Influence of poultry composted organic manure on selected soil properties and organic carbon under Tomato cultivation

By

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INTRODUCTION

- Soil degradation poses a major threat to sustainable agricultural practices….. excessive soil erosion, nutrient run-off and loss of soil organic matter
- Its ineffective management has resulted in soil quality deterioration and consequently influences crop development (Golehin *et al*., 1995; Tejuda *et al*., 2006)
- Therefore, soil organic matter (SOM) improvement and stability is of major concern in sustainable agriculture.
- This often advantageous for crop production (Arriaga and lowery, 2003) as sustenance of SOM is important in terms of cycling plant nutrients and improving the soil's physical, chemical and biological properties.

INTRODUCTION CONTINUED

- Previous researches have consistently affirmed the proliferation of organic materials utilization in agricultural some of which include

✓ increase in soil aggregation Paglai *et al*. (2004)

✓ Improve soil total porosity Schjonning *et al*. (2002).

✓ increased soil water retention Miller *et al* . (2002).

- **Objective of this study**

To compare the residual effect of organic manure (poultry-composted organic manure) on the selected soil physical properties and organic carbon under tomato cultivation.

MATERIALS AND METHODS

Description of Study Area

- Located at Alabata, Ogun state (latitude 7^0 15'N and longitude 3^0 28'E)
- total plot size was 720m^2 (36 plots) and each experimental plot is 4m x 5m laid in randomized complete block design
- The treatment applied on the plots were 0, 10, 20 ton/ha of poultry composted manure
- Land preparation for the succeeding crop was carried out by hoeing before transplanting. No compost was applied to the succeeding tomato.

Soil Sample and Analysis

- Initial soil samples were collected before first and second planting for analysis.
- Soil sample were equally collected at 0-20cm and 20-40cm depth from each experimental plots.
- Total Organic Matter was determined using Walkey-Black method (1964).

Materials and Methods continued

- Aggregate Stability was estimated using wet sieving techniques as described by Emerson, 1997.
- Saturated Hydraulic Conductivity was determined using constant head method (Klute and Dirksen 1986)
- Bulk Density was determined by using the core method (Harte and Horn, 1989).
- Total Porosity was determined in undisturbed water saturated cores assuming no air was trapped in the pores.

Materials and Methods continued

Cultural Practices

- Land preparation for the succeeding crop was carried out by hoeing before transplanting and compost was applied to the succeeding tomato.
- The two tomato varieties planted were UC82B and BESKE and were transplanted accordingly for the second planting.
- The spacing was 80 X 30cm with planting population of 56,000 plants per hectare.
- Weed control took place twice at 3 and 7 weeks after transplanting using Africa hoe.

Statistical Analysis

- Data generated were subjected to analysis of variance using Genstat statistical package (2007) and significant difference was reported at $P \leq 0.05$.

RESULTS AND DISCUSSION

Table 1. Soil analysis results of the studied sites before planting and after first planting

Parameters	Value	
	Pre planting soil Analysis	After first planting Analysis
pH (H_2O)	6.04	5.59
Total Nitrogen, TN (g/Kg)	0.09	0.46
Potassium, K^+ (Cmol/Kg)	0.42	1.01
Available Phosphorus, Av. P (mg/Kg)	1.55	1.25
Sodium, Na^+ (Cmol/Kg)	0.23	0.18
Magnesium, Mg^{2+} (Cmol/Kg)	1.47	1.16
Calcium, Ca^{2+} (Cmol/Kg)	2.35	1.87
Total Exchangeable Acidity, TEA (Cmol/Kg)	0.17	0.14
Cation Exchangeable Capacity, CEC (Cmol/Kg)	4.62	3.47
Organic Carbon, OC (%)	1.01	2.17
Base Saturation, BS (%)	96.1	89.1
Bulk density (g/cm^3)	1.63	1.47
Sand (g/Kg)	805	800
Clay (g/Kg)	80	92
Silt (g/Kg)	105	108
Texture	Loamy Sand	Loamy Sand
Porosity (%)	46	48
Permeability (cm/hr)	4.50	5.15

Table 2 Organic carbon (%) as affected by poultry manure under tomato cultivation

Tomato varieties	Compost rate (t/ha)	Depth (cm)	
		0 – 20	20 - 40
UC82B	0	1.357	0.883
	10	1.917	1.368
	20	1.765	1.173
BESKE	0	2.207	0.870
	10	2.678	1.082
	20	2.298	1.063

lsd at ($p>0.05$) for treatment[a] x depth is 0.6440
treatment[a]= tomato varieties x compost rate

Table 3 Soil bulk density as affected by poultry manure under tomato cultivation

Tomato varieties	Compost rate (t/ha)	Depth (cm)	
		0 – 20	20 - 40
UC82B	0	1.357	1.593
	10	1.340	1.487
	20	1.312	1.502
	0	1.435	1.457
BESKE	10	1.252	1.410
	20	1.375	0.883

lsd at ($p>0.05$) for treatment[a] x depth is 0.1244
treatment[a]= tomato varieties x compost rate

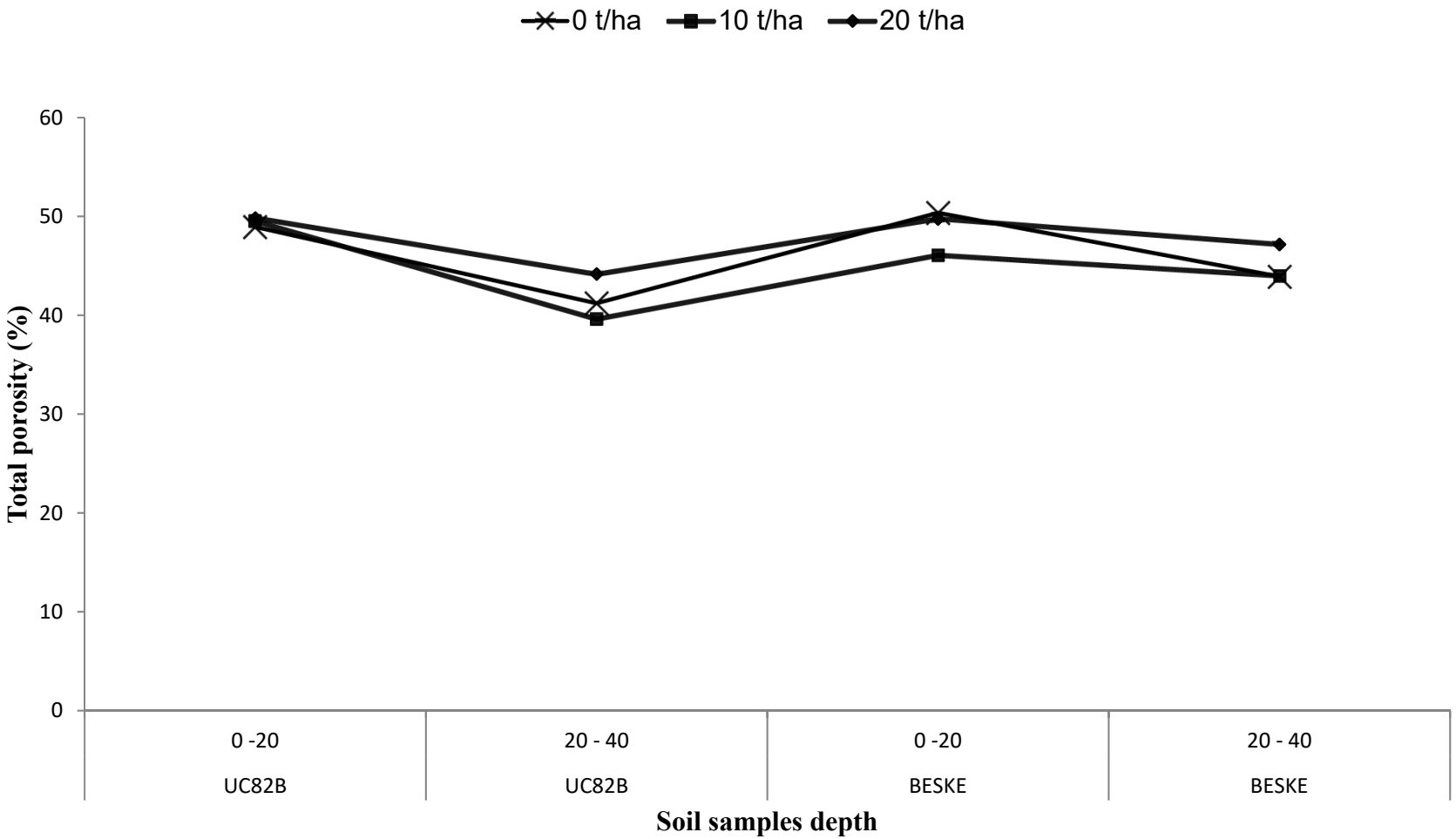

Figure 1. Total porosity as affected by poultry manure under tomato cultivation

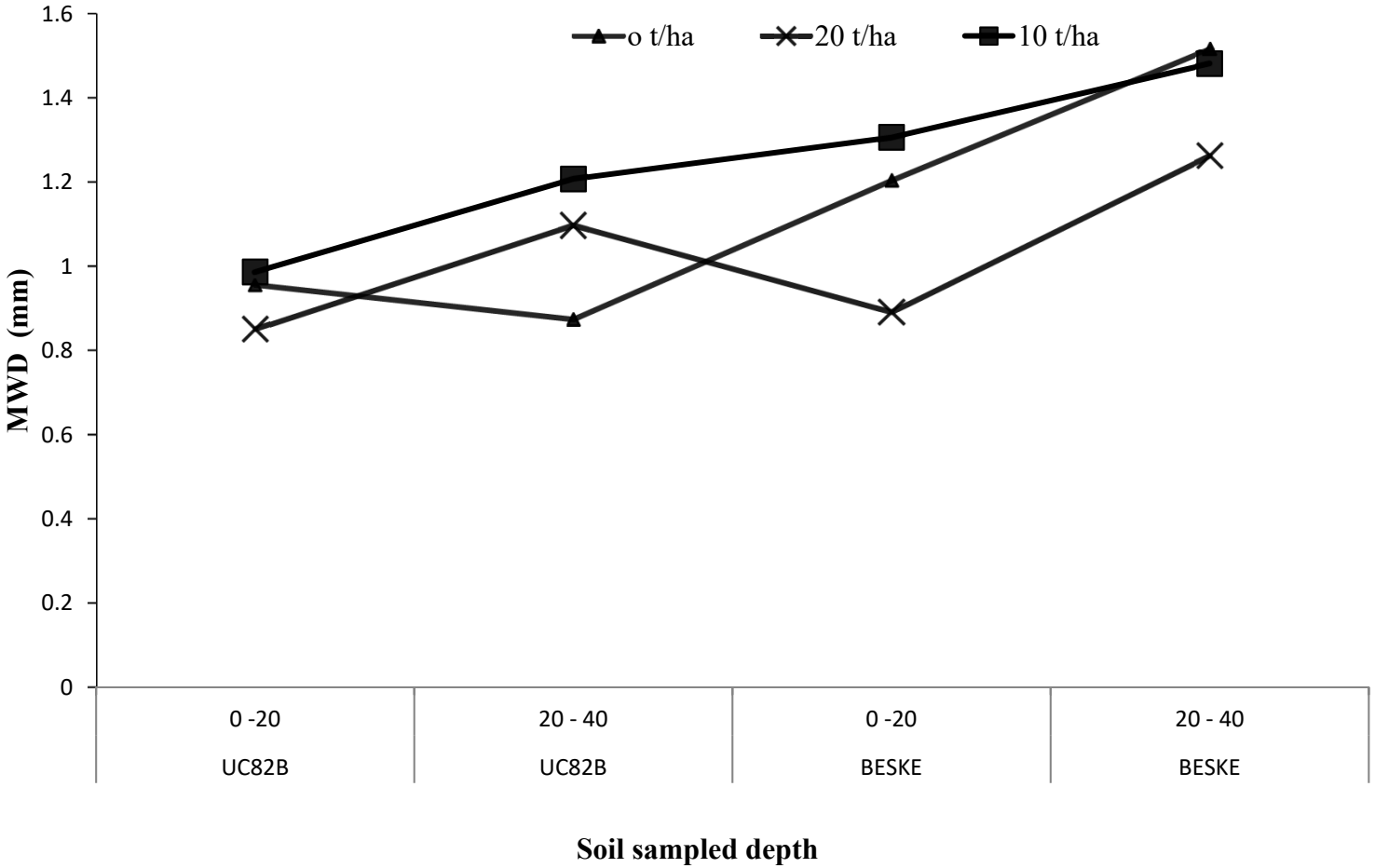

Figure 2. Mean weight diameter (MWD) as affected by poultry manure under tomato cultivation

CONCLUSION AND RECOMMENDATION

- This study showed that application of poultry composted manure to soils increased soil organic carbon and decreased soil bulk density thereby causing an increase in total porosity of the soil. The increase in porosity in the topsoil may be due to increase in frequency of very small pores. Generally, high soil organic matter (poultry composted organic manure) increased soil physical properties e.g. saturated hydraulic conductivity, total porosity, water retention e.t.c.
- Furthermore, the plot amended with 10ton/ha has the highest organic carbon content and shows increased in soil physical properties than either the control or plot amended with 20 t/ha.
- In conclusion, application of organic manures at 10 t/ha is adequate to improve carbon content and other soil physical properties for fragile soils characteristics of the area.

THANKS FOR LISTENING