

## Amaranths (*Amaranthus viridis*) dry matter and soil Qualities: Organic vs Inorganic Fertilizers

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**Key words:** *Anarathus viridis*, Poultry manue, Manure extract, Compost

### Abstract

*In this paper, comparative effects some organic fertilizers were investigated on Amaranthus viridis and soil quality. The study was carried out on the field in two successive plantings (first planting and residual) at the Department of Agronomy, University of Ibadan, Ibadan, Nigeria. Treatments used were poultry manure, poultry manure extract, NPK (15-15-15), and control at 100 kg N / ha, laid in a completely randomized block design with four replicates. Parameters observed were percentage dry matter and some chemical properties of the soils. The result of this research revealed that percentage dry matter accumulation of crop treated with poultry manure and poultry manure extract was better than that of mineral fertilizer NPK. Also, Poultry manure extract also improved post harvest soil nitrogen and pH than the NPK fertilizer. Thus, poultry manure and poultry manure extract which are organic fertilizers are recommended for raising quality green amaranth under similar soil condition.*

### Introduction

Fertilizer use impacts on both crop quality and the environment. Thus, it is necessary to evaluate the effects of both inorganic and organic fertilizers on *Amaranthus viridis* and soil qualities. While mineral fertilizers are getting more scarce and expensive for many peasant farmers in many developing countries (Obi and Ofoduru, 1997), their negative effects with intensive use have tendency of reducing qualities of crops and soils productivity. Poultry manure and its extract as well as compost are common organic fertilizers used by some vegetable producers in Nigeria. *Amaranthus viridis* is one of the species of amaranths used in common diets of Africans and Asians (Olaniyi *et al.*, 2008). Thus, the objective of this paper is to compare percentage dry matter accumulation of amaranths and some soil important parameters as influenced by poultry manure, poultry manure extract and mineral fertilizer NPK 15-15-15.

### Material and methods

The experiment was conducted on a field at the experimental site of the Department of Agronomy, University of Ibadan, Nigeria (Latitude 7° 27' N, Longitude 3° 54' E), from December 2011 to February 2012. Fertilizer treatments were NPK (15:15:15), Poultry manure; Poultry manure extract and Control of no soil addition, laid in a randomized complete block design with four replicates. The dimension of each plot for the amaranth was 1.0 m x 1.5m. The fertilizers were applied at the rate of 100 kg N ha<sup>-1</sup>. Fertilizer treatments were applied at the rate of 100 kg N per hectare. Planting was done in two successions and harvesting was done at 4 and 5 Weeks after Sowing (WAS) respectively for main and residual planting (without any further fertilizer application). Crop percentage dry matter was subjected to Analysis of variance and means separated using least significant difference (p<0.05). Soil analyses were according to standard procedures as presented by Okalebo *et al.* (1993). The initial experimental soil's total nitrogen (0.11 g/kg) which was below the critical level for N (<1.5g/kg). organic matter content (47 g/kg) was high (>30 g/kg), while available phosphorus of 12 mg/kg was within critical range (8-20 mg/kg). The potassium, calcium, iron, copper, zinc and manganese concentrations of the soil were on the sufficient levels..The textural class of the experimental site was however found to be sandy loam.

### Results

The results of the percentage dry matter content are shown on Table 1. At the main planting, effects of fertilizer treatments on the percentage dry matter accumulation in whole plants weight revealed that soil treated with poultry manure resulted into a significantly (p<0.05) higher percentage dry matter content (19.45 %) compared to that of NPK mineral fertilizer (4.47 %) and other fertilizer treatments. There was no significant difference between the poultry manure extract and the poultry manure treatments. Observations

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on other plants parts at the main planting followed same trend; showing that poultry manure extract resulted into significantly better effects than the NPK mineral fertilizer and control (no fertilizer) treatments. However, during the residual planting, poultry extract and the control soils resulted into better significantly ( $p < 0.05$ ) higher percentage dry matter accumulation, compared to other fertilizer treatments used. The Poultry manure extract was the best in plant whole weight percentage dry matter accumulation (15.40 %), while the control treatment resulted best of the rest parameters observed: stem girth (12.83 %), root weight (17.10 %) and edible part (25.20 %).

The results of the soil analysis after first and residual plantings are shown in Table 2. At the end of the residual planting, the pH of the soils remained slightly alkaline in all the treatments, except that of the NPK soil that became more slightly acidic (6.7) at the end of the residual planting. The organic matter contents were better in other treatments compared to that of NPK and control treatments at the end of the residual plantings. Total nitrogen of the soils treated with poultry manure and control increased from 0.1 to 0.3 and 0.2 g/kg respectively. Available phosphorous contents poultry extract and poultry manure extract treatments increased to 20 and 19 mg/kg respectively from 14 mg/kg. However, the available phosphorus of the NPK and control soils reduced from 22 and 12 to 10 and 9 mg/kg respectively. However, the NPK treated soil resulted in highest exchangeable potassium of 0.3 cmol/kg at the end of the residual planting.

**Table 1: Effects of fertilizer treatments on percentage dry matter of amaranth**

Treatments	Main Planting (% dry matter)				Residual Planting (% dry matter)			
	Whole weight	Stem weight	Root weight	Edible part	Whole weight	Stem weight	Root weight	Edible part
Poultry manure extract	19.45	21.00	15.09	25.80	15.40	15.99	13.60	18.10
Poultry manure	16.67	19.10	11.22	23.10	9.90	10.35	8.90	10.50
NPK	4.47	3.90	7.97	5.50	6.30	5.97	8.40	5.60
Control	9.97	10.60	8.62	10.80	14.10	12.83	17.10	25.20
L.S.D ( $p < 0.05$ )	6.18	8.11	6.11	12.60	6.95	6.35	9.97	10.92

**Table 2: Post- planting chemical properties of soil subjected to treatments**

Parameters	Measured values							
	Poultry manure extract		Poultry manure		NPK		Control	
	Main	Residual	Main	Residual	Main	Residual	Main	Residual
pH(H <sub>2</sub> O)	7.6	7.8	7.1	7.6	6.8	6.7	7.7	7.8
OC (g/kg)	21.6	19.2	28.2	24.6	10.8	6.6	24.0	9
Total N (g/kg)	0.2	0.2	0.1	0.3	0.2	0.1	0.1	0.2
Available p (mg/kg)	14	20	14	19	22	10	12	9
Exchangeable cation (cmol/kg)								
Ca	2.5	3.0	2.4	2.9	2.2	1.8	2.4	2.4
Mg	2.6	2.5	2.9	2.0	2.1	2.1	2.9	2.4
K	0.4	0.2	0.7	0.2	0.4	0.3	0.4	0.2
Na	0.8	1.2	0.9	4.0	0.8	0.1	0.8	0.9

## Discussion

Generally, the results revealed that both the Poultry manure and the Poultry manure extract resulted in higher proportion of dry matter than mineral fertilizer NPK after residual plantings. This is indication that fertilizer treatments contributed to dry matter accumulation of *Amaranthus viridis*, like any other organic fertilizers (AdeOluwa, 2010). This implies that vegetable consumers could have better value for money in purchasing such treated vegetables per unit weight. Soil fertility status was better with other fertilizer treatments, especially the Poultry manure. The NPK treated soil had worst fertility status at the end of the residual planting. This result is in consonance with reports of Batiano and Mokwinye, (1991) and AdeOluwa (2010) that mineral fertilizers tend to degrade the soil with time. Thus, the use of poultry manure and its extract as organic fertilizers for raising *Amaranthus viridis* is encouraged for quality produce and sustainable soil.

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