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Efficacy of Poultry Droppings and Npk Fertilizer on the Growth and Yield of Cassava (*Manihot Esculenta*) on the Jos Plateau

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Abstract:- A field experiment was carried out from March, 2017 to November, 2018 at the Federal College of Forestry, demonstration farm to determine the efficacy of poultry droppings and Npk fertilizer on the growth and yield of Cassava (*Manihot esculenta*). The study comprises of four treatments (poultry droppings, Npk fertilizer, Poultry droppings + Npk fertilizer and Control). These treatments were arranged in a Randomized Complete Block Design (RCBD) replicated four times. The combine application of poultry droppings and Npk fertilizer produced the highest (170.00cm), number of branches (2.00), leaf area (795.12cm^2), stem girth (8.45cm), canopy spread (281.00cm), number of tubers (7.5), and larger diameter tubers (57.00mm)and produce the highest yield. The growth and yield of cassava was affected by the application of poultry droppings and Npk fertilizer. The combine application of PD + Npk fertilizer was found to increase the growth and yield characteristics of cassava than the single application of poultry and Npk fertilizer and the control (no application). This could be as a result of the increase in nutrient to the soil which improves its fertility. Thus, the use of a combination of poultry droppings and Npk fertilizer is recommended for the growers of cassava in the study area. Further research should be undertaken on the levels of both poultry droppings and Npk fertilizer for optimum productivity.

Keywords:- *Cassava, Poultry Droppings, Npk Fertilizer, Growth, Yield components.*

I. INTRODUCTION

Cassava (*Manihot esculenta*) is a perennial woody shrub with an edible root, which grows in tropical and subtropical areas of the world. It is cultivated in almost all the agro ecological zones in Nigeria and plays a prominent role in alleviating the food problem in the country because it thrives and produces stable yields under conditions in which other crops fail (1). Cassava may be planted alone or intercropped with vegetables, plantation crops (such as coconut, oil palm, and coffee), yam, sweet potato, melon, maize, rice, groundnut, or other legumes. Cassava is not only rich in carbohydrates, but also contains calcium, vitamins B and C, and essential minerals. Cassava can be processed into starch, flour (to make cakes, bread, and biscuits), chips, Cassava chips can be used for animal feed, used as biofuel when combined with additives and can also be processed into garri and Fufu.

Cassava is a root (tuber) crop that removes substantial amounts of nutrients when harvested, the highest being potassium (K), then nitrogen (N), calcium (Ca), magnesium (Mg) and phosphorous (P) (2). Declining soil fertility has been a serious problem facing small scale farmers in Nigeria due to in adequate plant nutrients and organic matter due to leaching and erosion of topsoil by intense rainfall. Inorganic fertilizers are usually expensive and not available in required quantities to the subsistence farmers who produce the bulk of the food (3). Organic inputs which are often proposed as alternative sources of nutrients cannot meet the crop nutrients demand for large scale production because of their relatively lower nutrient composition; high application rates; high labour requirements and limited availability (4). An integrated nutrient management program, involving both organic manure and inorganic fertilizer use, has been suggested as a rational strategy. The combined application will increase soil fertility and reduce environmental problems that may arise from the use of sole inorganic fertilizers and improves the microbial properties of the soil (2). (4) was of the view that there are evidences from field research that high and sustainable yields are possible with integrated use of fertilizers and manure.

Application of organic manure as a source of nutrients was considered one way to enhance crop response to nutrient application. Organic manure not only improves soil fertility, it also increases water holding capacity, reduces the rate of erosion, improves soil aeration and has a beneficial effect on soil microorganisms (5). Poultry manure is rich in organic manure since solid and liquid excreta are excreted together resulting in no urine loss. In fresh poultry excreta uric acid or urate is the most abundant nitrogen compound (40-70 per cent of total N) while urea and ammonium are present in small amounts (6) as cited by (5).

Peasant farmers do not apply fertilizer to cassava because they are contented with the low yields obtained from using limited inputs or even from their infertile soils. The combination of organic manure and NPK fertilizer is capable of sustaining long term cropping in Nigeria due to the residual effects of the organic components (7). High and sustained crop yields have been obtained with appropriate and balanced

combination of NPK fertilizer and organic matter amendment (8). In nigeria today, the demand for cassava for both industrial and domestic purposes is increasing. This calls for farmers to adopt measures of improving the productivity of cassava. The objective of the research work is to determine the efficacy of poultry droppings and NPK fertilizer on growth and yield of cassava on the Jos Plateau.

II. MATERIALS AND METHODS

➢ *Study Site*

The study was carried in March, 2017 to November, 2018 at the Federal College of Forestry demonstration farm located in Jos, Plateau state. Jos, is a region of the middle belt of Nigeria and located between latitude 7° and 11° North, longitude 7° and 25° East at an altitude of about 1200km above sea level. The area lies in the northern guinea savanna of Nigeria with an annual rainfall of 1460mm and a temperature of 19°C to 32°C, (9).

➢ *Experimental Design and Procedure*

The field layout was a randomized complete block design (RCBD) in a arrangement, with four treatment (25tons/ha of Poultry Droppings, NPK (15:15:15) Fertilizer, Poultry Droppings + NPK Fertilizer and Control) and four replications. The planting pattern used for cassava was at a spacing of 1 x 1meter. Cassava cuttings were obtained from National Root Crop Research Institute (NRCRI), Vom, of length 20 – 30cm long from the central portion at 12months old. The cuttings are planted diagonally with two cuttings per placement with up to ¾ of their lengths pushed into the soil with the knots pointing upwards.

III. RESULTS AND DISCUSSIONS

Treatment	Plant Height (cm)	Number of Branches	Leaf Area (cm^2)	Stem Girth (cm)	Canopy Spread (cm)
Control	154.50a	1.50a	90.70a	6.85a	101.00a
Poultry Droppings	172.00c	1.750a	705.00c	8.69b	252.75c
NPK Fertilizer	166.00b	1.750a	162.30b	8.43b	239.75b
PD + NPK	170.00bc	2.00a	795.12d	8.45b	281.00d
SE±	1.86	0.60	11.85	0.20	3.64
P (Value)	0.000	0.870	0.000	0.000	0.000
LS	**	NS	**	**	**

Table 1:- Efficacy Of Poultry Droppings And Npk Fertilizer On The Growth Of Cassava (*Source: Field Experiment 2018)*

Means within a column having same letters are not significantly difference at $P \leq 0.05$.
LS = level of significant at 0.05
** = Significant (0.01 and 0.05)
NS = Not Significant

Significant differences were observed at both 1% and 5% probability level for cassava plant height, leaf area, stem girth and canopy spread (Table 1) with the single application of poultry droppings and Npk fertilizer and the combine application of poultry droppings and Npk fertilizer. The combine application of poultry droppings and Npk fertilizer gave the highest significant mean value in plant height (170.00cm), leaf area (795.12cm^2), stem girth (8.45cm) and canopy spread (281.00cm) as compared to the other treatments. The single application of poultry droppings gave the highest significant mean value than the single application of Npk fertilizer for plant height (172.00cm, 166.00cm), leaf area (705.00cm^2, 162.30cm^2) and canopy spread (252.75cm, 239.75cm) respectively. The treatment application was significantly different from the control on stem girth, although no significance was declared between poultry droppings, Npk fertilizer and the combine application of Npk and poultry droppings. No significant difference was declared for all the treatments in terms of number of branches.

Similar results were obtained on the response of cassava growth characteristics due to fertilizer application have been severally reported (10; 11; 12) in (13). Evidently, the residual effect of applying poultry droppings and fertilizer application causes significant increase in plant height, leaf area, number of leaves and canopy spread. This could have been as a result of the slow and continuous release of plant nutrient in soil which sustained the crop growth (13).

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Treatment	Yield (tons/ha)	Biomass (tons/ha)	Tuber Diameter (mm)	Weight of Tubers (Kg/Tuber)	Number of Tubers
Control	18.50a	5.25a	9.28a	7.55a	5.50a
Poultry Droppings	27.63b	8.53b	52.63b	11.65b	5.50a
NPK Fertilizer	30.25c	8.13b	51.75b	13.28c	6.75bc
PD + NPK	34.75d	9.35c	57.00c	13.70c	7.50c
SE±	0.68	0.22	1.26	0.33	0.57
P (Value)	0.000	0.000	0.000	0.000	0.010
LS	**	**	**	**	**

Table 2:- Efficacy Of Poultry Droppings And Npk Fertilizer On The Yield Of Cassava (*Source: Field Experiment 2018)*

Means within a column having same letters are not significantly difference at $P \leq 0.05$.
LS = level of significant at 0.01
** = Significant (at both 0.01 and 0.05)

The result from the research study indicates that there were significant difference at both 1% and 5% level of probability between the treatments on number of tuber, tuber diameter, weight of tuber, yield and biomass (Table 2). The combine application of poultry droppings and Npk fertilizer gave the highest (7.5) number of tubers per plant stand followed by the single application of Npk fertilizer (6.75), poultry droppings application and the control produce 5.50 tubers each respective. No significant mean value was observed at the application of PD + Npk and single application of Npk fertilizer for weight (13.70Kg/tuber and 13.28Kg/tuber) of tuber. The single application of poultry droppings (11.65Kg/tuber) was significantly different than the control (7.55Kg/tuber).

Significant difference was observed due to the different treatments in terms of tuber diameter. The combine application of PD + Npk fertilizer gave the highest mean diameter (57.00mm) followed by single application of both poultry droppings and Npk fertilizer (52.63mm and 51.75mm) which were significantly not different. The control has the least (9.28mm) tuber diameter. Cassava tuber yield was significantly higher with the combine application of PD + Npk fertilizer (34.75 tons/ha) followed by Npk fertilizer application (30.25tons/ha), poultry droppings and the control produce 27.63tons /ha and 18.50tons/ha respectively.

Higher tuber yield due poultry droppings and Npk fertilizer application could be attributed to favourable changes in the soil, which might have resulted in loose and friable soil condition and enabled better tuber formation (5). Moreover, positive influence of these treatments might be due to slow and steady availability of nutrients throughout the crop period of growth and development from poultry droppings and Npk fertilizer.

IV. CONCLUSION

The growth and yield of cassava was affected by the application of poultry droppings and Npk fertilizer. The combine application of PD + Npk fertilizer was found to increase the growth and yield characteristics of cassava than the single application of poultry and Npk fertilizer and the control (no application). This could be as a result of the increase in nutrient to the soil which improves its fertility. Thus, the use of a combination of poultry droppings and Npk fertilizer is recommended for the growers of cassava in the study area. Further research should be undertaken on the levels of both poultry droppings and Npk fertilizer for optimum productivity.

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