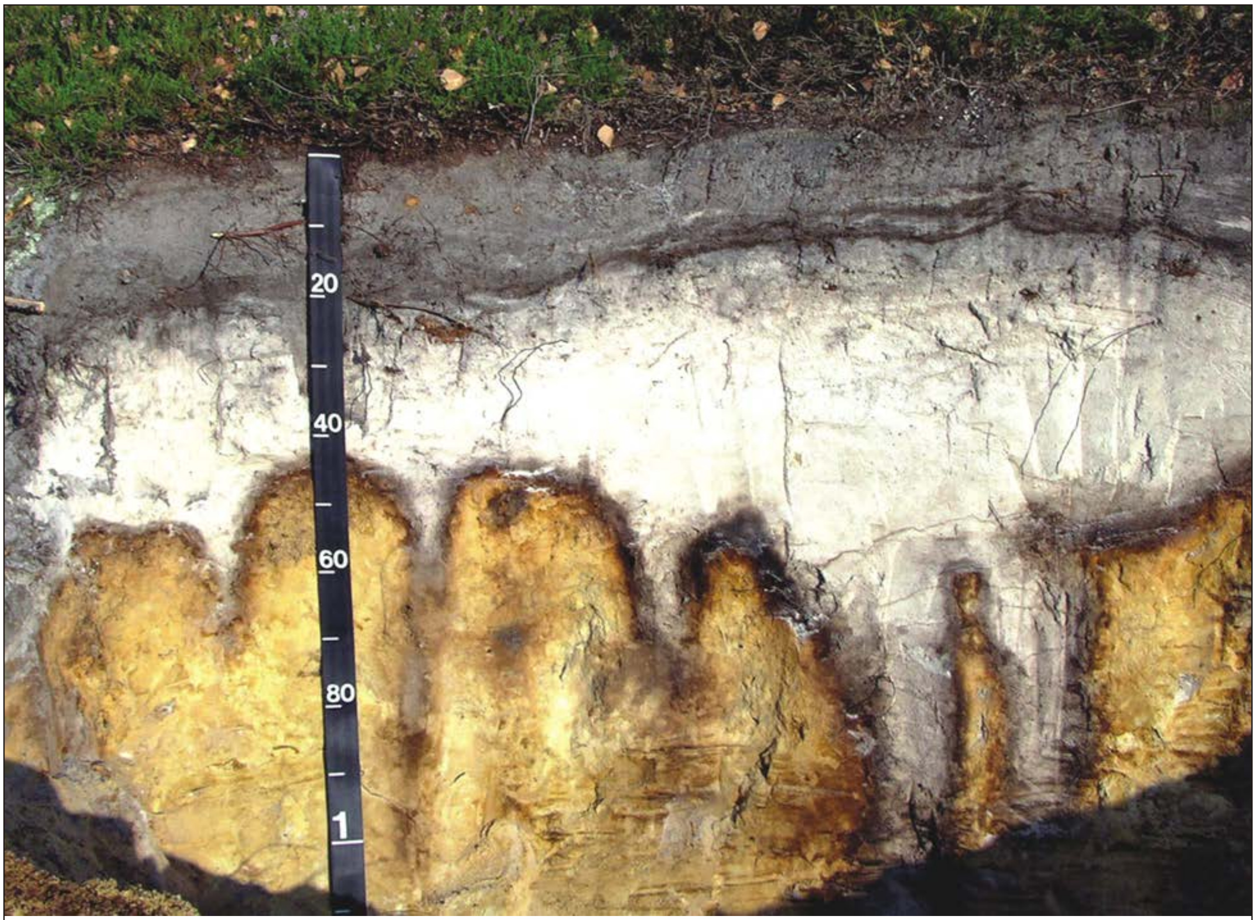

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Responses of Some Soil Biological, Chemical and Physical Properties to Short-term Compost Amendment

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ABSTRACT

Compost amendment has a positive influence on soil properties and thus can serve as a soil management strategy for a sustainable crop production system. Changes in soil biological, chemical and physical properties in response to 2 separate applications of compost were estimated using 3 rates of compost (0, 10 and 20 t ha^{-1}) on two varieties of tomato (UC82B and BESKE) in 2006 and 2007. Soil samples were taken at 6 and 12 months after the first compost application and 12 and 24 months after the second application for analysis. Results revealed that total microbial count was significantly ($p \leq 0.05$) higher after amendment but fungal count was significantly higher only at 12 months in plots amended with 20 t ha^{-1} than in control after the first compost application. Microbial Biomass Nitrogen (MBN) significantly increased in plots amended with 20 t ha^{-1} while Microbial Biomass Phosphorus (MBP) and Microbial Biomass Carbon (MBC) increased with increase in rate of amendment up to 1 year after second compost amended. Furthermore, MBP, MBC and soil organic matter were higher at 1 than 2 years after compost the second compost amendment. At 2 years after compost amendments, bulk density significantly decreased by 4.8%, aggregate stability improved by 15.7% and total porosity significantly increased by 2.9%. Also, plots amended with 20 t ha^{-1} compost and planted to Beske had significant reduction in bulk density and increase in hydraulic conductivity compared with those planted to UC82B. However, aggregate stability was higher in all plots with Beske. Conclusively, compost amendment led to an improvement in soil organic carbon and microbial activities which significantly improved soil physical quality particularly in plots sown to Beske variety.

Key words: Aggregate stability, bulk density, microbial biomass, microbial populations, total porosity

INTRODUCTION

Compost is derived from biological conversion of organic materials into a soil-like fertilizer; it is a term that describes a managed process of organic matter decomposition and recomposition (Insam *et al*., 2002). It is an organic soil amendment that may be applied alone or in combination with inorganic fertilizers. In addition to supplying major plant nutrients, organic fertilizers also supply micronutrients to plants and because they are slow-release fertilizers, their effects last longer than inorganic fertilizers (Gabrielle *et al*., 2004; Tu *et al*., 2006). Apart from its effect on nutrient release, compost is known to improve physical properties, such as soil bulk density, water retention, infiltration and aeration. Furthermore, it improves soil organic matter level, thereby serving as a store-house of energy for soil micro-organisms. The effect of compost on soil microbial population, however, depends on the content of organic matter and the quality of the materials used (Kowaljow and Mazzarino, 2007; Chaves *et al.*, 2004). Applications of composted urban waste, plant residues, cotton gin and poultry manure high in organic matter content to soils have been used to restore and maintain soil organic matter, thus reclaiming degraded soils and supplying plant nutrients (Ros *et al.*, 2003; Walker, 2003; Tejeda *et al.*, 2006). In their study, Handayani *et al.* (2010) observed that particulate organic matter; C, N and C-associated with macro-aggregates and amount of macro-aggregates were strongly affected by soil management. Also, the use of compost is considered a good management practice as it stimulates soil microbial populations and activities, leading to mineralization of plant nutrients (Eriksen, 2005; Randhawa *et al.*, 2005) and improvement of soil fertility and quality (Ros *et al.*, 2003; Walker, 2003; Tejeda *et al.*, 2007).

Soil organic matter supplied by compost improves soil physical properties by acting as a cementing agent necessary for flocculating soil particles to form stable aggregates (Spaccini *et al.*, 2004; Tejeda *et al.*, 2006). Moreover, formation of mucilage's by bacteria and fungi enhances the formation of soil micro-aggregates (Six *et al.*, 2004). All of these lead to improvement in the soil structure leading to improvement in bulk density, aeration, water holding capacity, infiltration and hydraulic conductivity. Research reports on the specific changes in soil physical and microbiological properties due to compost application have been severally reported elsewhere, however, there is dearth of information on this subject on West African soils.

In this study, the gradual changes in biological and physical properties were evaluated in soil amended with 2 separate yearly (2006 and 2007) applications of composted plant and animal matter and sown to 2 varieties of tomato.

MATERIALS AND METHODS

The field experiment was conducted at University of Agriculture, Alabata, Abeokuta (7° 15' N, 3° 25' E) in South-Western Nigeria from 2006 to 2008. Abeokuta is located in the forest-savanna transition zone with average annual rainfall ranging from 900 to 1200 mm during the rainy months (March to July; early cropping season and September to November; late cropping season). The short dry spell, often referred to as August break, extends from late July to August and the long dry spell extends from November to March. The mean temperature which is generally cool from June to September and hot from November to May, is about 32.5°C, with a low diurnal variation of 5-10°C. The soil is sandy (OxicPaleudulf), near neutral in reaction (6.67 in H_2O) with low contents of organic matter (0.21%), nitrogen (0.09%), Bray 1 available phosphorus (7.8 mg kg^{-1}) and exchangeable bases (3.35 Cmol kg^{-1} Ca^{2+} and 0.22 Cmol kg^{-1} K^{+}). The experimental field is located on a lower slope topographic position very close to the valley bottom.

Compost was prepared using plant residues (maize, soybean and siam weed) and poultry manure (deep litter) at ratio 3:1 (by volume) in heaps of 1.5 by 1.5 by 2 m. The composting materials were watered to maintain moisture content of 55% (Mckinley *et al.*, 1985) and turned 5 times at every 10-day intervals to improve aeration and decomposition of the pile. The temperature in the composting material ranged from 35-60°C in the first three weeks. Eight weeks was allowed for composting process to be fully completed and an additional 4 weeks was allowed for curing. At the end of composting, analysis revealed that the compost contained 1.1% nitrogen, 0.9% phosphorus and 0.3% potassium.

In a split-plot arrangement, two tomato (*Lycopersicon esculentum*) varieties (UC 82B and Beske) formed the main treatments and 3 rates of compost (0, 10 and 20 tons ha^{-1}) constituted the sub-treatments arranged in Randomized Complete Block Design (RCBD) with 3 replicates. Two sampling depths (0-20 and 20-40 cm) were considered for the soil physical parameters. The plot size was 5×4 m. The different rates of compost were broadcast and worked thoroughly into the soil 2 weeks before 4 week old tomato seedlings were transplanted in August 2006 and September 2007. The field was left fallow after the cultivation of tomato.

One year after first compost amendment, the composite soil sample of the experimental field was analyzed for particle size (Gee and Bauder, 1986), pH (in water 1:1), organic carbon (Nelson and Sommers, 1996), total nitrogen (Bremner, 1996), Bray 1 available P and exchangeable bases (Thomas, 1982). Total microbial and fungi populations using the dilution plate count method (Jensen, 1962), microbial biomass carbon, phosphorus and nitrogen (Vance *et al*., 1987) were estimated at 6 and 12 months after the first compost amendment (February 2007 and August 2007) and 1 and 2 years after the second amendment (August 2008 and August 2009). The microbial diversity was estimated 6 months after the first compost amendment (February, 2007) by characterizing the micro-organisms with biochemical tests, they were identified from Bergey's manual (Buchanan and Gibbons, 1974). Micro-arthropod (Crossby and Coleman, 1999) and earthworm populations (Bouche and Gardener, 1984) were estimated in August 2008 and 2009. Gravimetric soil moisture content was measured in February 2007 (oven-dried at 105°C for 24 h) while bulk density (Blake and Hartge, 1986), total porosity (Carter and Ball, 1993), hydraulic conductivity (Reynolds, 1993) and water stable aggregate (Kemper and Rosenau, 1986) were determined in August 2008 and 2009.

The data were subjected to Analysis of Variance (ANOVA) using the SAS (1989) procedure. Where significant at up to 5% probability, the means were separated using the Least Significant Difference (LSD).

RESULTS

Some soil properties of the experimental field before and 12 months after the first compost amendment showed that silt fraction increased by 6.2% while sand fraction decreased by 6.6% but the textural classification did not change (Table 1). Furthermore, pH increased from 6.67 to 6.99,

Table 1: The physicochemical analyses of experimental field before and 12 months after compost amendment

Item	Initial soil	After first compost amendment
Properties		
Sand (%)	95.0	88.4
Silt (%)	1.6	7.8
Clay (%)	3.4	3.8
Textural class	Sandy	Sandy
pH	6.67	6.99
Organic carbon (%)	0.12	1.28
Available P (mg kg^{-1})	7.8	10.3
Total N (%)	0.09	0.12
C/N ratio	1.3	10.6
Exchangeable bases (Cmol kg^{-1})		
Na^+	0.21	0.37
Ca_2^+	3.25	3.10
Mg_2^+	0.80	0.72
K^+	0.22	0.24

Table 2: Response of soil microbial populations and moisture content to 2 tomato varieties(UC82B and Beske) and rates of compost amendment at 6 and 12 months after compost application in 2007 at Abeokuta

	No. of isolates		Total microbial count ($\times 10^5$cfu g^{-1})				Fungal count ($\times 10^5$cfu g^{-1})				Moisture content (%)	
	6*		6		12		6		12		6	
Compost rate (t ha^{-1})	UC82B	Beske	UC82B	Beske	UC82B	Beske	UC82B	Beske	UC82B	Beske	UC82B	Beske
0	8.0	7.0	12.3	12.2	12.2	14.0	0.40	0.27	0.35	0.25	3.3	3.9
10	10.0	9.3	17.7	19.5	20.2	22.0	0.67	0.70	0.70	0.70	3.9	4.2
20	10.0	10.3	25.1	24.0	26.4	27.3	0.61	0.70	1.20	1.50	4.3	4.6
LSD	0.098		1.505		1.558		0.098		0.141		0.2	

*Months after compost amendment

organic carbon increased by 1.16%, available P by 2.5 mg kg^{-1}, nitrogen by 0.03%, K by 0.02 Cmol kg^{-1} and Na by 0.16 Cmol kg^{-1} while Ca and Mg decreased by 0.15 and 0.08 Cmol kg^{-1}, respectively.

The result of microbial numbers and gravimetric moisture content at 6 and 12 months after the first compost application (MACA) showed that soil moisture content significantly increased as the rate of compost was increased in all plots sown to Beske and UC82B (Table 2). At 6 MACA, under the two tomato varieties, the highest moisture content (3.9-4.6%), number of isolates (9.3-10.3), total microbial count (17.7-25.1$\times 10^5$ cfu g^{-1}) and fungal count (0.61-0.70$\times 10^5$cfu g^{-1}) were recorded in plots amended with 10 or 20 t ha^{-1} while the lowest values always occurred in the control plots. Similarly, at 12 MACA, also under the two tomato varieties, the highest values for total microbial (20.0-27.3$\times 10^5$ cfu g^{-1}) and fungal (0.70-1.50$\times 10^5$ cfu g^{-1}) counts were recorded in plots amended with compost up to 10 or 20 t ha^{-1} and the lowest values from the unamended control plots. However, plots sown to Beske had higher total microbial populations than those sown to UC82B, irrespective of compost rate. The trend was not consistent for fungal populations.

The total microbial and micro arthropod populations were significantly higher at 2 than at 1 year after the second compost amendment/planting (YACA/P) and in plots sown to Beske than to UC82B (Table 3). But the differences in fungal and earthworm populations 1 and 2 YACA/P and also in plots sown to the 2 varieties of tomato were not statistically significant. Furthermore, the microbial and faunal populations were not significantly different at all rates of amendment 1 and 2 YACA/P. However, the highest total microbial (20.5$\times 10^5$ cfu g^{-1}) and fungal (0.39$\times 10^5$ cfu g^{-1}) counts were recorded in plots with 20 t ha^{-1} and the lowest values were recorded in the control plots. The highest micro arthropod population (9.5$\times 10^3$ m^{-2}) was recorded in plots amended with 10 t ha^{-1} and the lowest value (8.0$\times 10^3$ m^{-2}) in plots amended with 20 t ha^{-1}. For earthworm population, the highest value (46.67$\times 10^3$ ha^{-1}) was observed in the control plots and the lowest value (40.0$\times 10^3$$ha^{-1}$) in plots amended with 10 t ha^{-1}.

Table 4 presents the response of soil microbial biomass N, P and C to treatments at 6 and 12 MACA. The results showed that the values of MBN, MBP and MBC increased with the rate of compost up to the highest level (20 t ha^{-1}) either at 6 or 12 MACA. At 6 MACA, the lowest values for MBN (0.10 mg kg^{-1}), MBP (6.3 mg kg^{-1}) and MBC (68.2-76.5 mg kg^{-1}) were obtained in plots amended with 0 t ha^{-1} compost while their corresponding highest values of 0.13-0.14, 12.1-12.5 and 125-131mg kg^{-1} were obtained in plots amended with 20 t ha^{-1} under the two tomato varieties.

Table 3: Residual effect of compost, tomato varieties and duration after the 2nd compost application/planting on the values for microbial, micro-arthropod and earthworm populations at Abeokuta

Treatment	Total microbial count ($\times 10^5$cfu g^{-1})	Fungal count ($\times 10^5$cfu g^{-1})	No. of micro-arthropod ($\times 10^2$ m^{-2})	No. of earthworm cast ($\times 10^3$$ha^{-1}$)
YACA/P				
1	17.78b	0.37	7.78b	45.56
2	21.63a	0.48	9.65a	40.00
LSD	*	NS	*	NS
Variety				
UC82B	17.40b	0.40	7.40b	40.00
Beske	22.00a	0.46	10.00a	45.56
LSD	*	NS	*	NS
Rate of compost (t ha^{-1})				
0	15.60	0.31	8.66	46.67
10	18.90	0.38	9.50	40.00
20	20.50	0.39	8.0	41.67
LSD	NS	NS	NS	NS

*: Significant at $p \le 0.05$. NS: Not significant. YACA/P: Year after compost amendment/planting. Values followed by different letters are significantly different at 5% probability level

Table 4: Response of soil microbial biomass to 2 tomato varieties (UC82B and Beske) and rates of compost amendment at 6 and 12 months after compost application in 2007 at Abeokuta

	MBN (mg kg^{-1})				MBP (mg kg^{-1})				MBC (mg kg^{-1})			
	6*		12		6		12		6		12	
Compost rate (t ha^{-1})	UC82B	Beske	UC82B	Beske	UC82B	Beske	UC82B	Beske	UC82B	Beske	UC82B	Beske
0	0.10	0.10	0.03	0.04	6.3	6.3	6.00	9.7	76.50	68.2	98.50	106.0
10	0.12	0.11	0.18	0.19	8.1	9.4	12.90	13.3	94.30	98.4	143.00	143.0
20	0.14	0.13	0.19	0.22	12.1	12.5	16.50	17.2	131.00	125.0	177.00	189.0
LSD	0.036		0.019		0.0136		3.15		16.99		7.85	

*Months after compost amendment, MBN: Microbial biomass nitrogen; MBP: Microbial biomass phosphorus; MBC: Microbial biomass carbon

With amendment either at 10 or 20 t ha^{-1}, MBN value was higher in plots sown to UC82B than those sown to Beske. Conversely, MBP value was higher in plots sown to Beske than those sown to UC82B. The trend observed for MBC was not consistent. Similarly, at 12 MACA, the lowest values for MBN (0.03-0.04 mg kg^{-1}), MBP (6.0-9.7 mg kg^{-1}) and MBC (98.5-106.0 mg kg^{-1}) were obtained in plots amended with 0 t ha^{-1} compost while their corresponding highest values of 0.19-0.22, 16.5-17.2 and 177.0-189.0 mg kg^{-1} were obtained in plots amended with 20 t ha^{-1} under the two tomato varieties. However, with or without amendment, the values of MBN, MBP and MBC were always higher in plots sown to Beske than those sown to UC82B.

Changes in microbial biomass N, P, C and soil organic carbon 1 and 2 YACA/P are presented in Table 5. The soil MBP, MBC and SOC were significantly higher at 1 than 2 YACA/P. However, the value of MBN was insignificantly higher at 2 than 1 YACA/P. Furthermore, the values of MBN in plots sown to the two tomato varieties were similar while those of MBP, MBC and SOC were insignificantly higher in plots sown to Beske than those sown to UC82B. It is interesting to note that soil amendment decreased the values of MBN, MBP, MBC and SOC. The highest numerical values of 0.36, 22.3, 76.5 mg kg^{-1} and 2.9% for MBN, MBP, MBC and SOC, respectively were observed in the control plots while their corresponding lowest values of 0.29, 16.7, 71.2 mg kg^{-1} and 2.7% were recorded in plots with 20 t ha^{-1}.

Table 6 presents the changes in bulk density, hydraulic conductivity, aggregate stability and total porosity 1 and 2 YACA/P. Bulk density was significantly reduced from 1.46 g cm^{-3} in 1 YACA/P to 1.39 g cm^{-3} in 2 YACA/P. The value of aggregate stability significantly increased from 1.02 MWD in 1 YACA/P to 1.21 MWD in 2 YACA/P while that of total porosity from 44.8% in 1 YACA/P to 4 7.7% in 2 YACA/P. Furthermore, bulk density and aggregate stability were

Table 5: Residual effect of compost, tomato varieties and duration after the 2nd compost application/planting on the values of soil microbial biomass and organic carbon at Abeokuta

Treatment	MBN (mg kg^{-1})	MBP (mg kg^{-1})	MBC (mg kg^{-1})	SOC (%)
YACA/P				
1	0.30	22.7^{a}	86.7^{a}	3.28^{a}
2	0.34	17.0^{b}	61.6^{b}	2.31^{b}
LSD	NS	*	*	*
Variety				
UC82B	0.32	17.3	68.0	2.57
Beske	0.32	22.4	79.7	3.00
LSD	NS	NS	NS	NS
Rate of compost (t ha^{-1})				
0	0.36	22.3	76.5	2.9
10	0.30	20.5	73.9	2.8
20	0.29	16.7	71.2	2.7
LSD	NS	NS	NS	NS

*: Significant at $p \leq 0.05$, NS: Not significant, YACA/P: Year after compost amendment/planting, MBN: Microbial biomass nitrogen; MBP: Microbial biomass phosphorus; MBC: Microbial biomass carbon, Values followed by different letters are significantly different at 5% probability level

Table 6: Residual effect of compost, tomato varieties and duration after the 2nd compost application/planting on the values of soil bulk density, hydraulic conductivity, aggregate stability and porosity at Abeokuta

Treatment	Bulk density (g cm^{-3})	Hydraulic conductivity (cm hr^{-1})	Aggregate stability (MWD)	Total porosity (%)
YACA/P				
1	1.46^{a}	59.2	1.02^{b}	44.8^{b}
2	1.39^{b}	56.7	1.21^{a}	47.7^{a}
LSD	*	NS	*	*
Depth (cm)				
0-20	1.34^{b}	55.1	1.03^{b}	49.1^{a}
20-40	1.5^{a}	60.8	1.24^{a}	43.4^{b}
Variety×compost				
UC82B 0	1.46^{a}	46.1^{b}	0.92^{b}	45.1
UC82B 10	1.47^{a}	39.9^{b}	1.10^{b}	44.5
UC82B 20	1.41^{a}	53.0^{b}	0.98^{b}	47.0
Beske 0	1.41^{a}	58.2^{b}	1.36^{a}	47.1
Beske 10	1.44^{a}	50.8^{b}	1.39^{a}	45.0
Beske 20	1.33^{b}	99.6^{a}	1.38^{a}	48.5
LSD	*	*	*	NS

*: Significant at $p = 0.05$, NS: Not significant, YACA/P: Year after compost amendment/planting, Values followed by different letters are significantly different at 5% probability level

significantly lower while total porosity was significantly higher in the surface soil (0-20 cm) than in the subsoil (20-40 cm). Interactions between compost and tomato variety were significant; indicating that the two tomato varieties responded differently to compost amendment. The results showed that plots amended with or without compost and sown to Beske generally had lower values of bulk density (1.33-1.41 g cm^{-3}) than those sown to UC82B (1.41-1.47 g cm^{-3}) and higher values of hydraulic conductivity (50.8-99.6 cm h^{-1}) than those to UC82B (39.9-53.0 cm h^{-1}). Furthermore, plots sown to Beske had higher values of aggregate stability (1.36-1.38 MWD) than those sown to UC82B (0.92-1.10 MWD) and total porosity (45.0-48.5%) than those sown to UC82B (44.5-47.0%). Plots amended with 20 t ha^{-1} compost and sown to Beske significantly had lower bulk density and higher hydraulic conductivity than the other treatments. Also, all plots with or without compost amendment and sown to Beske significantly recorded greater values of aggregate stability than those sown to UC82B.

DISCUSSION

Present study showed that soil amendment with compost at different rates may enhance soil organic matter level, biological activities and physical conditions for increased productivity. The increase in silt fraction of the top soil of the whole experimental field could probably be as a result of higher biological activities due to an increase in organic matter level. It could also be attributed to the lower topographical position of the experimental field that probably enhanced deposition of finer material from the upper slope (Malgwi and Abu, 2011). The reduction in soil acidity and improvement in organic matter mineralization after the first compost amendment in 2006 led to an increase in some soil micro and macronutrients. The increase in soil pH, organic carbon, nitrogen and phosphorus was a consequence of degradation of acid type compounds such as carboxylic and phenolic groups, as well as mineralization of amino acids and peptides to ammonia as earlier reported by Paredes *et al.* (2005). Furthermore, the decrease in basic cation contents such as Ca and Mg was probably attributed to displacement of these cations by Na^+ on the exchange site. Troeh and Thompson (1993) stated that little or no Na^+ should be added to soil as liming material because of its negative effect on soil structural stability. Sodium accumulation was reported in soil after 25 amendments of compost due to high Na content in animal manures (Hao and Chang, 2003; Li-Xian *et al.*, 2007; Moral *et al.*, 2008). The levels of soil micronutrients observed in this study were adequate for arable crop production according to the findings of Ayeni and Adeleye (2011).

The observed increase in soil microbial populations and activities which led to accumulation of soil organic matter could probably be attributed to the stimulation of Zymogenous microorganisms and incorporation of exogenous microorganisms as a result of soil amendment with compost (Scaffers, 2000). Consequently, accumulation of soil organic matter led to an increase in soil water retention (Rawis *et al.*, 2003) which probably provided a more favourable micro-environment for proliferation of microbial population and activities. It is interesting to note that high soil microbial population was still sustained 2 years after compost amendment despite the fact that organic matter content had reduced. This could be due to improved structural properties of the soil. Giusquiani *et al.* (1995) and Van Veen and Kuikman (1990) showed that improvement in soil physical properties, particularly structural stability and porosity, may affect its biological and biochemical activities. However, 1 year after the second compost amendment, microbial biomass N, P and C decreased as a result of corresponding decrease in the soil organic matter. This is because microbial biomass is directly influenced by availability of easily decomposable organic materials

(Tejeda *et al*., 2006) which in turn positively affect soil enzymatic activities in compost amended soil (Kowaljow and Mazzarino, 2007; Ceccanti *et al*., 1993). Furthermore, Takeda *et al*. (2009) observed that increase in microbial biomass P is a consequence of increased phosphatase activity. Akintokun *et al*. (2007) had earlier isolated some phosphate solubilizing fungi in some selected soil from south west Nigeria. Rahman *et al*. (2008) also reported that microbial community and microbial biomass N and C were responsive to soil management practices and can therefore be used as an indicator of soil quality.

Improvement in soil bulk density, total porosity and aggregate stability in compost amended plots at 2 YACA/P, especially in the surface soil, could be attributed to an increase in soil organic matter which acted as a cementing factor necessary for flocculating soil particles to form stable aggregates. Moreover, microbial populations might have contributed to aggregate formation and stabilization through the production of mucilages which enhanced the formation of soil microaggregates (Spaccini *et al*., 2004; Six *et al*., 2004). Mbagwu (1989) had earlier noted that organic waste incorporated into the soil at the rate of 10% increased the total porosity by 23%.

Aggelides and Londra (2000) also reported that saturated and unsaturated hydraulic conductivity, water retention capacity, bulk density, total porosity, pore size distribution, soil resistance to penetration, aggregation and aggregate stability were improved proportionally by rates of compost application. Tejeda *et al*. (2009) attributed reduction in bulk density of compost amended plots to dilution of the denser mineral fraction and increased soil aeration as a result of increased soil porosity and structural stability.

It is also interesting to observe that microbial and faunal populations and activities were greater in plots sown to Beske than to UC82B at 2 YACA/P. This implies that, apart from compost amendment, higher soil organic matter, hydraulic conductivity and aggregate stability and lower bulk density were enhanced by plant residues in plots sown to Beske than to UC82B. Hence, the significant varietal differences observed on soil properties 6 and 12 MACA tend to suggest that the two tomato varieties had remarkable differences in their contributions to soil improvement with or without compost amendment. The application of plant residue to soil is considered a good management practice because it stimulates soil microbial growth and activity with the subsequent mineralization of plant nutrients (Randhawa *et al*., 2005). The soil improvement derived from greater residues production by Beske may have implication on the long-term stability and sustainability of humid tropical soil. According to Oades (1993) mucilages produced by bacteria and fungi represent a source of labile soil organic carbon. Aggregate binding effect of labile soil organic carbon is rapid and transient while slower decomposing soil organic carbon has subtler effect on aggregation but the effect may be longer lived (Martens, 2000).

CONCLUSION

It could be concluded that soil amendment with compost can improve soil chemical, biological and physical conditions and thus improve crop production in humid tropical soils.

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