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Original Paper

Effect Of Enriched Municipal Solid Waste Amended With NPK Fertilizer On The Growth And Yield Of Maize (*Zea Mays L*)

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***Abstract*— The growth of maize is often influenced by soil fertility, and municipal solid waste (MSW) has the potential to enhance soil quality when appropriately processed and supplemented with necessary nutrients, MSW can function as a beneficial fertilizer, supporting plant growth and improving soil health. This study investigates the effect of different Nitrogen, Phosphorus, and Potassium (NPK) fertilizer rates combined with MSW on the growth and yield of maize. A pot experiment was conducted at the Teaching and Research Farm, Ekiti State University, using a completely randomized design with three replicates. The treatments consisted of 25% NPK+MSW, 50% NPK+MSW, 75% NPK+MSW, 100% NPK+MSW, and a control. Fifty kilograms of MSW were weighed into 15 different pots, with various levels of NPK 15:15:15 (25%, 50%, 75% and 100%) incorporated. Growth metrics such as plant height, leaf area, number of leaves per plant ear height, and stem girth were accessed and yield parameters such as, Length of cob, Diameter of cob, Number of grains per cob, 100 grain weight, and Yield (g/pot) were also measured. The results revealed that the combination of 100% NPK with MSW resulted in significantly higher values for all growth and yield parameters compared to the control. This suggests that the use of MSW in combination with NPK fertilizer, especially at the 100% rate, can significantly enhance maize growth and lead to improved yield, while also contributing to waste management.**

Keywords—component, formatting, style, styling, insert (*key words*)

I. INTRODUCTION

Maize (Zea mays L.), a member of the Poaceae family, is a key crop of global significance and is considered one of the most important cereal crops worldwide (IITA, 2020). In Nigeria and other parts of Sub-Saharan Africa, maize plays a significant socio-economic role as a staple food, supporting household food security, serving as animal feed, providing raw materials for agro-industrial products, and contributing to trade. Maize plays a key role in enhancing the economy and reducing hunger (Tena and Beyene, 2011). Nigeria is the top producer of maize in Africa (IITA, 2019), with its cultivation extending across various agro-ecological zones, ranging from the rainforest to the northern guinea savanna. The growth in maize production is mainly driven by the expansion of cultivated land however, yield challenges remain a major issue, including inefficient use of improved agricultural practices, inadequate plant health management, limited financial investment, and inefficient resource utilization (Badmus and Ariyo, 2011).

Maize thrives in a diverse range of agro-ecological zones and is unmatched by any other crop due to its exceptional ability to adapt to diverse environments. It has become globally important due to its wide range of uses, including as food for humans and livestock, as well as its contribution to the production of various industrial and pharmaceutical products. Additionally, maize can be harvested as 'green maize' within 70 days of planting, providing a vital food source for rainforest communities. This early harvest helps alleviate food shortages that would otherwise last up to nine months after the previous year's root crop harvest has been consumed. Maize is grown by both small-scale and commercial farmers around the world (Onwueme and Sinha, 2004). It ranks third in global production and consumption, following rice and wheat (Yayock et al., 2005). Maize, originally cultivated in South and Central America, was introduced to West Africa by the Portuguese in the 16th century. In Nigeria, it has become one of the most important grains, both in terms of the number of farmers involved in its cultivation and its economic significance. It is primarily grown in the rainforest and derived savanna regions of the country. (Iken and Amusa, 2004).

Maize provides over 20% of the total calories in human diets. Several improved maize varieties with varying, maturity periods have been worked on and released by the CSIR-Crops Research Institute (CSIR-CRI) and IITA in Ibadan, Nigeria, to meet the needs of farmers in different ecological zones (Olasehinde et al., 2023).

Municipal Solid Waste (MSW) includes the discarded materials from urban areas, produced by households, businesses, schools, government offices, and other institutions. As urban populations continue to rise, managing solid waste disposal has become increasingly challenging, resulting in soil and environmental pollution. (Ahsan et al., 2015). Composting has emerged as a solution to this issue, offering a way to address soil fertility problems in humid regions. Composting not only reduces waste volume but also minimizes landfill space requirements. It is a well-established method for producing a final product that can serve as a soil conditioner or fertilizer, containing essential nutrients like (NPK), and micronutrients.

Oyinlola (2001) highlighted that organic materials make up about 76% of the total municipal solid waste (MSW) in Nigeria. (Sayara et al. 2020) emphasized the importance of measures to reduce environmental impacts and preserve organic resources, suggesting improvements in source sorting, recovery, and recycling, including composting of organic green waste.

Composting is an effective solution to address the large amounts of organic waste, converting it into a valuable product. It is an essential recycling process that replenishes nutrients from organic materials back into the soil in a form usable by plants, enhancing soil fertility and supporting crop production. Additionally, the use of such materials can influence soil composition and the activity of soil organisms (Carmine et al., 2004). Municipal solid waste compost can improve soils that have been cultivated for many years but may lack essential nutrients such as Boron, Zinc, and Copper, addressing these deficiencies. (Simeon, and Ambah, 2013)

Managing soil nutrients continues to be one of the most difficult aspects of crop production (Guta et al., 2025) .In Nigeria, municipalities are struggling with the uncontrolled disposal of waste, necessitating effective solutions to reduce environmental pollution. Using waste as fertilizer could help mitigate the reduction and improve soil and its structure. It is well-established crops that fail to thrive in soils lacking adequate nutrients. However, the use of municipal solid waste can significantly impact plant growth, development, and yield due to the nutrients released during decomposition. The apparent challenges associated with municipal solid waste management and its demonstrated significance for plant growth needs to be examined. This study aims to assess the effects of enriched municipal waste on the growth and yield of maize, as well as its influence on the soil quality.

II. Material and Method

A. Study site

This experiment was conducted at the Teaching and Research Farm of the Ekiti State University, Ado- Ekiti, Ekiti State, Nigeria, during March-June 2021 cropping season. This study site is between longitude 7°48’ E latitude 7°30 N, this area is in the sub humid agro-ecological zone and with annual rainfall of 1,367mm and average temperature range is between 23°C-33°C with a deviation of 27°C. Dry season span from November to early March, February and March are the hottest month with mean temperature 28° C.

B. Soil collection and preparation

The municipal solid waste was obtained from the dung waste site along Irasa-Ilokun, Road, Ado-Ekiti. The waste was collected, the non-biodegradable materials were removed, pulverize, air dried to give a fine smooth soil. The waste has been decomposed over a long period of time. The control soil was collected from a fallow plot from a distance of 100m away from the dump site.

C. Soil Sampling

Pior to planting, municipal solid waste soil samples were collected to assess their physical and chemical properties. Samples were gathered from various locations within the environment and then combined to create a composite sample. The soil samples were air-dried, crushed, and sieved through a 2mm sieve before being sent for routine analysis at the laboratory. The same was subjected to analysis using standard method as described by (Agbenin 1995) particle size analysis was determined by the hydrometer method (Bouyoucos, 1951) while pH was measured in a 1:25 soil to water and Cacl2 suspension with a glass electrode pH meter. Organic matter was determined by (Walkay and black 1934) wet oxidation N was determined by Micro kjedahl method technique (Jackson 1962). The available phosphorus was estimated by the procedure explained by Olsen et al. (1954) Potassium was determined by flame photometer and calcium (ca) magnesium (mg) by Na-EDTA titration ECEC was obtained by summation of exchangeable cations and the exchangeable acidity base saturation was calculated as the sum of total exchangeable base divided by ECEC.

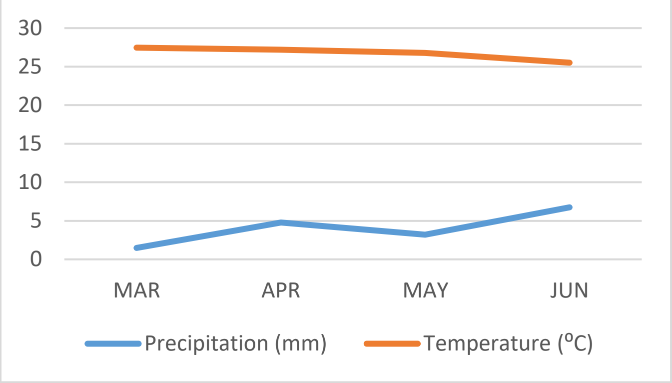

Fig. 1. The precipitation and temperature readings during the periods of cropping in 2021 (NASA Power)

D. Experimental Layout

The experiment was laid out in a complete randomized design (CRD) in three replicates. Treatment consisted of 250kg/ha NPK 15-15-15 fertilizer application to decomposed municipal solid waste to give the following combination 25% NPK+MSW, 50% NPK+MSW, 75% NPK+MSW, 100% NPK+MSW and Control.

50Kg of the municipal solid waste was weighed into 15 different pots, the pot was punctured at the bottom to ensure proper aeration, and the soil was amended with NPK fertilizer at two weeks after planting (2WAP). The samples were kept wet daily for 20 days before planting. The pots were placed in an open environment throughout the experiment. Three seeds were sown per pot and later thinned to two plants per stand to avoid intra crop competition and to allow adequate flow of nutrient and air.

Control	25% NPK+MSW	50% NPK+MSW	75% NPK+MSW	100% NPK+MSW	REP 1
Control	25% NPK+MSW	50% NPK+MSW	75% NPK+MSW	100% NPK+MSW	REP 2
Control	25% NPK+MSW	50% NPK+MSW	75% NPK+MSW	100% NPK+MSW	REP 3

Fig. 2. The experimental layout of the study.

E. Data collection

Data collection commenced at 2 weeks after planting (WAP) and continues till 10 WAP. Data were collected on the following parameters:

1. Plant height (PH): The height of the plant was measured with a meter rule (cm).
2. Number of leaves (NL): This was done by counting the number of leaves present on each plant.
3. Stem Girth: Stem girth was measured with a Vernier caliper (cm).
4. Leaf Area: Leaf area was done by multiplying the length by width and with the constant factor (0.89) of unlobed leaf area method. (Olasantan, 1999).
5. While the yield parameters taken were: cob weight (g), number of cobs, cob length, and cob diameter.

F. Statistical Analysis

All data were subjected to analysis of variance (ANOVA) using SPSS software, according to Gomes AK and AA Gomez (1984), and the differences between treatment means were separated using Fisher's least significant difference (LSD) test at the 0.05 level of significance.

III. Result and Discussion

The physical and chemical properties of the soil in the study site prior to cropping are presented in Table 1. The soil was sand loamy in texture, which is slightly acidic with a pH of 6.8. The total nitrogen was 0.12% which was lower to the critical value of 0.15% obtained by (Agboola and carey, 1973), and the available P was 8.92mg/kg, lower than critical level obtained by (Adeoye and Agboola 1985), while the exchangeable bases K, Ca, Mg, and Na were 0.26, 3.00, 3.30 and 0.017 cmol/kg respectively.

TABLE I. PHYSICAL AND CHEMICAL COMPOSITION OF THE SOIL USED IN THE EXPERIMENT

Properties	**Values**
Organic Carbon (%)	3.95
Ph 1:2 (water)	6.84
Nitrogen (%)	0.12
Available Phosphorus (mg/kg)	8.92
Calcium (Cmol/kg)	3.00
Magnesium Cmol/kg)	3.30
Potassium Cmol/kg)	0.26
Sodium Cmol/kg)	0.017
Exchanged Acidity	0.70
Particle Size Density	
Sand (%)	87.4
Silt (%)	7.0
Clay (%)	5.6
Textural Class	Sandy Loamy

A. Effects of municipal solid waste amended with NPK fertilizer on the plant height of maize.

Application of 100% NPK+MSW gave the highest mean value while the lowest was obtained from the control pot. Plant height has been described as a measure of growth related to the efficiency in exploitation of environmental resources (Alimohammadi et al, 2011). Applying 100% NPK fertilizer amended with municipal solid waste (MSW) produced a significantly ($p < 0.05$) higher plant height than the other treatments (control, 75%, 50%, and 25% NPK + MSW) during the 10-week growth period, this is in accordance with (Chukwukelu, 2019). Table 2 shows the responses of plant height to the application of NPK + MSW did not vary significantly for the 75% NPK + MSW treatment during the 10 weeks, though it gave a plant height of 216.33 cm at week 10, which was slightly lower than the 100% NPK + MSW treatment (220.80 cm), while the lowest height was observed in the control. Inoculation with higher concentrations of NPK (100% and 75% NPK + MSW) resulted in a significant ($p < 0.05$) increase in plant height, with the 100% NPK + MSW treatment showing the greatest plant height (220.80 cm) compared with the control (108.50 cm) at week 10. The plants treated with 100% NPK + MSW had 103.8% higher plant height than the control, while the control showed the lowest growth. The combination of NPK concentration and MSW treatment varied significantly for plant height, with the highest NPK concentration (100%) resulting in the highest plant growth, significantly surpassing the control and other treatments. The variations in plant height across the NPK + MSW treatments ranged from 108.50 cm (control) to 220.80 cm (100% NPK + MSW) by week 10. The 50% and 25% NPK + MSW treatments had significantly lower plant heights, reaching 195.30 cm and 189.80 cm by week 10, respectively, compared to 100% and 75% NPK + MSW. The results indicated that reducing the NPK concentration in the MSW treatments led to progressively lower plant heights, but all amended treatments still outperformed the control.

TABLE II. EFFECT OF MUNICIPAL SOLID WASTE AMENDED WITH NPK FERTILIZER ON PLANT HEIGHT (CM^2).

Treatment	Weeks After Planting				
	2	4	6	8	10
Control	**16.53a**	**19.00b**	**64.00b**	**105.33a**	**108.50a**
100% NPK + MSW	27.50ab	36.4.50b	172.86a	182.6b	220.80a
75% NPK + MSW	26.00ab	32.83a	124.60a	166.72ab	216.33a
50% NPK + MSW	23.30b	30.50ab	93.40ab	178.60b	195.30b
25% NPK + MSW	25.66b	29.50ab	87.20ab	182.00b	189.80b

Mean with the same letter(s) are not significantly ($p<0.05$) by DMRT

B. Effect of municipal solid waste amended with NPK fertilizer on the number of leaves.

Leaf number is a key indicator of the morphological traits of maize (Liu et al., 2020). Applying 100% NPK fertilizer amended with municipal solid waste (MSW) produced a significantly ($p < 0.05$) higher number of leaves compared to the other treatments (control, 75%, 50%, and 25% NPK + MSW) during the 10-week growth period (Table 3). The plants treated with 100% NPK + MSW showed the highest number of leaves at week 10, reaching 16.33 leaves, significantly higher than the control, which had 10.66 leaves. The plants treated with 100% NPK + MSW also showed significant growth in the number of leaves at all measurement points, especially after week 6, when the number of leaves increased to 13.66 and continued to rise steadily this was in accordance with (Omotoso, 2014) where the highest fertilizer rate gave the best result. The control treatment, though not showing significant differences early on, had a lower leaf count compared to other treatments after week 6. At week 10, the plants in the control treatment had 10.66 leaves, which was significantly lower than the 100% NPK + MSW treatment.

The 75% NPK + MSW treatment resulted in an increase in the number of leaves, with 13.93 leaves by week 10, though it did not differ significantly from the 100% NPK + MSW treatment. The plants treated with 50% NPK + MSW and 25% NPK + MSW showed fewer leaves, reaching 11.63 leaves and 11.33 leaves, respectively, by week 10, which were still higher than the control but significantly lower than the 100% NPK + MSW treatment.

Overall, the number of leaves generally increased over time for all treatments, with 100% NPK + MSW showing the most significant improvement in leaf number, This agree with (Gungula et al., 2005) that Increasing fertilizer rates led to a greater number of leaves per plant, with the highest average values observed in most instances .The plants in the control treatment exhibited a slower rate of leaf development, particularly after week 6, while plants in the 50% and 25% NPK + MSW treatments showed more gradual increases.

TABLE III. EFFECT OF MUNICIPAL SOLID WASTE AMENDED WITH NPK FERTILIZER ON THE NUMBER OF LEAVES.

Treatment	Weeks After Planting				
	2	4	6	8	10
Control	5.00a	7.66a	9.66bc	11.33b	10.66a
100% NPK + MSW	4.66a	8.33a	13.66a	15.33a	16.33a
75% NPK + MSW	5.00a	7.66a	12.33ab	13.33ab	13.93a
50% NPK + MSW	4.10a	6.66a	9.32c	10.63b	11.63a
25% NPK + MSW	4.33a	6.06a	8.33c	9.667b	11.33a

Mean with the same letter(s) are not significantly ($p<0.05$) by DMRT

C. Effect of municipal solid waste amended with NPK fertilizer on leaf area

Table 4, shows that the plants treated with 100% NPK + MSW exhibited the highest leaf area at week 10, with 697.01 cm^2, which was significantly higher than the control, which had 620.63 cm^2. The 100% NPK + MSW treatment also showed substantial leaf area growth over time, particularly after week 6, when the leaf area increased to 583.80 cm^2 and continued to rise steadily. The control plants, although showing considerable leaf area growth, peaked at 693.40 cm^2 by week 8, and then slightly decreased by week 10, indicating a smaller overall increase in leaf area compared to the 100% NPK + MSW treatment. A larger leaf area results in greater light interception and dry matter production, which in turn fosters plant growth (Ofosu-Anim and Leitech, 2009).

The 75% NPK + MSW treatment resulted in a moderate increase in leaf area, reaching 666.99 cm^2 by week 10, but it did not differ significantly from the control. The plants treated with 50% NPK + MSW and 25% NPK + MSW showed slightly lower leaf areas, with 616.30 cm^2 and 606.02 cm^2, respectively, by week 10. These treatments still produced a relatively high leaf area compared to the control but were significantly lower than the 100% NPK + MSW treatment. When nutrients are available in the proper proportions, it enhances photosynthetic activity, leading to increased light interception, dry matter production, as well as improved accumulation and partitioning. (Robert and Walker, 1989; Smith et al.1992, Hartz, 1996). Throughout the experiment, the general trend was that the leaf area increased over time for all treatments, with 100% NPK + MSW consistently outperforming the other treatments in terms of leaf area, particularly after week 6. The control treatment exhibited a slower but steady increase in leaf area, while the 50% NPK + MSW and 25% NPK + MSW treatments showed slightly lower growth rates.

TABLE IV. EFFECT OF MUNICIPAL SOLID WASTE AMENDED WITH NPK FERTILIZER ON LEAF AREA (CM^2)

Treatment	Weeks After Planting				
	2	4	6	8	10
Control	34.67a	303.67b	607.63a	693.40a	620.63a
100% NPK+MSW	28.36a	499.23a	583.80a	691.51a	697.01a
75% NPK+MSW	32.48a	448.13ab	467.07a	643.06a	666.99a
50% NPK+MSW	31.29a	310.12b	462.10a	632.10a	616.30a
25% NPK+MSW	29.88a	300.36b	456.63a	628.93a	606.02a

Mean with the same letter(s) are not significantly (p<0.05) by DMRT

D. Effect of municipal solid waste amended with NPK fertilizer on the stem girth.

Applying 100% NPK fertilizer amended with municipal solid waste (MSW) produced a significantly ($p < 0.05$) higher stem girth compared to the other treatments (control, 75%, 50%, and 25% NPK + MSW) during the 10-week growth period (Table 5). The plants treated with 100% NPK + MSW exhibited the highest stem girth at week 10, with 16.56 cm, significantly higher than the control, which had 15.60 cm. The 100% NPK + MSW treatment showed consistent growth in stem girth throughout the experiment, with increases at each week, peaking at 16.56 cm at week 10. The control treatment, while showing a steady increase in stem girth, only reached 15.60 cm by week 10, which was lower than the 100% NPK + MSW treatment.

The 75% NPK + MSW treatment also showed notable growth in stem girth, with 15.60 cm by week 10, but this was not significantly different from the control or the 100% NPK + MSW treatment. The 50% NPK + MSW and 25% NPK + MSW treatments showed slightly lower stem girth values, with 15.40 cm and 16.00 cm, respectively, at week 10. While these values were higher than the control, they were not significantly different from the 100% NPK + MSW treatment.

Throughout the experiment, stem girth increased progressively for all treatments. The 100% NPK + MSW consistently produced the largest stem girth, significantly outperforming the control and the other treatments by week 10. The control treatment had the smallest increase in stem girth, while the 50% NPK + MSW and 25% NPK + MSW treatments exhibited moderate growth in stem girth.

TABLE V. EFFECT OF MUNICIPAL SOLID WASTE AMENDED WITH NPK FERTILIZER ON THE STEM GIRTH.

Treatment	Weeks After Planting				
	2	4	6	8	10
Control	5.83a	8.83a	12.80a	14.56a	15.60a
100% NPK+MSW	8.00a	10.00a	15.00a	15.83a	16.56a
75% NPK+MSW	7.16a	9.50a	14.00a	14.33a	15.60a
50% NPK+MSW	7.09b	9.40a	14.10a	14.33a	15.40a
25% NPK+MSW	7.03b	9.33a	14.83a	14.96a	16.00a

Mean with the same letter(s) are not significantly (p<0.05) by DMRT

E. Effect of municipal solid waste amended with NPK fertilizer on the yield components of maize (cm).

Applying 100% NPK fertilizer amended with municipal solid waste (MSW) produced significantly ($p < 0.05$) higher ear height, cob length, and cob diameter compared to the other treatments (control, 75%, 50%, and 25% NPK + MSW) (Table 6). The plants treated with 100% NPK + MSW had the highest ear height at 18.68 cm, which was significantly greater than the control treatment, which had an ear height of 14.19 cm. The 100% NPK + MSW treatment also showed the largest cob length at 17.88 cm, which was significantly greater than the control with 15.10 cm, and the longest cob length compared to the other treatments. In terms of cob diameter, the 100% NPK + MSW treatment also produced the largest diameter at 44.02 cm, significantly higher than the control (32.53 cm) and the other treatments.

The 75% NPK + MSW treatment showed moderate improvements in yield components, with an ear height of 17.86 cm, cob length of 16.73 cm, and cob diameter of 38.12 cm. Although these values were significantly greater than the control, they were still lower than the 100% NPK + MSW treatment. The 50% NPK + MSW treatment produced a slightly lower ear height (16.20 cm), cob length (16.30 cm), and cob diameter (36.09 cm) than the 75% NPK + MSW treatment, but these values were still higher than the control. Similarly, the 25% NPK + MSW treatment showed values of 15.73 cm for ear height, 16.02 cm for cob length, and 35.07 cm for cob diameter, all of which were higher than the control but lower than the 75% and 100% NPK + MSW treatments.

The 75% NPK + MSW treatment was also significantly better than the control in all measured components, but it did not differ significantly from the 50% NPK + MSW and 25% NPK + MSW treatments. This suggests that the higher NPK concentrations were more effective in enhancing maize yield components, with a noticeable decline in the impact as the NPK concentration decreased. These findings are in accordance with Obidiebube et al., (2012) when observed that NPK are applied at different rate on maize

TABLE VI. EFFECT OF MUNICIPAL SOLID WASTE AMENDED WITH NPK FERTILIZER ON THE YIELD COMPONENTS OF MAIZE.

Treatment	Ear Height (cm)	Length of Cob (cm)	Diameter of Cob (cm)
Control	14.19c	15.10a	32.53a
100%NPK+EMSW	18.68a	17.88a	44.02a
75%NPK +EMSW	17.86a	16.73b	38.12b
50%NPK +EMSW	16.20b	16.30b	36.09b
25%NPK +EMSW	15.73b	16.02b	35.07b

Mean with the same letter(s) are not significantly ($p<0.05$) by DMRT

F. *Effect of municipal solid waste amended with NPK fertilizer on the yield components of maize.*

The result showed that application of 100% NPK+MSW gave the highest number of com (193.00g), 100 grain weight (28.9g) and the yield (236g/pot), while the lowest was from the control. (Lawal et al., 2015) had stated that the use of nitrogen gives significant increase in maize grain and yield. The increase in yield from application of NPK was mainly due to greater plant height, stem, and diameter and leaf area of the plant. (Husnain, 2001).

TABLE VII. EFFECT OF MUNICIPAL SOLID WASTE AMENDED WITH NPK FERTILIZER ON THE YIELD COMPONENTS OF MAIZE.

Treatment	Number of grains per cob (g)	100 grain weight (g)	Yield (g/pot)
Control	136.67a	20.10a	92.8d
100%NPK+EMSW	193.00a	28.98a	236.01a
75%NPK +EMSW	173.33a	26.30b	202.00b
50%NPK +EMSW	166.20b	23.30b	196.22c
25%NPK +EMSW	140.73b	21.02c	172.01c

Mean with the same letter(s) are not significantly ($p<0.05$) by DMRT

G. *The Effect of municipal solid waste amended with NPK fertilizer on soil nutrient composition after cropping.*

Table 8 below shows the Physio-chemical properties of the soil after cropping. Table 8 also shows the initial characterization of the soil samples used for the experiment. The soil pH before cropping was 6.84 indicating slightly acidic while the soil pH after harvest ranges from 6.99 to 7.61, which means there was an increase in the pH of all treatment after harvest, this is also in agreement with K.

The result of soil shows that the NPK fertilizer used increased the N, P, K content of the soil. (Akanbi et al., 2007) had noted that N and K are the most important nutrients required for proper growth. NPK fertilizer also gave a significant increase in Ca, Mg, and p content of the soil as reported by (Duncan, 2005; Agbede et al., 2008).

Zebarth et al. (1999) observed that applying organic wastes annually, such as municipal biosolids, commercially produced poultry and food waste, composted hog manure solids, and locally sourced peat moss, applied at a rate of 45 t ha-1 over four years, did not have a significant impact on the saturated hydraulic conductivity or the soil's water-holding capacity. However, it did result in a significant increase in soil organic matter content, a decrease in soil bulk density, and a reduction in soil water retention in coarse-textured soils. However, the application of organic manure did not cause any immediate or significant changes in soil moisture content, bulk density, or porosity. (Ezeaku et al., 2006)

TABLE VIII. THE EFFECT OF MUNICIPAL SOLID WASTE AMENDED WITH NPK FERTILIZER ON SOIL NUTRIENT COMPOSITION AFTER CROPPING.

Parameters	Initial	100% NPK+MSW	75% NPK+MSW	50% NPK+MSW	25% NPK+MSW	Control
Org C (%)	3.95	6.82	5.82	6.53	5.86	4
pH	6.84	6.99	7.42	7.61	7.44	6.9
Nitrogen (%)	0.12	3.1	1.98	0.97	0.2	0.13
Available Phosphorus (mg/kg)	8.92	61.87	60.87	53.07	43.56	7.01
Calcium (Cmol/kg)	3	7.7	6.8	4	3.1	3.05
Magnesium (Cmol/kg)	3.3	7.2	5.62	4	3.2	3.39
Potassium (Cmol/kg)	0.26	0.52	0.49	0.37	0.35	0.3

IV. CONCLUSION

Result obtained from this study showed the growth and yield parameters (plant height, number of leaves, steam girth, leaf area, cob weight (g), number of cobs, cob length, cob diameter) measured were significantly different among the various treatments with the amendment of NPK fertilizer having significant influence on the production of maize. The OC and the total N content of the studied soil were equally improved relative to the control.

Based on the result obtained, municipal solid waste contains large quantities of plant available nutrients and therefore enhances the productivity of the soil. The result has shown that application of 100%NPK+MSW gave the highest number of cobs, 100-grain weight and yield of maize.

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