, followed by S #1C, S #3A and S #3B having same value 0.8 which is being the least value. The Na showed maximum value (0.56) in S #2C, followed by S #2A (0.45), followed by S #3C (0.32), followed byS #1C (0.30), followed by S #1A (0.2), followed by S #3B (0.18), followed by S #1B (0.15), and then being the least (0.12) in S #2B and S #3A. The S #2A and S #2B showed maximum value 140 for K, followed by S #1B (135), followed by S #1A and S #1A having value 130, followed by S #1C and S #3B having value 128, then being the least 120 in S #2C and S #3C.

The nutrients (Na and K) obtained from composts act as slow-release fertilizers and effect plant's nourishment, moreover chemical and physical properties likeelectrical conductivity (EC) and total pore space were related too. (Bernal et al.,2002)

Table 6 . Mean± Standard deviation valuation and the effect of compost on nutrient level of soil at spot 1, 2 and 3 with respect to compost site.

Spot	Calcium	Sodium	Potassium	Soil texture
S1	1	0.2	130	Loam
S2	0.9	0.15	135	Loam
S3	0.8	0.30	128	Loam
S4	1	0.45	140	Loam
S5	1.3	0.12	140	Loam
S6	1	0.56	120	Loam
S7	0.8	0.12	130	Loam
S8	0.8	0.18	128	Loam
S9	1.8	0.32	120	Loam

Mean ± Standard deviation of Ca = 1.04 ± 0.31
Mean ± Standard deviation of Na = 0.25 ± 0.15
Mean ± Standard deviation of K = 130.11 ± 6.94

Water holding capacity

It is the quantity of water that holds into interstitial spaces of soil after gravitational loss for a specific period of time. Some of compost sample' values are given below in table 4.1.2.5.1.

Compost, specifically prepared by EM has the capability of mineralization of soil organic matter thus improving nutrient availability, soil health and crop growth (Piyadasa et al., 1995). The bio-augmented compost is also related to enhance soil structure, to increase soil productivity, to improve soil microbial activity and better water holding capacity of the soil (Arancon et al., 2004).

Table 7 shows the water holding capacity of the spots

Spots	Water volume mL	Soil volume mL	Readings mL	Soil Texture
S # 1B	100	100	46	Loam
S # 2B	100	100	28	Loam
S # 3A	100	100	42	Loam

Mean ± Standard deviation of WHC = 38.67 ± 7.72

Conclusion and Recommendations

It is concluded that pit composting at the composting site incur positive effects on the surrounding soils and vegetation by improving soil quality and inducing enhanced growth in trees. Growing trees in the surrounding of composting site can be used to establish composting site releasing least compost runoff dispersing in the surrounding water bodies and rendering extremely least likely percolation into ground water.

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