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Full Length Research Paper

The production of one Orange-Fleshed Sweet Potato variety (OFSP) – *Solo gold* in Gidan Kwano, Minna, Niger State, Nigeria

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Abstract

Sweet potato (*Ipome abatatas* L.*)* is a durable food security crop with wide adaptation features that can fit well into smallholders production systems. It is important as a food security crop and it is also good in relation to drought effect, vigorous early growth and low input prerequisite which has attracted sufficient attention from agricultural researchers in the production of this crop. Thus, the aim of the study is to look at the agronomic performance of orange sweet potato in Gidan Kwano, Minna, Niger State, Nigeria. The varietal vines were obtained from the Neason Ventures, Federal University of Agriculture, Makurdi, Nigeria. The experiment was laid out in a complete randomized design -CRD. The vine length, number of leaves, width of leaves and leaf petiole showed significant difference among the treatments, root tubers were also assessed. The sweet potato was planted on rides that had been treated with poultry manure.

Keywords: Adoption, sweet potato, organic manure production, technologies, Nigeria.

INTRODUCTION

Sweet potato *(Ipomoea batatas* [L.] Lam Poir) belongs to the morning glory (Convolvulaceae) family and is a staple meal in many Sub-Saharan African countries, with both domestic and industrial applications. It has therapeutic benefits as well as high nutritional values, out-performing other tuber crops including yam, cassava, and cocoyam (Loebenstein. 2009; Abong' *et al*., 2020). The crop has a brief growing season of only a few months. Depending on the variety, this allows the growing of two or three crop cycles in a year. This crop is usually produced by resource-challenged farmers.

The yield per hectare of this crop in Nigeria is 6 t ha^{-1} (BNARDA, 2008). This is low and below African average yield of 7 t ha^{-1} (FAOSTAT, 2012). This implies low economic returns from farming activity and a discouragement to the farmers as this will further confirmed them to poverty and deprivation (Hahn *et al*., 1993). The causes of low productivity of this crop among other factors can be attributed to unproductive cultural practices and low nutrient status of the soil (CRI, 2002; Ning *et al*., 2015; Duan *et al*., 2018). The insufficient nutrient status of most Nigerian soils resulted from dominance of low-activity clays (Uzoh *et al*., 2015), an

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intensive cropping, slash-and-burn agricultural strategy that is connected with bush fallow and excessive soil leaching (Zingore *et al*., 2003). Due to heavy population pressure and other human activities, the system is currently unsustainable, resulting in a shorter fallow period (Steiner, 1991). Sweet potato is among the feeder crops which removes high amount of nutrients from the soil and inadequate nutrient availability to the plant had resulted in low productivity. The problem of poor productivity associated with intensive cropping practices has resulted to use inorganic fertilizers to enhance soil and crop productivity.

Other problems associated with inorganic fertilizers are high cost, inaccessibility and unavailability of the products to farmers (Akanni *et al*., 2011). These have necessitated the needs for alternative strategies that are environmental friendly, affordable and accessible to the poor- resource farmers. Hence, the research into the utilization of agricultural wastes for improved soil and crop productivity. Organic residue addition to soil is particularly important for maintenance of tropical soils (Uzoh *et al*., 2015).

Many crop species respond well to the application of organic fertilizer in the form of cattle dung as it can sustain yield under continuous cropping on most soils unlike chemical fertilizer (Maynard, 1991). Organic fertilizer aimed at protecting the ecosystem, ensure environmental cleanliness and make the soil to be more productive and sustainable. Salawu and Mukhar (2008) reported that the application of organic fertilizers have significantly imparted on growth and yield of sweet potato. Cattle dung is an organic material high in nutrient (Guptal *et al*., 2004). As composted cattle dung contain beneficial bacteria which converts nutrients into easily accessible form that can be moderately released for the plant uptake.

Brobbey (2015) reported that tuber yield tend to increase with increase in vine length used and a length of about 30 cm is recommended. Several hypotheses have been formulated on the use of organic fertilizers and methods of propagation of sweet potato.

Sweet potato has been treated with levity at the side of Maize, yam, being giving attention to the availability of information from the various research institutions and availability of consumption and marketing. Despite its many benefits, sweet potato is characterized by low production, yield and tuber quality in the country. This can be traced to other factors like the low fertility of the soils on which the crop is grown. The problem of low productivity joined with intensive cropping practices has resulted to use inorganic fertilizers to enhance soil and crop productivity. The continuous use of these with inorganic fertilizers has led to pollution of ground water, inimical to the activity of soil microbes**.** Low soil fertility is currently recognized as the fundamental biophysical cause of declining per capital food production in Africa (Jama, *et al*., 2000), and this constitutes a major constraint in sustainable small household crop production. The use of organic manure is often limited and this has resulted in the gradual depletion of the nutrients in Nigerian farm lands. Chemical fertilizer has been the stereotypical way of supply nutrients to the crop, however, research has shown that while inorganic fertilizer boosts root output (Njoku *et al*., 2001), it also reduces sweet potato quality (Nedunchezhiyan *et al*., 2003) and worsens soil deterioration (Akpaninyang and Okpara 2013). On the contrary, the increasing cost of fertilizer, farmers are looking for another options, yet sustainable methods of cultivating their crops. Applying organic fertilizer provides suitable condition for both high and stable yield of the crops which otherwise helps their commercial interest. There are very few studies worldwide on production of sweet potato using organic manure (Ugonna, *et al*., 2013; Anedo *et al*. 2020; Ejechi, *et al*., 2020 and Salami, *et al*. 2021).

This study will encourage farmers who grow sweet potatoes to contribute to provide food security, generate income, and increase the yield potential of the crop for commercial and industrial use. There is a necessity to satisfy various segment of the society and to offer cheap source of the healthy vital nutrients in the diets of those afflicted of vitamin A deficiency. The addition of the orange –fleshed variety which is significant for vitamin and rich source of energy help to fight malnutrition among the less resourced. Besides, the policy makers will be able to formulate informed decisions from the results of this study.

The aim of this study is to check the agronomic performance of orange–fleshed sweet potato (*Solo gold*) using organic manure (poultry) and control (no organic manure) in Gidan Kwano, Niger State Nigeria. The objectives were; to check the growth features of orange fleshed sweet potato in Gidan Kwano, Niger State, Nigeria and to determine the yield of orange fleshed sweet potato using poultry organic manure in Gidan Kwano.

MATERIALS AND METHODS

Description of the study site

The experiment was carried out during the raining season of 2021 at the horticultural farm of Federal university of Technology Gidan Kwano campus, Minna, Niger State, Nigeria.

Source of seed

The vines of the variety was sourced from the Neason Ventures, Federal University of Agriculture, Makurdi, Nigeria.

Land preparations and planting date

The land was cleared, and ridges were made using big hoes. Planting was done on 1st of July 2021.

Planting materials

One sweet potato variety - Orange fleshed sweet potato (*Solo gold*) was obtained from Makurdi. The variety is not commonly cultivated in Minna town. It was selected because it is a new variety to the community.
Plot size: The plot size was 5m x 4m ($20m^2$)

Fertilizer Application

The Organic Fertilizer (poultry manure) was applied 2 weeks before planting at the rate of 100g/plot equivalent to 5t/ha just to increase the soil fertility and the performance of the yield of the orange fleshed sweet potato.

Treatment and Experimental Design

The experiment was laid out in a complete randomized design - CRD. Treatments consisted of the application of 100g/plot poultry manure and a control. The plot size was 5m x 4m ($20m^2$). The *inter* and *intra* row spacing was 75 cm x 35 cm. Each plot was made up of four ridges and replicated three times (see the Appendix). The total land area used was $221m^2$.

Data collection

Growth data such as number of leaves, length of stem, petiole length, width of leaf, number of tubers and number of fresh weight in kg were recorded accordingly at harvest. Yellowing, drying of leaves, falling of leaves, and cracking of the soil indicated the maturity of the sweet potato.

Statistics analysis

The data collected on growth and yield parameters were subjected to analysis of variance (ANOVA) procedure using statistical analysis system (SAS). Means that differ significantly were separated using significant difference (LSD).

RESULT

Performance of orange flesh sweet potato on vine length as influence by poultry manure

The performance of poultry organic manure sources on vine length is presented in Table 1. At 3, 6, 9 and 16WAS, plants that obtained poultry manure had significant higher vine length (29.42 and 153.47) while control had (20.50 and 93.69) at 6 and 9WAS, there was no significant difference ($P \geq 0.05$) between the plants that obtained poultry manure (90.89 and 119.94) and the control (65.06 and 89.92).
The significant difference ($P \leq 0.05$) found in the vine length could be as a result of the effect of the ridge height and planting angle. This agrees with Edmond (2001), who found that ridge height and planting angle affects sweet potato vine length at all phases of growth.
Hossain and Miah (2010) and Onunka (2012) have also showed that processing vine for increased generation of planting material and is a worthwhile venture for sweet potato farmers.
The organic fertilizer improves both the physical and chemical properties of the soil, soil structure, soil tilts, cation exchange capacity, water holding capacity, crumb formation, and hence plant growth and yield. It also promotes infiltration, protects against erosion, has long lasting and balanced nutrient supply and facilitates the spread and penetration of plant roots.
The relatively poor performance of the chemical fertilizer tends to lend credence to the observation of Obi and Ebo, (1995), and Ojeniyi, (2000) who asserted that the use of inorganic fertilizer has not been helpful under intensive agriculture because it is often associated with reduced crop yield, soil acidity and nutrient imbalance. Yeng, *et al*., (2012) also reported that increased growth and yield of sweet potato when integrated application of poultry manure and inorganic fertilizer.

Performance of orange flesh sweet potato on plant leaves as influence by poultry manure

The performance of poultry manure on number of leaves is presented in table 2. At 3, 9 and 16WAS, plant that obtain poultry manure had significantly higher number of leaves (26. 63, 117.60 and 81.26) while control had the number of leaves (18.73, 87.50 and 43.56). At 6WAS, there was no significant difference ($P \geq 0.05$) between the plants that were given poultry manure (92.93) and control (63.50).
The difference in the number of leaves ($P < 0.05$) could be due to the effect of poultry manure on the growth of orange flesh sweet potatoes. This is consistent with Adelekan *et al*., (2010), who found that poultry manure increased the number of leaves in their study. It is also in agreement with the work of Law-Ogbomo and Osaigbovo (2017) who showed that larger vines were a precursor to higher number of leaves as indicated through positive correlation between vine girth and number of leaves.

Performance of orange flesh sweet potato on width of leaves as influence by poultry manure

The performance of poultry manure on width of leaves is presented in table 3. At 3, 6, 9, and 16WAS plant that obtain poultry manure had a significant higher width of

Table 1. Performance of orange flesh sweet potato on vine length as influence by poultry manure.

Vine length (cm)				
Treatment	**3WAS**	**6WAS**	**9WAS**	**16WAS**
Poultry manure	29.42[a]	90.89[a]	119.94[a]	153.47[a]
Control	20.50[b]	65.06[a]	89.92[a]	93.69[b]
SE ±	2.31	7.70	8.39	14.86
LSD (0.05)	7.30	31.64	31.29	40.42

Means followed by the same letters on a column are not significantly different according to least significant difference (LSD) at P=0.05. WAS: Weeks after sowing.

Table 2. Performance of orange flesh sweet potato on number of leaves as influenced by poultry manure.

Number of leaves				
Treatment	**3WAS**	**6WAS**	**9WAS**	**16WAS**
Poultry manure	26.63[a]	92.93[a]	117.60[a]	81.26[a]
Control	18.73[b]	63.50[a]	87.50[b]	43.56[b]
SE ±	1.95	8.23	6.83	8.56
LSD	5.13	30.71	7.24	9.38

Means followed by the same letters on a column are not significantly different according to least significant difference (LSD) at p=0.05. WAS: Weeks after sowing.

Table 3. Performance of orange flesh sweet potato on width of leaves as influence by poultry manure.

Width of leaves				
Treatment	3WAS	6WAS	9WAS	16WAS
Treatment	3WAS	6WAS	9WAS	16WAS
Poultry manure	7.71[a]	9.74[a]	12.55[a]	16.19[a]
Control	5.4[b]	6.54[b]	7.94[b]	9.72[b]
SE±	0.54	0.76	1.11	1.49
LSD	1.18	1.71	2.62	2.29

Means followed by the same letters on a column are not significantly different according to least significant difference (LSD) at P=0.05. WAS: Weeks after sowing.

leaves (7.71, 9.74, 12.55, and 16.19) than the control (5.4, 6.54, 7.94 and 9.72). The use of organic manure provided the best option for leaves as reported by Adeyeye *et al*. (2016) who showed that number of leaves were significant in all the treatments using organic fertilizers were used in their study. Our results were similar to those reported by Nduwayezu *et al.* (2005) and Amara *et al*. (2015) who showed that farmyard manure organic increased vegetative growth of sweet potato.

Performance of orange flesh sweet potato on the leaf petiole as influence by poultry manure

The performance of poultry manure on leaf petiole is presented in table 4. The performance of poultry

Table 4. Performance of orange flesh sweet potato on the leaf petiole influenced by poultry manure.

	Leaf petiole (cm)			
Treatment	**3WAS**	**6WAS**	**9WAS**	**16WAS**
Poultry manure	5.37[a]	12.13[a]	15.21[a]	25.20[a]
Control	4.19[b]	7.89[b]	9.94[b]	14.69[b]
SE±	0.32	0.97	1.21	2.42
LSD	1.15	1.41	1.74	3.67

Mean followed by the same letters on a column are not significantly different according to least significant difference (LSD) at p=0.05.

Table 5. Performance of orange flesh sweet potato on weight of tubers as influenced by poultry manure.

	Weight of tubers (kg)	
Treatment	**Mark able-big tubers**	**Small tubers**
Poultry manure	6.70[a]	10.66[a]
Control	1.10[b]	1.0[b]
SE±	1.36	2.47
LSD	3.32	7.44

Means followed by the different letters on a column are significantly different according to the least significant difference (LSD) at p=0.05. Kg: kilogram.

Table 6. Performance of orange flesh sweet potato on number of tubers as influenced by poultry manure.

	Number of tubers	
Treatment	**Number of Marketable-big tubers**	**Number of small tubers**
Poultry manure	6.70[a]	10.66[a]
Control	1.10[b]	1.0[b]
SE±	1.36	2.47
LSD	3.32	7.44

Means followed by the same letters on a column are not significantly different according to the least significant difference (LSD) at p=0.05.

manure on the leaf petiole is significantly different at 3, 6, 9, and 16WAS. (5.37, 12.13, 15.21, and 25.20) while the control (4.19, 7.89, 9.94 and 14.69).
Gain (2014) also reported that the highest total dry matter production was found significantly with effect of leaf petiole**.**

Performance of orange flesh sweet potato on the weight of tubers as influence by poultry manure

The weight of the tubers are classified into two - big tubers and small tubers, the plants that obtain poultry manure had a higher weight, big tuber (6.70) and small tubers (10.66) while control, big tubers (1.10) and small tubers (1.10). This result is comparable to the work of Emin *et al* (2004) who reported that application of farm yard manure signified increased the dry matter of potatoes. Esmaeilian *et al*., (2012), reported that the application of poultry manure significantly increased dry matter production of sunflower in their study.

Performance of orange flesh sweet potato on numbers of tubers as influenced by poultry manure

The numbers of tubers are classified into two, Numbers of big tubers and small tubers. There is no significant

difference between the numbers of big - markable tubers (29.33) and control (19.33). But there was a significant difference between the numbers of small tubers (108.67) and control (18.33). Result of this study is similar to that reported by Novianantya *et al*., (2017) who reported that application of farmyard manure and solid organic fertilizers increased the vegetative growth of potato through the soil improvement. This yield increased the orange flesh sweet potato tubers in response to poultry manure is similar to the work reported by Orkwor (1990; Liu *et al*., 2017**)** who also reported severally that the greater the yam sett weight used in planting, the greater the weight of tubers produced. According to Nwoke *et al*., (1973) the main effect of large yam sett size is to produce a vigorous initial growth of root, vine and leaves which give the plant an advantage that last throughout the growing season. Generally the use of 15 tons/ha poultry manure plus 750g yam sett weight was found to produce more ware yams. Similarly too Pahlevi *et al*. (2016), have shown that potassium is an important macronutrient which contributes to the expansion of tubers during development and which participates in the process of translocation of phyto-assimilates from the source (mature leaves) to the storage section (sweet potato tuber).

CONCLUSION AND RECOMMENDATIONS

Sweet potatoes are an essential root crop that can generate more edible energy than other root crops and vitamin than other crops. Based on the results obtained from this study, it is therefore concluded that the use of poultry manure can increase the growth and yield of orange flesh sweet potato variety (*Solo gold*) grown in Gidan Kwano, Minna, Niger State, Nigeria.

The study recommends that the application of 100g/plot poultry manure gave better growth and yield of the orange fleshed sweet potato **(OFSP)** variety and the added nutrient value of vitamin A. can be suggested to farmers around Gidan Kwano, Minna, Niger State,.

The study also recommends that the need for awareness campaign by extension agents, public health agencies, nutritionists and non-governmental organizations on the availability of these sweet potato varieties that produce high yields for better returns. It also highlighted that government and non-governmental organizations should encourage sweet potato producers to adopt improved technologies through conduct of practical oriented training programmes, provision of suitable and necessary incentives and technologies in order to increase production and income.

Development of new varieties having better storability, most small and marginal farmers have poor access to cold storage facilities due to small quantity of produces and financial inability. They have to sell their potatoes to middlemen immediately after harvesting with lower price. Therefore, development of new varieties having better storability at home conditions will be highly beneficial to the poor potato farmers. This study suggests that smallholder farmers can successfully use organic fertilizers to produce their orange flesh sweet potato crops at relatively comparable levels when inorganic fertilizers are either too expensive or unavailable altogether.

Competing interests.

Authors have declared that there is no competing interest in this study.

REFERENCES

Abong', G.O.; Muzhingi, T.; Okoth, M.W.; Ng'ang'a, F.; Ochieng, P.E.; Mbogo, D.M.; Malavi, D.; Akhwale, M.; Ghimire, S. (2020). Phytochemicals in leaves and roots of selected Kenyan orange fleshed sweet potato (OFSP) varieties. Int. J. Food Sci., 2020, 1–11.

Adelekan B. A., F. I. Oluwatoyinbo and A. I. Bamgboye., (2010). Comparative effects of undigested and anaerobically digested poultry manure on the growth and yield of maize (Zea mays,. African Journal of Environmental Science and Technology Vol. 4 (2), pp. 100-107,

Akanni, I.D., Ojeniyi, S.O. and Awodum, M.A. (2011).Soil properties, growth and nutrient content of maize, pepper and Amaranthus as influenced by organic and organomineral fertilizer. J. Agric and Techn. 11, 1074-1078.

Akinrinde, E.A. (2006). Issues of optimum nutrient supply for sustainable crop production in tropical developing countries. Pakistan Jour. of Nutr. 5 (4), 387-390.

Akpaninyang , D.A. and Okpara J.C.(2013). Integrated nutrient management for orange-fleshed sweet potato in south eastern Nigeria F. Uganda Journal of Agricultural Sciences, 14 (2): 117-123

Anedo, E.O., Asawalam, D.O. & Ewuziem, J.E (2020) Effect of integrated fertilizer management on the economic performance of orange fleshed sweetpotato in rain forest agro-ecology of Nigeria. Nigerian Agricultural Journal 51 (1), 55-61

BNARDA (2008). Annual Report of Benue State Agricultural and Rural Development Authority, Makurdi, Nigeria.

Brobbey, A. (2015). Growth, yield and quality factors of sweetpotato (Ipomoea batatas (L.) Lam) as influenced by seedbed type and fertilization. Kwame Nkrumah University of Science and Technology, M.Phil Thesis).75 pp.

CRI (2002). Sweet potato: The crop of the future. Crop Research Institute of Council for Scientific and Industrial Research, Ghana. Factsheet, November, 2002. 6pp.

Duan W, Wang Q, Zhang H, Xie B, Li A, Hou F, Dong S, Wang B, Qin Z, Zhang L. (2018). Differences between nitrogen-tolerant and nitrogen-susceptible sweetpotato cultivars in photosynthate distribution and transport under different nitrogen conditions. PLoS One. 2018;13:e0194570. https://doi.org/10.1371/journal.pone.0194570

Edmond JB (2001). Sweet potatoes. The AVI publishing company, New Delhi, p. 13.

Ejechi, M.E., Ode, I.O. and Sugh, E.T. (2020). Empirical analyses of production behaviour among small-scale sweetpotato farmers in Ebonyi State Nigeria. Nigerian Agricultural Journal 51 (1), 17-21

Emin C. M., Klic S., Guuel E and Mert M., (2004). Effect of FYM and mineral fertilization on growth and yield of early potato (Solanum tuberosum) under the mediterenean conditions in Turkey. Indian Journal of agronomy 49: 198-200.

Esmaeilian Y, AR Sirousmerh, MR Asghripour and E Amiri (2012). Comparison of sole and combined nutrient application on yield and biochemical composition of sunflower under water stress. Int. J. Appl. Sci. Tech. 2(3): 214-220.

FAOSTAT (2012).Global production and consumption of root and tuber. In: FAO Corporate Document Repository. Report on the Inter-Center Review of Root and Tuber Crops Research In the CGIAR. http://www.fao.org. Accessed in September 15 201.

Gani MN (2014). Impact of Poultry Litter on Soil Properties and Production of Jute. Unpublished Ph D Thesis, Department of Soil, Water and Environment. University of Dhaka, Bangladesh, Dhaka-1000. Bangladesh.

Gordon, W.R., Whitney D.A. and Raney R.J. (1993). Nitrogen management in furrow irrigated, ridge- tilled corn. J. Prod. Agric., 6, 213-217.

Guptal, R., Kumar, R. and Tripathi, S.K. (2004). Study on agro-climatic condition and productivity pattern of sugarcane in India. Sugar Techn. 6 (3), 142-149.

Hahn, S.K., Osiru, D.S.O., Akoroda, M.O. and Atoo, J.A. (1993). Production of yam: present role and future prospects. IITA Research Guide 46.. http://cipotato.org/sweetpotato/

Hossain, M. A. and M. A. M. Miah. (2010). Post-harvest losses and technical efficiency of potato storage systems in Bangladesh. Technical Report submitted to FAO Bangladesh. Available at: http://www.fao.org/inpho/content/conpend/text 10-10-2021

Islam, S. (2006). Sweetpotato (Ipomoea batatas L.) leaf: its potential effect on human health and nutrition. Journal of Food Science, 71(2), R13-R121.

Jama, C. A. Palm, R. J. Buresh, A. Niang, C. Gachengo, G. Nziguheba and B. Amadalo (2000). Tithonia diversifolia as a green manure for soil fertility improvement in western Kenya: Agroforestry Systems 49: 201–221.

Law-Ogbomo, K.E. and Osaigbovo, A.U.(2017). The performance and profitability of sweet potato (ipomoea batatas l.) as influenced by propagule length and application rates of cattle dung in humid ultisols. Journal of Tropical Agriculture, Food, Environment and Extension. 16(1) 17 – 25.

Liu Xing Qiu, Huizhen Zhang, Wenming Zhang, Chunhong Wang and Yafei Ma Xing (2017). The Relationship between Plant Sink and Source of Continuous Cropping Potato and Its Regulating Mechanism on Tuber Yield. Journal of Applied Ecology, 28(05) 1571-1582.

Loebenstein G. (2009) Origin, Distribution and Economic Importance. In: Loebenstein G., Thottappilly G. (eds) The Sweetpotato. Springer, Dordrecht. https://doi.org/10.1007/978-1-4020-9475-0_2.

Maynard, A.A. (1991). Intensive vegetable production using composed animal manure. Conneticut Bull. Agric. Expt. Station, 16, 175-181.

Nduwayezu J.B., L.L.L. Lulandala , S.A.O Chamshama and A.G. Mugasha , 2005. The Effect of Cutting Height of Senna singueana (Del.) Lock. In Mixed Intercropping System on Foliage Biomass Production and Maize Yield in Morogoro, Tanzania. Journal of Agronomy, 4: 323-328.

Nedunchezhiyan M, Srinivasulu Reddy D, Haribubuk (2003). Nitrogen Management Practices on quality characters of sweet potato (Ipomoea batatas (L.) Lame). *Journal of Root crops* 29 (2).69-72.

Ning YW, Ma HB, Zhang H, Wang JD, Xu XJ, Zhang YC. (2015). Response of sweetpotato in source-sink relationship establishment, expanding, and balance to nitrogen application rates. Acta Agron Sin.;41:432-9. https://doi.org/10.3724/SP.J.1006.2015.00432

Njoku JC, Okpara, DA, Asiegbu JE (2001). Growth and yield respond of sweet potato in inorganic nitrogen and potassium in tropical ultra soil : Niger Agric. J. 32:30-41

Nkambule, B.S and E.M.Ossom. 2010. Effects of jugo bean (*Vigna subterranean* l.Verdc.) plant population on physiological growth indices and yields under intercropping with sweet potato (*Ipomo eabatatasl*. Lam.). Environ. Boil., 4:201-215.

Nwoke, F.I.O., Njoku, E. and Okonkwo S.V.C. (1973): The effect of size of seed yams on yield of individual plants of (Dioscorea rotundata) 3rd International Symposium. Tropical Root Crops Ibadan, Nigeria.

Obi, M.E. and Ebo, P.O. (1995). The effect of different management practices on the soil physical properties and maize production in severely degraded soil in southern Nigeria. Biological Resource Technology, 51: 117-123.

Ojeniyi S.O. (2000) .Effect of goat manure on soil nutrients and okra yield in a rain forest area of Nigeria. Applied Tropical Agriculture 5: 20-23.

Onunka, N. A., L. I. Chukwu, E. O. Mbanasor and C.N. Ebeniro (2012). Effect of organic and inorganic manures and time of application on soil properties and yield of sweetpotato in a tropical ultisol. Journal of Agriculture and Social Research (JASR) Vol. 12, No. 1, 2012 183

Pahlevi RW, Guritno B, Suminarti NE (2016). The effect of proportion combination nitrogen and potassium fertilization on growth, yield and quality of sweet potato (Ipomea_Batatas (L.) Lamb) cilembu variety in low land. Jurnal Produksi Tanaman 4(1):16-22.

Salami, S. A., Ewulo, B. and Adewole, W. A. (2021). Farmer's perception on the benefits of poultry production in Abuja Municipalarea Council, Federal Capital Territory, Nigeria. Nigerian Agricultural Journal: 52 (1) 96-101

Steiner, K.G. (1991). Overcoming soil fertility constraints to crop production in West Africa: Impact of traditional and improved cropping systems on soil fertility. In: Mokwunye, A.U. (ed.) Alleviating Soil Fertility Constraints to Increase Crop Production in West Africa (pp: 69-91). Proceedings of International workshop on Intercropping Cassava. Trinandrum, India. Kluwer Academic Publishers, Dordrecht, The Netherlands.

Ugonna, C.U, Jolaoso M.O. and Onwualu A.P. (2013) A Technological Appraisal of Potato Value Chain in Nigeria. International Research Journal of Agriculture, Science and Soil Science. 3(8):767- 769.

Uzoh, I.M., Obalum, S.E. and Ene, J. (2015). Mineralization rate constants, half-lives and effects of two organic amendments on maize and carbon-nitrogen status of loamy Ultisol in Southeastern Nigeria. Agro-Science, 14 (3): 35-40.

Yeng, S.B., Agyarko, K., Dapaah, H.K., Adomako, W.J. and Asare, E. (2012). Growth and yield of sweet potato (*Ipomea batatas* L.) as Influened by Integrated application of chicken manure and inorganic fertilize r. Afri can Journal of Agricultural Research, 7(39):5387-5395.

Zuraida, N. (2003). Sweet potato as an alternative food supplement during rice shortage. Journal Litban Pertanian, 22(4), 151.

APPENDIX

Plate 1. Vines treated with poultry manure.

Plate 2. Harvest of sweet potatoes tubers.

Plate 3. Harvested yellow flesh sweet potatoes tubers.