THEME 2

Influence of Nitrogen Fertilizer Application on Organic Carbon Content of Underutilized Vegetable Grown Soils In Southwestern Nigeria

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INTRODUCTION

Soils of sub-Saharan Africa (SSA) including Nigeria are highly weathered and predominated by low activity clays such as kaolinites. Soil organic matter acts as a store house for plant nutrients and helps to sustain soil physical properties under intensive cultivation (Aina, 1998 Idowu *et al*., 2014). There is a wide gap between the actual and obtainable crop yields in both SSA and Nigeria in particular, which has been associated with the prevailing poverty level amongst the small-holder farmers. The average fertilizer use in SSA estimated at 10 kg ha^{-1} is the lowest in the world. Inorganic fertilizers are too expensive for the resource-poor farmers. However microdosing is a technology that has been examined for maize production in East Africa and recommended for reducing the investment on fertilizer. The technology has not been tested on vegetables (Figures 1 to 3), and the response of soil organic carbon with N addition. Information on effect of N addition on soil organic carbon has been inconsistent, while some authors reported that N addition suppressed soil respiration and enhanced soil organic carbon, others observed the opposite.

Fig. 1: Solanum macrocarpon

OBJECTIVES

The main objective of this study was to examine the influence of nitrogen fertilizer rate on soil organic carbon with a view to establish the optimal nitrogen fertilizer application for vegetable production in rainforest and derived savanna agroecological zones of southwestern Nigeria.

Fig. 2*: Telfairia occidentalis*

Fig. 3 *Amaranthus viridis*

Tab. 2: N application on SOC with T. occidentalis

	Ogbomoso	Ilesa
	---(g/kg)-----	
Native soil	4.1	9.2
N kg/ha		
0	3.6	8.9
20	3.7	9.8
40	4.0	9.7
60	4.9	9.2
80	8.5	9.4
Mean	4.9	9.4

MAIN RESULTS

The results showed that agroecology had a significant influence on native soil organic carbon (SOC) content (Tables 1 to 3). The average native soil organic carbon was 4.1 g kg^{-1} and 12.3 g kg^{-1} for Ogbomoso and Ilesa, respectively. Soil organic carbon content was decreased after crop harvest in Ilesa while an increase in the values were obtained in Ogbomoso, compared with the control. Time of N addition had no effect on SOC in the two locations. Addition of N increased SOC with or without basal organic fertilizer application compared with the control. The average mean for SOC ranged from for 2.3 g kg^{-1} to 8.5 g kg^{-1} for Ogbomoso and 8.2 g kg^{-1} to 16. 4 g kg^{-1} for Ilesa. The vegetable yield in Ogbomoso was higher than in Ilesa (the results are not shown).

Tab. 3: N application on SOC with A. viridis

	Ogbomoso	Ilesa
	----(g/kg)-----	
Native SOC	4.7	11.6
N kg/ha		
0	2.3	8.2
20	3.6	9.1
40	3.4	11.3
60	4.7	12.4
80	5.3	8.9
Mean	3.9	9.9

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Tab. 1: N application on SOC with S, macrocarpon

	Ogbomoso	Ilesa
	----(g/kg)----	
Native soil	3.3	15.3
N kg/ha		
0	2.4	15.5
20	3.7	13.8
40	4.6	16.4
60	4.2	9.7
80	5.3	8.7
Mean	4.0	11.7

CONCLUSION

The study concluded that application of 20 kg N ha^{-1} plus 5 ton ha^{-1} of organic fertilizer was optimal for sustaining soil organic carbon for vegetable production in rain forest and derived savanna of southwestern Nigeria. Promotion of production of good quality organic fertilizers from abundant organic materials in the region is essential.