Effect of Different Levels of N.P.K. 15:15:15 Fertilizer Application on the Yield of Sweet Potato (Ipomea Batatas) in South-South Nigeria

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Abstract— This research was carried in Delta state Polytechnic School of Agriculture teaching farm in Delta state Polytechnic Ozoro in Isoko North local government area of delta state, Nigeria. There are different levels of fertilizer application suggested by various authorities. The need to elevate the effect of different levels of fertilizer application on the yield of sweet potato necessitated the study. Eighty vines of sweet potatoes collected from nearby farm were planted in complete randomized block design which was replicated three times. At establishment, twenty vines were dressed with 4.6kg fertilizer, another twenty 3.0kg, another twenty 7.4kg while the remaining twenty served as control. The parameters collected were subjected to analysis of variance (ANOVA). The results shows that (table 2) potato treated with 7.4kg fertilizer had more leaves of 127, 145.3, 177.7, and 184.7 as against 63, 83.3, 105.3, 127, and 83, 108.3, 134.3, and 162.0 for 3kg and 4.6kg respectively whereas the control had 28.7, 40.2, 58.6, and 67.3. Table (3) shows that Potato 7.4kgfertilizer had better length of vine of 66.1, 69.8, 81.2, 96.9 and 64.8, 70.1, 95.1 and 113.2 for 3.0 and 4.6kg respectively.Table (4) shows that 7.4kg treatment had superior weight of tuber of 114.38 as against 53.17, 80.26 and 34.11 for 3kg, 4.6kg and control respectively. Conclusively, sweet potatoes treated with 7.4kg fertilizer performed better in terms of number of leaves, vine length and weight of tubers at harvest. However there was significant difference among the treatment. It is therefore recommended that 7.4kg should be applied per stand so as to improve yield of potato and profit of the farmers.

Keywords— sweet potato, number of leaves, length of vine, weight of tuber and number of leaves.

I. INTRODUCTION

Sweet potato (Ipomeabatatas L) is a dicotyledonous plantthat belongs to the family conovulacea (Miller, 2008). The crop is grown in many countries globally but production primarily occurs in tropical and subtropical areas where it is important staple food in the diet of many people (Hijamas, 2001). Sweet potato is one of the most important root and tuber crops in sub-saharan Africa with both domestic and industrial uses and its nutritional value far exceed that of yam, cocoyam and cassava (Onwueme, 1997). Potatoes are used for varieties of purposesand not as vegetable for cooking at home it is likely that less than 50% of potatoes grown worldwide are consumed fresh and the rest processed into potato.

Food product and food ingredient for cattle, pigs, and chicken (Adamu, 2002 and Abdulrazea, 2004). In Nigeria it is prepared into potato chips. More so, the starch from potato is widely used by pharmaceutical textile, wood and paper industries as adhesive agent. (Gravel, 1999).Ojiako (2009) said sweet potatoes yield per hectare in Nigeria has declined. This however yield low could be attributed to poor field management by the farmer. The main objective of the study is to determine different level of fertilizer application on the yield of potato while the specific objectives are

Determine the number of leaves

Determine the number length of vine

Determine the number of branches

Determine the weight of tubers at harvests.

Sweet potato maybe adapted to grow on poor soils, as such most farmers do not apply appropriate dosage to their crops resulting in poor yield. Though inorganic fertilizer have been the conventional method of soil mineral inputs in sweet potato production.

According to Bureshet al (1997) and Palm et al (1997). It has generally been accepted that both organic and inorganic inputs are needed to increase crop production in west Africa. With the increasing pressure on farm and for infrastructure development, limited land is available for this crop.

Soil fertilization is one of the main factors increasing the yield of plant (Kolodzie2006) it effects the accumulation, mineralization and humification of fertilizer added to the soil (Loginowet al 1991) and determine plant production potential.(Iyagand Arora, 1988) . the amount of fertilizers introduced into the soil, including mineral fertilizers affects the amount of mineral nitrogen available to the plant and the organic carbon content of the soil. (Bijsmaand Arora2000).

Mineral fertilization improves light textured soil physical properties and water .fertilization not only increases crop yield but also alter its quality and results in the higher buildup of nutrient in the yield (Vos, 1999).

Crop yield and mineral fertilizer efficacy depend on the content of available phosphorous, potassium and nitrogen in the soil (Strimumarand Ockerman1990). It has been found that nutrient present in fertilizers are more effective than the equivalent amount of these nutrient present in farmyard manure.

Therefore mineral fertilizer efficacy for potatoes was noticeable higher than that of organic fertilizer (Sheilet al, 1997). Depending on fertilizer forms, rates and nutrient ratios, the content of dry matter, starch, protein and other substance may either increase or decrease. Excessive nitrogen application reduces starch , dry matter and sugar content in tubers and go bad more rapidly during

This result from the fact that nitrogen promotes growth of potato vines and over the year the use of fertilizers application at different level had improved agriculture. Fertilizer should be applied to potato at 200kg/ha of NPK (Schipper, 2000)

It was also reported that fertilizer should be applied at the rate of 250kg/ha and this must be done before and after planting before the flower emerged (rice et al, 1994). Researchers also shows that the crop requires as much of 169kg/ha of po5 with increasing phosphorous requirement (Aliyuet al, 2003). Elliot (2002) said 180kg/ha should be used to dress potato .However 168kg/ha fertilizer could be used to maintain long term soil fertility. Soil fertility make crop grow faster and also improve healthy soil.

II.   MATERIALS AND METHOD

The research was conducted in Delta state Polytechnic research farm in Ozoro in IsokoNorth Local Government, Area in Delta State,Nigeria. It is locatedwithin the rain forest zone of the mid-western Nigeria between latitude 5 30

It has an annual rainfall of between 250mm-3000mm and temperature range between 280c and 300c. Its attitudinal position is below 50 meters above the sea level (Ofunne, 1999). The soil of the studied area is moderately drained acidic loamy sand (Ogboi and Emakpor, 2006). Eighty sweet potato vine collected from a nearby farm and were planted into Randomized Complete Block Design which was replicated three times. At establishment some of the vines were treated with 3kg , others 4.6kg another 7.4kg while others served as control. The parameters measured are number of leaves, number of branches and weight of tubers at harvest. Data were collected at intervals of two weeks. Data collected were subjected to analysis of variance (ANOVA).

III.   RESULTS

Table 1, show the result of pre-planting analysis of selected soil properties. The texture of the soil was loamy sandy and this may be attributed to the parent material (coastal plain bands). The pH of the soil was strongly acidic. Organic matter were generally low. Similarly cation exchange capacity was equal low.

Table shows the number of leaves of potato at 6 – 12 week after planting. The result revealed that potato treat with 7.kkg has more leaves of 97.0, 145.3, 177.7 and 184.7 as against 63.0, 88.3, 105.3 and 127.3 for 3.0kg treatment. 4.6kg treatment has 83.0, 108.3, 134.1 and 162.0 while the control has 28.7, 40.2, 38.6 and 67.3.

Table (2) revealed the mean length f vine. 7.4kg treatment superior length of vein of 76.8, 90.7, 113.2 and 135.6 as against 3.0kg treatment which has 56.3,69.8, 81.2 and 96.7. while 4.6kg treatment has 64.8, 70.1,95.1 and 113.2 as against control which had 27.6, 33.8, 45.1 and 56.1. table (3) shows that the weight of tuber at harvest. The result also shows that 7.4kg treatment had the highest mean weight of 114.38kg as against 53.17, 80.26 and 34.1, for 3.0kg and control treatment respectively.

Table.1: physical-chemical properties of the soil at inception of the experiment

Soil properties	Value
Sand %	**47**
Silt%	**14**
Clay %	**39**
texture	Sandy clay
Soil bulk density/cm^3	1.12
Infiltration rate cm^3/sec	1.9
Soil pH	5.9
Organic matter %	1.96
Total nitrogen%	1.96

Available ppm	6.6
Exchangeable cation	**Mg/100g soil**
Na	1.30
Ca	0.50
Mg	0.65
H	0.55
Al	1.46

Table.2: Mean number of leaves at 6th -12th week after planting

Treatment	6	8	10	12
3.0kg	**63.0**	**88.3**	105.3	127.0
4.6kg	**83.0**	**108.3**	134.3	162.0
7.4kg	**127.0**	**145.3**	177.7	184.7
Control	**28.7**	**40.2**	58.6	67.3
Fcal	**5.1**	**0.9**	4.3	
Ftab	**0.05**			

Table.3: Mean length of vine (cm) at 6th -12th week after planting

Treatment	6	8	10	12
3.0kg	**66.1**	**69.8**	81.2	96.9
4.6kg	**64.8**	**70.1**	95.1	113.2
7.4kg	**76.8**	**90.7**	113.2	135.6
Control	**27.6**	**33.8**	45.1	56.1
Fcal	**8.1**	**2.8**	19.8	2.7
Ftab	**0.05**			

Table.4: Weight of potato tubers at harvest

Treatment	Weight (kg)
3.0kg	**53.17**
4.6kg	**80.26**
7.4kg	**114.38**
Control	**34.11**

IV.   DISCUSSIONS

Table (1) revealed that the texture of the studied area was loamy, sandy and this may be attributed to parent materials (coastal plain sand). This agrees with the finding of Anikwe(2000) who observed that coastal plain and usually gives rise to coarse sandy soil. The PH of the soil was acidic and the organic carbon and organicmatter were generally low (London, 1991). Similarly, carbon exchange capacity was low. This suggests that the soil is low in fertility. This could be attributed to increased pressure on land use for cropping, oil exploration and massive infrastructuraldevelopment and limited fallow period due to increased population (Agbim, 2000). Table (2) revealed the mean number of leaves of potato. It shows that 7.4kg treatment had highest mean number of leaves throughout the experimental period. This agreed with (005, 1999) who reported that crop yield and mineral fertilization depend on the content of available phosphorous, potassium and nitrogen in the soil. However there was significant difference among the various treatment used.

Table (3) shows the mean length of vine potato. It shows that 7.4kg treatment had the highest mean length of vine. This finding agreed with (rice and schipper, 2000). Who reported that fertilizer application at different levels had improved yield and soil nutrient status. Table (4) shows the weight of yield kg per treatment. It also shows that 7.4kg treatment had highest weight of tuber at harvest. This also agreed with (Strimumarand Ockerman, 1990) who stated that crop yield and mineral fertilization efficiency depend on the content of available phosphorous, potassium and nitrogen in the soil. It has been found also that nutrient present in fertilizers are more effective than its equivalent amount of these nutrient present in farmyard manure. Therefore fertilizer efficiency for potato was noticeably higher than that of organic manure (Shielet al, 1997).

V.   CONCLUSION

The result revealed that potato treated with 7.4kg per stand performed better than those treated with 3.0kg, 1.6 and control in terms of number of leaves, length of vine at weight of tuber at harvest.

RECCOMENDATION

Since there was significant difference among the potato treated with 3.0kg, 7.4kg,4.6kg of fertilizer and control. It is therefore recommended that 7.4kg of NPK 15-15-15 fertilizer should be applied per stand so as to improve the yield of potato and the profit margin of potato and the profit margin of the potato farmers.

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