

**INFLUENCE OF CASSAVA MILL EFFLUENT AND POULTRY MANURE ON GROWTH OF MAIZE (*ZEAMAYS*) AND SOME SOIL CHEMICAL PROPERTIES IN IGBARIAM, SOUTH-EAST, NIGERIA.**

**Nsoanya L.N.**

Department of Soil Science, Chukwuemeka Odumegwu Ojukwu University, Igbariam Campus, Anambra State, Nigeria.

[nsoanyaleonard@gmail.com](mailto:nsoanyaleonard@gmail.com)

**ABSTRACT**

A study was carried out in the Teaching and Research Farm of Faculty of Agriculture, Chukwuemeka Odumegwu Ojukwu University, Igbariam Campus, to investigate the Influence of Cassava Mill Effluent and Poultry Manure on Growth of Maize (*Zeamays*) and some Soil Chemical Properties in Igbariam, South-east, Nigeria. The experiment was laid out in Randomized Complete Block Design (RCBD) with four levels of treatments consisting of Control (No treatment); 10t/ha of Poultry Manure (PM); 500 L /ha of Cassava mill effluent (CME); 250 L/ha CME + 5t /ha (PM). The treatments were replicated three times and data collected were analysed following the Analysis of Variance (ANOVA) for Randomized Complete Block Design (RCBD). Treatment means were separated with least significant difference (LSD) at 5% significance. Results obtained showed that, there was significant difference ( $P = 0.05$ ) among the different treatments both on growth parameters (Number of leaves, plant height and leaf area) measured and some Soil Chemical Properties in Igbariam, South-east, Nigeria. Cassava Mill Effluent (CME) and Poultry Manure (PM) as well as their combinations at reduced rate increased the growth parameters of maize plant when compared with the Control. The highest values of Number of leaves (14.67 and 12.73); Plant height (137.2cm and 127.67 cm); Stem girth (6.78cm and 6.12cm and Leaf area (488.51cm<sup>2</sup> and 459.04cm<sup>2</sup>) were recorded at the 7<sup>th</sup> weeks after planting (WAP) in the plots where Poultry Manure was applied alone and its combination with Cassava mill effluents respectively. The study also revealed that, Cassava mill effluent, Poultry Manure and their combinations had great influence on some soil chemical properties (namely:- Organic Matter, Total Nitrogen and Available Phosphorus). The highest values of Organic Matter (0.97% and 0.90%). Total Nitrogen (0.084% and 0.068%); and Available Phosphorus (11.81ppm and 9.64) ppm were recorded at the plots where pm was applied alone and its combination with Cassava Mill Effluent respectively. It is therefore recommended that, Cassava Mill effluent sole be applied by farmers in the study area at the rate of 500 L / ha. Or in combination with Poultry Manure (RM) at the rate of 250 L / ha of CME + 5t /ha of PM as Soil amendment to increase plant growth and soil fertility status.

**Key words:** Cassava Mill Effluent; Soil Fertility; Soil amendment, Poultry Manure, soil Chemical Properties.

**INTRODUCTION**

Cassava (*Manihot esculenta crantz*) is a staple root crop grown and eaten in many parts of the tropics especially in Nigeria. Cassava is often processed into different forms like fufu, garri, flour and pellets to reduce its deterioration when harvested. Cassava processing generates both solid and liquid wastes or residues (Cumbana *et al*, 2007; Jyothi, *et al* 2005). According to Oboh, (2006); two types of biological wastes are derived from Cassava processing namely: the Cassava peels and the liquid squeezed out of its fermented parenchyma mash. Horsfall *et al*, (2006) and Isabirye *et al*, (2007) estimated that an average of 2.62m<sup>3</sup> ton<sup>-1</sup> solid residues and 3.68m<sup>3</sup> ton<sup>-1</sup> water residues are generated via Cassava processing in Nigeria. Therefore Cassava effluents are liquid wastes from the Cassava mill. Cassava effluent has been reported to increase the Number of organisms in the soil ecosystem which can be attributed to increase in the soil pH, organic carbon and total nitrogen (Ogboghodo *et al*, 2001). Based on the above, there is serious need for scientists to investigate further the possibility of maximum utilization of these large quantities of solid and water residues for agricultural production rather than causing environmental pollution. There is no doubt that, production of high yield of maize (*Zeamays*) requires mineral nutrients either in inorganic or organic forms. The quickest way to supply nutrients to plants is the use of inorganic fertilizers. However, due to its high cost, acidifying effect of ammoniacal fertilizers and non availability, organic fertilizers ( Poultry droppings, animal dungs, plant residues etc) are often preferred. ( Ayoola, 2006; Ayoola and Adeniyam, 2006; Nsoanya and Nweke; 2015). Although, some researchers have carried out studies on the effect of cassava effluent on physicochemical properties of soil in relation to the environment, yet there is scanty information on the effect of cassava mill effluent as Organic Fertilizer for soil fertility improvement and growth of plants. Hence, the objective of this study is to investigate the influence of Cassava Mill Effluent and Poultry Manure on growth of Maize (*Zea mays*) and some Soil Chemical Properties in Igbariam, south-east, Nigeria.

**MATERIALS AND METHODS**

**Site Location:**

The experiment was carried out at the Teaching and Research Farm of the Department of Soil Science, Faculty of Agriculture, Chukwuemeka Odumegwu Ojukwu University, Igbariam Campus, Anambra State, Nigeria. The experimental site is geographically located within latitude  $06^{\circ} 14'N$  and longitude  $06^{\circ} 45'E$  (Anambra State Ministry of Science and Technology Meteorological Station, Igbariam). The rainfall pattern is bimodal between April and October. The average monthly temperature is between  $21^{\circ}C$  and  $30^{\circ}C$ . Total annual rainfall ranges between 1500mm and 2000mm and the Relative Humidity (RH) of the study area is moderately high. The highest RH. was 87%; while the lowest RH (60%) was obtained during dry season. The Soil of the study area is sandy loam.

#### **Land Preparation, Experimental Design and Treatment Allocation.**

The field for the experiment was cleared and tilled using hoe. The area of the field was  $13m \times 10m$  ( $130m^2$ ). The experiment was laid out in a Randomized Complete Block Design (RCBD), consisting of four treatments and three replications to give 12 plots. Each plot measured  $2m \times 2m$  ( $4m^2$ ) with a distance of 1m between the plots and each block was separated by 2m alley. Treatment materials – Cassava Mill Effluent (CME) and Poultry Manure (PM) were applied to individual plots accordingly two weeks before planting to allow for decomposition and mineralization. The treatment comprised four levels namely:- Control ( No treatment). Poultry Manure (PM) 10 t / ha; Cassava Mill Effluent (CME) 500 L / ha and PM 5t /ha + CME 250 L /ha. Two seeds of hybrid Maize (Oba Super 2) were planted per hole at the planting distance of 75cm x 25cm and at a depth of 3cm, two weeks after the application of treatment materials. The seedlings were later thinned to one plant per hole and supplying of empty stands was done. Weed control was carried out manually using hoe at two weeks interval till harvest to reduce competition between the maize plants and weeds for available nutrients, water and light.

#### **Data Collection**

Data collection on growth parameters (namely:- Plant height, stem girth, Number of leaves, Leaf area) were measured at the 6<sup>th</sup> and 7<sup>th</sup> weeks after planting (WAP). Five maize plants were randomly selected from each plot and tagged for the measurement of the growth parameters. Number of leaves was carried out by visual counting and the average was calculated. Plant height was measured with a carpenter's tape from the ground level to the topmost leaf and the average was calculated. Stem girth was measured using a tailor's tape and the average value was calculated. Leaf area was determined by the area destructive lengthxwidth method using the relation; leaf area =  $0.75 (L \times W)$ ;

where 0.75 is a constant. Composite Soil Samples were randomly collected from different locations of the experimental field at the depth of 0 – 20cm before the application of treatment materials. The soil samples were air dried, crushed and sieved with a 2mm sieve and used for the analysis of physical and chemical properties of the soil before the application of treatment material (Table 1). Soil samples were also collected at the end of the study from each plot for determining some chemical properties namely:- pH, Organic Matter, Total Nitrogen and Available Phosphorus. Soil pH was determined using glass electrode pH meter; Organic Matter was determined by Walkley and Black (1934) wet oxidation method. Total Nitrogen was determined using Kjeldahl digestion method of Black et al (1965). Available Phosphorus was determined by the method of Bray and Kurtz (1945). Data generated from the study were subjected of an analysis of variance test based on Randomized Complete Block Design ( RCBD) according to Steel and Torrie (1980). While Least Significant Difference (LSD) at 0.05 was used to compare treatment means.

#### **RESULTS AND DISCUSSION:**

Results obtained in the study showed that, there was significant difference ( $p = 0.05$ ) among the different treatments both on growth parameters (Number of Leaves, plant height and leaf area) measured and some chemical properties of soil in Igbariam, South-east, Nigeria. Table 2. revealed that, Cassava Mill Effluent (CME) and Poultry Manure (PM) as well as their combination at reduced rate increased the growth parameters of Maize as the weeks after planting increased when compared with the Control. The highest values of Number of leaves (14.67 and 12.73); plant height (137.2cm and 127.67cm); stem girth (6.78cm and 6.12cm) and leaf area ( $488.51cm^2$  and  $459.04cm^2$ ) were recorded at the 7<sup>th</sup> week after planting (WAP) in the plots where Poultry Manure was applied alone and its combination with Cassava Mill Effluent respectively. The order of increase ranges as follows:-  $PM > PM + CME > CME > CO$ . The results obtained on growth parameters are supported by the study of Akpan (2012) who reported that, Cassava Mill Effluent had significant effect on growth parameters of pepper (Number of leaves, plant height), yield (fresh and dry weight) and soil chemical properties. Table, 3. showed that, the sole application of Cassava mill effluent and Poultry Manure as well as their combinations had great influence on soil chemical properties (such as Organic Carbon, Organic Matter, Total Nitrogen and Available Phosphorus) of soil of Igbariam, South-east, Nigeria. The pH was noticed to be at par ( $5.9 - 6.2 (H_2O)$  and  $5.1 - 5.3 (KCl)$ ) as the treatment materials had no severe influence on the pH of the soil of the study area. The highest values of Organic Matter (0.97% and 0.90); Total Nitrogen (0.084%

and 0.68%) and Available Phosphorus (11.81ppm and 9.64ppm) were obtained at the plots where Poultry Manure was applied alone and its combination with Cassava mill effluent respectively. The order of increase is PM > PM + CME > CME > CO. The results obtained on Soil Chemical Properties are supported by the studies of Osakwe (2012) and Akpan(2012) who reported that Cassava Mill

Effluent increased the levels of Organic Carbon, Organic Matter and Total Nitrogen. Based on the findings of the study, it is recommended that, Cassava Mill Effluent (sole) be applied by farmers in the study area at the rate 500 L / ha or in combination with poultry Manure (PM) at the rate of 250 L /ha of CME + 5 t /ha of PM as Soil amendment to increase plant growth and Soil Fertility Status.

Table 1. **Physical and Chemical Properties of the Soil of the Experimental Site before Treatment Application.**

Soil Properties	Value
<b>Physical Characteristics</b>	
Particle size (%)	
Clay	7
Silt	13
Fine sand	35
Coarse sand	45
Textural class	L S
<b>Chemical Characteristics</b>	
pH (H <sub>2</sub> O)	5.8
pH (KCl)	5.1
Organic Carbon (%)	0.40
Organic Matter (%0	0.76
Total Nitrogen (%)	0.042
Available Phosphorus (ppm)	3.73
<b>Exchangeable base (Me/ 100g)</b>	
Na <sup>+</sup>	0.04
K <sup>+</sup>	0.23
Ca <sup>2+</sup>	12.80
Mg <sup>2+</sup>	2.00
CEC (Me / 100g)	16.07
Base saturation (%)	93.78
<b>Exchangeable Acidity (Me / 100g)</b>	
Al <sup>3+</sup>	--
H <sup>+</sup>	1.20

Table 2. **Cassava Mill Effluent and Poultry Manure on Growth Parameters of Maize( *Zea mays*).**

Treatment	Number of Leaves		Plant Height (cm)		Stem girth (cm)		Leaf area (cm <sup>2</sup> )	
	WAP 6	WAP 7	WAP 6	WAP 7	WAP 6	WAP 7	WAP 6	WAP 7
<b>CO (No treatment)</b>	8.13	9.93	46.68	65.33	3.31	4.12	158.54	270.92
<b>PM 10T/ha</b>	12.13	14.67	81.13	137.20	5.55	6.78	327.55	488.51
<b>CME 500L/ha</b>	10.47	12.20	70.48	120.20	4.75	6.03	295.68	450.22
<b>PM 5T/ha+CME 250L/ha.</b>	11.27	12.73	76.21	127.67	5.00	6.12	315.25	459.04
<b>LSD0.05</b>	1.56	2.67	22.19	33.40	NS	1.01	20.02	112.40

CO – Control; PM – Poultry Manure; CME – Cassava Mill Effluent, LSD – Least Significant Difference WAP Weeks after Planting.

Table 3. Influence of Cassava Mill Effluent and Poultry Manure on some Soil Chemical Properties in Igbariam

Treatment	pH		Organic Carbon	Organic Matter	Total Nitrogen	Available Phosphorus
	H <sub>2</sub> O	KCl	(%)	(%)	(%)	(ppm)
<b>CO (No treatment)</b>	6.2	5.1	0.44	0.76	0.042	4.66
<b>PM 10T/ha</b>	6.1	5.3	0.56	0.97	0.084	11.81
<b>CME 500L/ha</b>	6.1	5.1	0.47	0.83	0.063	5.60
<b>PM 5T/ha+CME 250L/ha.</b>	5.9	5.2	0.52	0.90	0.068	9.64
<b>LSD0.05</b>	NS	NS	0.08	0.11	0.02	2.82

Co – Control; PM – Poultry Manure; CME – Cassava Mill Effluent, LSD – Least Significant Difference.

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