EFFECT OF DIFFERENT VINE LENGTHS ON THE GROWTH AND YIELD OF ORANGE-FLESHED SWEET POTATO IN ULTISOL OF SOUTH-EASTERN NIGERIA

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ABSTRACT
Field experiment was conducted in 2014 cropping season at the Teaching and Research Farm of the Agricultural Education Department, Nwafor Orizu College of Education, Nsugbe to investigate the effect of different vine lengths on the growth and yield of orange-fleshed sweet potato (Ipomea batatas(L) Lam) in ultisols of Anambra South Eastern Nigeria. The treatments were five different vine lengths of orange-fleshed sweet potato (20cm, 25cm, 30cm, 35cm and 40cm). The experiment was laid out in a Randomized Complete Block Design replicated three times. Data were collected on vine length and number of leaves per plant at 4 weeks interval, while data on yield parameters were collected at physiological maturity. The statistical analysis indicated significant differences in the parameters measured at 5% level of probability. Result showed that among the different vine length used, plants sown with 30cm vine length performed significantly better than the others in both growth and yield attributes, followed by 20cm vine lengths. The study therefore recommended that 30cm vine length is most suitable for orange-fleshed sweet potato and should be used for optimum growth and yield in Anambra South-East, Nigeria.

Keywords: Orange-fleshed, sweet potato, growth, yield and vine length.

INTRODUCTION
Sweet potato (*Ipomea batatas*) is one of the most important root and tuber crops. It is cultivated in more than 100 countries. Sweet potato varieties exist in many colours of skin and flesh, ranging from white to deep purple, although white, yellow and orange -flesh are the most common colours (Hageuimana, Carey, Oyunga and Imungi, 1999). Orange flesh sweet potato is the most widely grown in different part of the world and an important food crop in tropical and sub-tropical regions of the world, particularly in Asia and Africa (Hahn, 1977). According to Ray and Rari (2005) among root and tuber crops grown in the world, sweet potato ranks second after cassava. The highest produce of sweet potato in the world was China, whole in Africa, Uganda was rated the highest producer closely followed by Nigeria. In 2001 both countries contributed up to 3-6% of the world production (Amante and Sullivan, 2012).

Among the staple food crops yam, cassava and cocoyam, sweet potato is the only crop that contains enough beta-carotene, a precursor for pro-vitamin A (Hagenimana *et al.*, 1999). The orange flesh varieties have high contents of vitamin, beta-carotene and minerals. The tuber is used for food in many countries; it is eaten boiled, fried, baked or made into syrup; and also serve as raw materials for the manufacture of starch, glucose and alcohol (Woolfe 1992). It serves as a cover crop, suppressing weed growth. Its leaves are consumed when green by humans and when dry by livestock. The roots have both industrial and domestic uses especially the orange -flesh which contains beta carotene a pre-cursor for vitamin a (Anderson, Kapinga, Zhang and Hermann, 2007; Udo, Nodon Asuquo and Ndaeyo, 2005). The importance of this crop cannot be over-emphasized as it is among the root crops that play important roles in many parts of tropical Africa. The propagation is through vine cutting and thus is the

quickest and easiest way to grow piece of runner about 4-6 nodes that is 30cm length (Nwaigwe, Echendu, Nwankwo, Ewuziem and Nwako, 2011). Root number and yield were associated to vine lengths. According to IITA (2011) the use of vine cutting, as a planting material gives a higher multiplication rate than the traditional system. Tanaka and Sekioka (2011) in their work on evaluation of different vine cutting sizes reported high yield of sweet potato using 25cm to 30cm vine size compared to 20cm or 40cm vine size which recorded low yield; as too short or too long vine has no economic increase as per yield. Godfrey (2000) reported that cutting longer than 30cm tends to be wasteful of planting material, while much shorter cutting established slow and gave poor yields. FAO (2010) reported that vine size of between 25cm to 30cm gave higher marketable yield of sweet potato; the vine size of 20cm takes longer time to sprout and results to small yields, while vine size of 25cm too 30cm produced sweet potato with high marketable tuber yield (Anselo, Ganga, Badol, Heimer and Najidat, 2007). Supporting the above IITA (2011) reported that the best vine size for sweet potato is 30cm, while 25cm produced much yield close to 30cm vine size and 35cm to 40cm vine size is a waste of a lot of material due to their small yield.

Despite its growing importance and the tremendous potentials as food, animal feed, and source of raw material, sweet potato is still not widely cultivated. The unavailability of improved sweet potato planting materials to farmers constitutes a great problem to its cultivation. Access to adequate supply of improved sweet potato planting materials is the most basic of farmers' needs. The study therefore was conducted to determine the effect of different vine lengths on the growth and yield of orange-fleshed sweet potato in the teaching and research farm of Nwafor Orizu College of Education, Nsugbe.

MATERIALS AND METHODS

The experiment was carried out at the Teaching and Research Farm of Department of Agricultural Education, Nwafor Orizu College of Education, Nsugbe during 2014 cropping season. Nsugbe is located at latitude 06^0 25^1N and Longitude 060 82^1E of the equator. This location lies in the tropical rainforest zone. The average annual rainfall varies from 1,500mm to 1849mm and has a bimodial distribution with peak in July and September (NIMET, 2013). The area was cleared ploughed, harrowed and ridged. The ridges were made at 1m interval and plot size was 15m2. The treatments comprised of five vine lengths (20cm, 25cm, 30cm, 35cm and 40cm) arranged in a randomized complete block design, replicated three times. The plots were weeded three times manually and other agronomic practices were carried out. Data collected on 4 weeks interval were vine length and number of leaves per plant, while data on yield were collected at physiological maturity on number of tubers per plant, weight of tubers per plant and tubers weight in kg/ha. Data collected were subjected to analysis of variance and treatment means were separated using DMRT at 5% level of probability.

RESULTS AND DISCUSSION

The result of the effect of different vine cuttings on the vine length (cm) and number of leaves of orange -fleshed potato is shown in Table 1. The result showed that there were significant differences (P≤) among the different vine cutting evaluated. Plant sown with 30cm vine cutting had the highest vine length throughout the sampling periods with mean values of 56.00cm, 67.87cm, 139.55cm and 229.50cm respectively. This was closely followed by plants sown with 25cm vine cutting. The least vine length was obtained by plants sown with 20cm vine cutting (table 1). The result on number of leaves indicated that there was progressive increase in number of leaves among the different vine cutting sizes. Plants sown with 30cm vine cutting produced the greatest number of leaves across the sampling period with the values of 20.75, 54.90, 110.15 and 159.80 respectively, while the least number of leaves was obtained by plants sown with 20cm vine length (Table 1). These finding are in line with the work of (Anselo *et al*.; 2007) who reported that growth parameters such as vine length,

number of leaves and number of inter nodes were significantly influenced by vine cutting sizes. Supporting the above, Puran and Ronell (2014) reported that vine cutting with 3 to 5 nodes achieve better germination and survival. The assumption is that large cutting has a higher opportunity for sprouting and development due to the presence of more nodes and higher carbohydrate reserve.

Table 1: Effects of different vine cutting on vine length (cm) and number of leaves of orange – fleshed sweet potato

Vine lengths (cm)	Weeks After planting							
	4		8		12		16	
	Vine length	No of LVS	Vine length	No of LVS	Vine length	No of LVS	Vine length	No of LVS
20	32.00	10.65	56.0	32.10	81.66	80.22	135.70	87.4
25	39.67	16.33	63.30	49.55	121.33	92.40	201.45	111.50
30	56.00	20.75	67.87	54.90	139.58	110.15	229.50	159.80
35	38.67	16.22	53.65	36.00	114.00	81.33	174.16	93.2
40	37.33	12.33	45.13	34.33	94.11	80.66	137.67	91.50

Means in the same column with the same letter (s) are not significantly different at $P \geq 0.05$ using DMRT

The response of the effect of different vine lengths on the tuber yield of orange-fleshed sweet potato is shown in Table 2. The result indicated that plant raised with vine length of 30cm performed significantly better than other vine lengths. Vine length of 30cm resulted in highest number tubers per plant (5.88), weight of tubers per plants (3.61kg) and tuber weight in kg/ha (21.87kg). This superior performance was followed by plants sown with 25cm (Table 2) The superior performance of 30cm vine length could be attributed to its possession of between 3 to 5 nodes, higher carbohydrate reserve, and fast establishment which resulted to more branched and better vegetative growth and thus increase in yield and yield components. Plants sown with 40cm vine length obtained least number of tubers per plant, weight of tubers per plant and tuber yield in kg per hectare. These results were consistent with the findings of IITA (2011) that the vine length of 25cm to 30cm resulted in the production of large tubers weighing upto 10-30kg. Tanaka and Sekioka (2010) also reported high yield using 25cm to 30cm vine length. Corroborating the above, FAO (2010) reported that vine size of between 25-30cm gave higher marketable yield of sweet potato.

Table 2: Effect of different vine lengths on number of tubers/plant, weight of tubers per plant and tuber yield in kg/ha of orange fleshed sweet potato

Vine lengths (cm)	**Number of tubers per plant**	**Weight of tubers per plant**	**Tubers yield in kg/hg**
20	2.10^{c}	0.50^{c}	14.94^{d}
25	3.44^{b}	1.52^{b}	17.14^{b}
30	5.88^{a}	3.61^{a}	21.87^{a}
35	1.44^{d}	0.36^{d}	15.52^{c}
40	1.43^{d}	0.30^{d}	14.19^{d}

Means in the same column with the same letter (s) are not significantly different at $P \geq 0.05$ using DMRT

CONCLUSION

Orange flesh sweet potato is grown primarily for human consumption. It is a rich source of carbohydrate, vitamin, protein, lipid, calcium and beta-carotene. Poor access to improved sweet potato

planting materials adversely affects its production in the study area. Presently, export demands for orange fleshed sweet potato and its production are not being met by local producers. This could be as a result of different vine cutting lenghts used in production. The need to encourage farmers, teachers and students to pursue its production should be highlighted in order to boost sweet potato production. The study therefore recommends that 30cm vine length which resulted in significantly better growth and yield of orange-fleshed sweet potato be used to grow sweet potato in the area for maximum yield. The study will be of great help to agricultural science teachers, students and farmers. It will enable them to have access to adequate supply of improved planting materials. The study will also help the students and farmers to know the benefit of using standard vine length in the cultivation of orange-fleshed sweet potato. Furthermore, the study established that the most appropriate vine length for good growth and yield of orange-fleshed sweet potato in the study area is 30cm. Finally, the study will serve as a guide for future researchers.

REFERENCES

Amante, V.O and O.J. Sullivan (2012). Sweet Potatoes Diagnotes: A diagnostic key and information tool for sweet potato problem. http://keys.lucidcentral.org.keys/sweetpotato.

Anderson, P., R. Kapinga, D. Zhang and M. Hermann (2007). Vitamin A for Africa: an entry point for promoting orange-fleshed sweet potato to combat Vit.A deficiency in sub-saharan Africa. In: *proceedings of the 13th ISTREC symposium*, Tanzania: Arusha, Tanzania Pp711-720.

Anselmo, B.A., Z.N. Ganga, E.O. Badol, Y.M. Helmer and A.A. Nejidat (2007). Screening Sweet potato for drought tolerance in highland and genetics diversity among selected genotypes. *Trop. Agric.* (Trinidad) 75:189-196.

F.A.O (2010). Food and Agricultural Organization of the United Nations htt. II Faosted. F.A.O Org /site/336/ Desktop Default As pix? Page 336 sweet potato production world wide association, trends and the future.

Godfrey, S.N. (2000). Effects of cutting lengths of sweet potato yields in Sierra Leon. *Expt. Agric*. 10:33-37

Hageuimana, U.E., E. Carey, M.A, Oyunga and J.K. Imungi (1999). Carotenoid contents in fresh, dries and processed sweet potato products. *Ecol. Nutr*. 37:455-473. www.in.ng.com; World Healthy Food Nutritious.

Hahn. S.K (1977). Sweet potato. In *Ecophysiology of Tropical Crops* (Edited by B.T Alvin and T.T. Koslowoski) Academic press N.Y Pp 237-246.

I.I.T.A.(2011). Sweet potato. In sustainable food production in sub Saharan Africa: International Institute of Tropical Agriculture (IITA) contribution Pp79-83.

NIMET (2013): Nigeria meteorological Agency, annual report for 2012.

Nwaigwe, G.O., T.N.C. Echendu, H.M. Nwankwo, J.E. Ewuziem and F.N. Nwankwo (2011). Accessibility of Improved Sweet Potato planting materials to farmers in Abia State. In *Proceedings of the 45th Annual Conference of ASN* 2:71-76.

Puran, B.O. and S.H. Ronell (2014). Effect of initial stem nodal cutting strength on dry Matter production and accumulation in cassava .*Journal of Plant Breeding and crop science* 6(6): 64-72.

Ray, R.C. and P.V. Rari (2005). Post harvest spoilage of sweet potato in the tropics and control measures. *Food Science Nutrition* 45:623-644.

Tanaka, J.S. and T.T. Sekioka (2010). Sweet potato production in Hawaii In: *Proc. 4th Symp. of Int. Soc. Tropical Root Crops* Columbia Pp 150-151.

Udoh, D.J., B.A. Nodon, P.E. Asuquo and N.U. Ndaeyo (2005). *Crop Production Techniques for the Tropics* Concept Publishers

Woofe, J.A. (1992).Sweet potato: an untapped food resources. Publication in collaboration with CIP, peru Cambridge university press, Pp 30-35.