EFFECT OF PROPAGULE SIZE AND INTRA-ROW SPACING ON THE GROWTH AND YIELD OF SWEETPOTATO IN A HUMID AGRO-ECOLOGICAL ZONE

NJOKU, J.C.[1]., C. O. MUONEKE[2*]., P. I. OKOCHA[2], AND F. EKELEME[2]

[1]National Root Crops Research Institute Umudike., Abia state Nigeria.
[2]College of Crop and Soil Sciences, Michael Okpara University of Agriculture, Umudike, Abia state, Nigeria * Corresponding author's E-mail: cosmuoneke@yahoo.com

ABSTRACT
A 4 x 3 factorial experiment with three replications was used to investigate the responses of sweetpotato to propagule size (1, 2, 3 and 4 node cuttings) and intra-row spacing (20, 30, and 40 cm) in 2003 and 2004 cropping season. The result showed that 3 and 4 node cutting had higher percentage (%) emergence at 2 weeks after planting (WAP) while % emergence of 1 and 2 node cuttings increased from 2 to 4 WAP. The number of roots per plant of all propagule sizes increased with age of plant but not beyond 11WAP while fresh root weight per plant consistently increased up to the time of harvest in most cases. Planting of higher propagule size at narrow spacing of 20cm depressed storage roots weight per plant. The graded number of storage root yield increased significantly (P<0.05) with increased number of nodes per vine. There were no significant differences (P>0.05) among average root yield of 17.9, 19.7 and 20.0 t/ha for 2, 3 and 4 node cuttings respectively compared to the yield of 13.4 t/ha recorded by 1-node cutting in both seasons. Planting of 2 node cuttings at narrower spacing of 20 cm on the average produced significantly more saleable and total storage root yield than when planted at wide spacing of 30 or 40 cm but the yield was not significantly different from the 3 or 4 node cuttings at various spacing in both seasons. The 2, 3 and 4 node cuttings produced similar yield and as such, number of nodes could be reduced to 2 to provide more plantable vine pieces in time of scarcity of planting material.

KEYWORDS: Sweetpotato, *Ipomoea batatas*, node cuttings, propagule size, intra-row spacing.

INTRODUCTION

Sweet potato (*Ipomoea batatas* (L.) Lam) is one of the important root and vegetable crops with its origin from tropical America (Hahn, 1983). Globally, sweetpotato ranks third among the root and tuber crop after potatoes (281 Mt) and cassava (164 Mt) with a production of about 122 Mt (FAO 1996). China accounts for the highest of the world production followed by Uganda and Nigeria in that order (FAO, 2004). In Nigeria, it is one of the four major root and tuber crops coming after cocoyam, cassava, and yam (APMEU, 1996) and these crops play important roles in the social and economic development of the country. Sweetpotato has low input requirements, short growing period (3-6 months) and high yield potentials, especially under infertile soil conditions than other root crops (Woolfe, 1992; Kozai *et al.,* 1996). According to Horton *et al.* (1989), sweetpotato produces more edible energy, and dry matter in a per hectare per day basis than any other crop. It contains vitamins, particularly vitamin A and minerals comparable to those of various fruits (Truong, 1989). The storage roots and shoots are consumed directly (as fresh or processed food) and indirectly (as animal feed) and has potential as a major source of raw material for industrial purposes such as adhesives, textiles, paper, confectioneries, alcohol production as well as energy source of cell batteries (Kozai *et al.,* 1996; Woolfe, 1992). Sweetpotato production had steadily increased from 0.3 to 3.4 metric tons per annum under a period of 17 years due to increase in land area under sweetpotato (FAO, 1989, 1991, and 2007). However, yields are still low in farmers' fields (8t/ha). High yields of more than 30 tonnes per hectare had been recorded by the National Root Crops Research Institute (NRCRI), Umudike under experimental conditions (Njoku, 2000). The yield of sweetpotato may be further increased by introducing new technologies and production methods.

Several factors hinder the expansion of sweetpotato production. These include among others, unimproved varieties, insufficient planting material at the beginning of the cropping season and inappropriate plant spacing by farmers. Plant density occasioned by various spacings has a marked effect on growth of plants (Hamid and Osamu, 2001). At low planting density, or widely spaced plants, most of the environmental resources necessary for growth and yield are under-utilised, whereas at high densities, competition for these resources sets in (Forbes and Watson, 1994).

In Nigeria, propagation of sweetpotato is exclusively by vine cuttings. However, with prolonged dry season from November to March, farmers often have difficulties in preserving planting materials in good conditions from one season to the other especially where there is no reliable water source. As a result, they resort to the use of regrowths of sweetpotato vines from the bush fallow, which are not in sufficient quantities for early planting. The objective of this study is to investigate the effect of propagule size (the number of nodes on vine pieces) as well as intra-row spacing on the performance of sweetpotato using high yielding TIS 87/0087 variety as a test crop.

MATERIALS AND METHODS

The experiment was conducted in 2003 and 2004 at the research farm of the National Root Crops Research Institute (NRCRI), Umudike (07º 34′ E, 05º 29′ N, 122 above sea level) under rain-fed conditions. Rain fall is bimodal with an annual average of 2076.8 mm. The monthly rainfall and average minimum and maximum temperatures are represented in Fig. 1. The soil characteristics of the experimental sites in the two years is shown in Table 1. Lands which were previously cultivated with yam and left fallow for two years at the time of the experiments were disc ploughed, harrowed, and ridged 1 meter apart. Soil samples were taken for analysis before planting. The trial comprised four levels of propagule sizes (1, 2, 3 and 4 node cuttings), and three intra-row spacings (20, 30 and 40cm) in a randomized complete block factorial design with three replications. Each sub plots measured 4.5 m x 6 m.

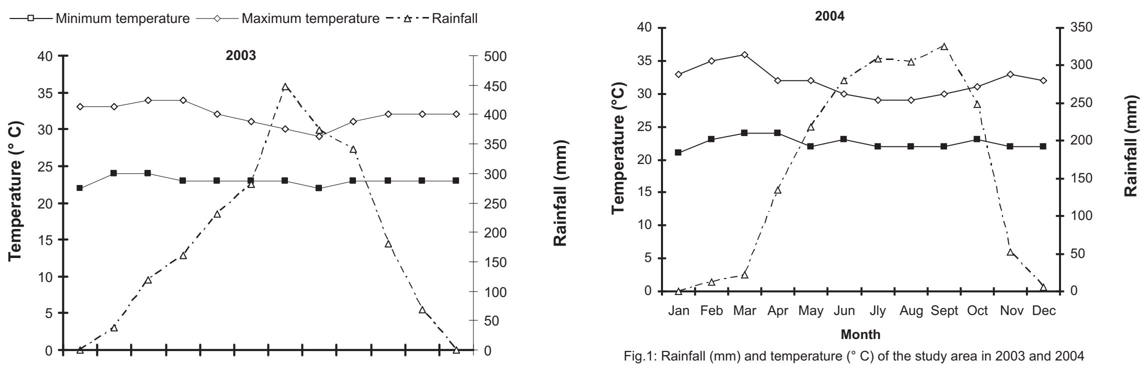

Fig.1: Rainfall (mm) and temperature (° C) of the study area in 2003 and 2004

Sweetpotato vines of TIS 87/0087 variety obtained from vine tip of healthy stem portions were cut into different node sizes (1, 2, 3 and 4) and planted at 20, 30, and 40 cm along the crest of the ridges given a total plant population of 50, 000; 33, 330 and 25, 000 plants per hectare, respectively. Supply of vacant stands was done at 2 weeks after planting (WAP). Each plot received a blanket application of NPK 15:15:15 at 400 kg/ha after hoe weeding at 4WAP.

Records were taken on percentage emergence, Number and fresh weight of root tubers/plant, number of marketable, unmarketable and total tubers/m^2, and tuber yield (t/ha). The storage roots were harvested at 17 WAP in 2003 and 15 WAP in 2004, and graded based on weights as follows: Marketable tubers (> 100 g), unmarketable (<100 g) (Levett, 1993). Weed data at 10 and 16 WAP in 2004. All weed species in 1 m x 1m quadrant in each subplot were clipped at ground level, separated into broadleaves, grasses and sedges, then counted and soil gently washed off. They were dried at 80° C for 48 h to constant weight in carbolite water extraction oven. The data were analysed using MSTAT-C software (MSTAT-C, 1988). Treatment mean differences were compared using standard error of difference (SED) at $P = 0.05$.

RESULTS

Soil and weather characteristics

The soils of the experimental site for both years were texturally classified as sand clay loam and acidic in reaction with medium organic matter content (Table 1). Nitrogen and potassium were low in both years while a moderate amount of phosphorus was found. Consideration of monthly rainfall for 2003 and 2004 showed that Umudike has a characteristic bimodal rainfall distribution pattern with peaks in July and September (Fig. 1). The total annual rainfall distribution was 2241 mm and 1911.4 mm in but a greater portion of the rains (1410.3 and 1240.3 mm) occurred during the experimental period of July to November. Between 2003 and 2004, the monthly minimum temperature varied from 21 ºC to 24 ºC whereas monthly maximum temperature ranges from 29 ºC to 36 ºC. For both years, the hottest months were February/April (2003) and February/March (2004).

Table 1: Initial physical and chemical properties of the soil of the experimental sites in 2003 and 2004 cropping season

Year	Clay (%)	Silt (%)	Sand (%)	Organic Matter(%)	Nitrogen (%)	Phosphorus (ppm)	Potassium (me/100 g)	CEC (me/100 g)	pH (H_2O)
2003	26.6	7.4	66.0	1.45	0.086	14.7	0.11	5.71	5.35
2004	28.0	5.0	67.0	1.86	0.094	12.7	0.104	6.14	5.16

Emergence

The mean percentage emergence for 2003 and 2004 showed that at 2WAP, 4-node cutting emerged better than those of 1, 2, and 3-node cuttings (Table 2). Also the 3-node cutting recorded more emergence than other smaller sizes (1 and 2-nodes). The 2, 3, and 4-node cuttings were superior to 1-node cutting. At 4 WAP, percentage emergence also increased with propagule size. In 2003, % emergence obtained at 4-node cuttings were higher than at 1 and 2-nodes but not with 3-node cuttings. In 2004, the order of superiority was 4>3>2>1-node cuttings. There was no significant ($P > 0.05$) effect of intra-row spacing or node cutting x spacing interaction on emergence.

Table 2: The effects of number of nodes and spacing on percentage (%) emergence at 2 and 4 weeks after planting (WAP) in 2003 and 2004 cropping seasons

Treatments	Percentage emergence (%)					
	2WAP			4 WAP		
	2003	2004	Mean	2003	2004	Mean
Number of nodes						
1	14.89	1.60	8.25	63.01	37.22	50.12
2	51.91	13.48	32.70	88.02	66.26	77.39
3	80.78	54.44	67.61	93.70	85.42	89.56
4	96.30	74.34	85.32	98.36	96.28	97.32
SED	4.72	4.89		3.00	4.68	
Spacing (cm)						
20	58.30	36.33	47.32	82.72	71.53	77.13
30	62.67	38.66	50.67	87.39	74.26	80.83
40	61.94	32.92	47.43	87.21	68.48	77.85
SED	4.08	4.23		2.60	4.06	

Yield and yield components

The number and fresh weight of roots were significantly ($P < 0.05$) affected by number of nodes and intra-row spacing in 2003 and 2004 (Table 3). The 4-node cuttings in most cases reached its maximum number of storage roots at 13 WAP and produced more storage roots compared to one node cutting. The 1-node cutting produced the least in most cases especially at the earlier part of the season in both years. The root fresh weight per plant increased with the age up to the time of harvest (15-17 WAP). Higher propagule sizes (2, 3, and 4-node cuttings) produced more root weight per plant than 1-node cutting. The effect of intra-row spacing was not consistent but 30 or 40 cm spacing had an edge in terms of number and weight of storage root per plant than 20cm. At harvest (15-17 WAP) especially in 2003, fresh root tuber weight per plant was highest with 30 cm intra-row spacing.

Table 3: Effect of number of nodes and spacing on number and fresh tuber weight/plant for 2003 and 2004

	Weeks After planting (WAP)										
	2003						2004				
	7	9	11	13	15	17	7	9	11	13	15
Number of nodes			**Number of tubers/plant**								
1	0.67	0.94	1.33	1.56	2.17	1.78	0.83	1.33	1.89	1.89	1.94
2	0.89	1.83	1.67	1.89	2.67	2.11	1.67	1.94	2.06	1.94	2.50
3	1.06	2.22	1.94	2.28	2.06	2.11	1.94	1.94	2.06	2.11	2.28
4	2.33	2.78	2.78	3.17	2.28	3.11	2.11	2.28	2.67	2.78	2.61
SED	0,41	0.37	0.25	0.36	0.39	1.01	0.27	0.30	0.38	0.29	0.44
Spacing (cm)											
20	1.29	2.25	1.75	2.25	2.21	2.38	1.63	2.13	2.17	2.13	2.42
30	1.21	1.71	1.67	2.29	2.46	2.21	1.50	2.00	2.08	2.33	2.25
40	1.21	1.88	2.38	2.13	2.21	2.25	1.79	1.50	2.25	2.08	2.33
SED	0.35	0.32	0.22	0.32	0.34	0.88	0.23	0.26	0.33	0.25	0.33
Number of nodes			**Fresh weight of tubers/plant**								
1	8.61	29.44	95.12	258.89	481.11	618.89	11.67	53.33	157.78	422.22	610.00
2	15.56	87.78	236.67	380.56	536.11	803.33	25.28	93.33	268.89	453.33	680.00
3	14.44	93.89	750.56	418.33	422.22	553.33	25.83	108.34	286.11	445.00	957.22
4	33.89	126.11	337.50	433.06	672.22	793.34	48.61	106.32	318.33	458.89	641.67
SED	9.04	20.90	58.89	83.66	74.19	103.76	8.31	27.66	49.91	70.42	131.03
Spacing (cm)											
20	17.08	75.83	175.50	329.58	491.25	499.59	31.25	87.50	197.08	317.08	526.25
30	18.96	84.17	220.01	378.33	525.42	761.67	23.12	120.42	289.17	524.17	955.83
40	18.33	92.92	294.38	410.20	582.08	715.42	29.17	103.75	287.08	498.33	695.00
SED	7.83	18.10	50.99	72.45	64.25	89.86	7.19	23.95	43.22	60.99	113.02

In 2003 and 2004, the number of marketable, unmarketable and total number of roots/m^2 were significantly ($P < 0.05$) affected by number of nodes and intra-row spacing (Table 4). The 4-node cuttings consistently produced the highest number of different grades of storage roots with 1-node cutting producing the least. Increasing the planting distance significantly reduced the number of marketable, unmarketable and total number of roots in most cases. Although the 4-node cuttings at all intra-row spacings produced the highest values in all grades of roots measured, it was not significantly ($P > 0.05$) different from 2 or 3-node cuttings but higher than the 1-node cutting. The depression in number of storage roots in most cases was more apparent when smaller propagule sizes (1 or 2 node cuttings) were planted at wider spacing of 30 or 40 cm. The root yields of different grades followed the same trend as number of roots (Table 5). The fresh marketable and total root yields increased significantly ($P < 0.05$) with increase in number of nodes up to 2-node cuttings, below which no further increment occurred. Although there were slight increases at 3 or 4 node cuttings, these did not differ significantly ($P > 0.05$) with the 2 node cuttings. Plant spacing did not significantly ($P > 0.05$) influence marketable and total root yield in both years. However, unmarketable root yield decreased at wider spacing of 30 and 40 cm compared to the closer spacing of 20 cm. Marketable yield was highest with 4-node cuttings spaced 40 cm in 2003 but it was highest with 2 or 3 node cuttings at intra-row spacing of 20 cm or with 4 node cuttings x 40 cm spacing in 2004. The unmarketable tuber yield was highest with 3 or 4 node cuttings at 20 cm intra-row spacing. Total root yield was highest with 3 or 4-node cuttings at intra-row spacing of 20 or 40 cm in both years but there was no difference with 2 node cuttings. Increasing the planting distance of smaller propagule sizes (1 or 2-node) tend to depress their root yield with the least yield produced by 1-node cutting planted at various spacings.

Table 4: Effect of number of nodes and spacing on number of marketable, unmarketable and total number of roots/m^2 for 2003 and 2004

	Number of nodes									
Spacing (cm)	2003					2004				
	1	2	3	4	Mean	1	2	3	4	Mean
Number of marketable roots/m^2										
20	3.40	4.90	6.02	6.19	5.13	3.92	6.11	5.61	8.69	6.08
30	2.85	4.29	4.83	4.65	4.13	2.73	4.86	4.98	6.42	4.75
40	2.79	2.83	4.31	5.54	3.87	3.87	1.94	4.23	4.31	4.88
Mean	3.01	3.97	5.06	5.47		2.86	5.06	4.97	6.68	
Number of unmarketable roots/m^2										
20	1.15	1.67	2.04	3.67	2.13	1.48	1.73	1.86	3.67	2.19
30	0.85	1.25	1.90	1.43	1.43	1.06	1.15	1.31	2.00	1.38
40	0.75	0.81	1.31	1.38	1.06	0.75	1.90	0.81	1.08	1.44
Mean	0.92	1.24	1.75	2.25		1.10	1.59	1.33	2.25	
Total number of roots/m^2										
20	4.54	6.56	8.06	9.94	7.28	5.40	7.84	7.46	12.36	8.26
30	3.71	5.44	6.73	6.35	5.56	3.79	6.00	6.29	8.42	6.13
40	3.54	3.65	5.63	6.92	4.93	2.69	6.13	5.12	12.5	4.97
Mean	3.93	5.22	6.81	7.74		3.96	6.66	6.29	8.91	

	Marketable		**Unmarketable**		**Total**	
	2003	2004	2003	2004	2003	2004
SE of a diff. bet. 2-node means	0.44	0.36	0.26	0.38	0.41	0.75
SE of a diff. bet. 2 spacing means	0.38	0.52	0.22	0.33	0.35	0.65
SE of a diff. bet. 2 node x 2 spacing means	0.76	1.03	0.45	0.66	0.70	1.3

Table 5: Effect of number of nodes and spacing (cm) on marketable, unmarketable and total storage root yield (t/ha) for 2003 and 2004

	Number of nodes									
Spacing (cm)	2003					2004				
	1	2	3	4	Mean	1	2	3	4	Mean
Yield of marketable roots (t/ha)										
20	13.63	18.27	17.79	18.90	17.15	12.58	20.46	20.98	19.27	18.32
30	11.42	14.57	18.08	15.02	14.78	11.54	17.76	19.31	19.48	17.02
40	14.58	13.84	17.42	20.65	16.62	13.67	16.78	18.31	20.69	17.54
Mean	13.21	15.56	17.76	18.19		12.60	18.70	19.71	19.81	
Yield of unmarketable roots (t/ha)										
20	0.62	1.13	1.50	2.17	1.36	0.90	1.00	1.25	1.56	1.18
30	0.38	0.60	1.09	1.13	0.79	0.55	0.71	0.48	0.85	0.65
40	0.17	0.44	0.77	0.89	0.57	0.38	1.02	0.44	0.75	0.65
Mean	0.39	0.72	1.12	1.40		0.61	0.91	0.72	1.06	
Total roots yield (t/ha)										
20	14.25	19.40	19.29	21.07	18.50	13.48	21.46	22.23	20.84	19.50
30	11.80	15.17	19.17	16.15	15.57	12.09	18.46	19.79	20.33	17.67
40	14.75	14.28	18.19	21.54	21.54	14.04	18.03	19.27	21.44	18.19
Mean	13.60	16.28	18.88	19.59		13.20	19.32	20.40	20.87	

	Marketable		**Unmarketable**		**Total**	
	2003	2004	2003	2004	2003	2004
SE of a diff. bet. 2 node means	1.91	1.11	0.21	0.18	1.84	1.10
SE of a diff. bet. 2 spacing means	1.65	0.96	0.18	0.16	1.59	0.95
SE of a diff. bet. 2 node x 2 spacing means	3.31	1.92	0.36	0.32	3.18	1.90

Weed type, density and weed dry matter

The dominant weed species were broadleaves and grasses. However, there were few sedges near the fringes where there were water logging. The broadleaves were *Ageratum conysoides* L. (Asteraceae), *Calapogonium muconoides* Desv (Fabaceae), *Commelina* benghalensis L. (Commelinaceae). The prominent grasses were *Panicum maximum* Jacq (Poaceae), *Eleusine indica* L. Gaertn (Poaceae) while the sedge was *Cypercus* spp. (Cyperaceae).

The broadleaf, grass weeds and sedges densities were highest with 1-node cutting and least with 4-node cuttings at 10 and 16 WAP in 2004 (Table 6). Broadleaf weeds were more prominent than the grass weeds and sedges for each node cutting. The total weed density was highest for 1-node cutting and least with 4-node cuttings. Broadleaved weeds and sedges were highest with 40 cm than the 20 and 30 m intra-row spacings at 10 WAP but at 16 WAP, only the grass weed density was also highest with the 40 cm intra-row spacing (Table 6). Similarly, total weed density was highest with the 40 cm intra-row spacing. There was no effect of intra-row spacing on broadleaf, sedges and total weed density at 16 WAP. Weed dry weight was also highest with 1-node cutting and 40 cm intra-row spacing at 10 and 16 WAP (Table 7). Weed dry matter was reduced at higher node cuttings and close spacing.

Table 6 Effect of number of nodes and spacing (cm) on weed types and density at 10 and 16 WAP in 2004

	10 WAP				16 WAP			
	Types of weed (No/m^2)			Density(No /m^2)	Types of weed (No/m^2)			Density (No/m^2)
No. of nodes	Broadleaf	Grass	Sedge		Broadleaf	Grass	Sedge	
1	180.00	7.78	9.56	197.3	200.56	13.00	6.44	220.0
2	99.67	5.67	4.00	109.3	145.89	20.11	2.89	168.9
3	67.00	4.11	2.78	73.9	93.56	10.44	3.11	107.1
4	49.33	2.11	1.56	53.0	88.00	3.78	2.33	94.1
Std. error of diff between 2 means	35.31	1.61	1.49	35.9	59.46	7.10	1.99	61.9
Intra-row spacing (cm)								
1	78.67	4.67	3.08	86.4	137.58	9.00	3.33	149.9
2	96.08	4.50	3.42	104.0	134.75	8.75	2.33	145.8
3	122.25	5.58	6.92	134.8	123.67	17.75	5.42	146.8
Std. error of diff between 2 means	30.58	1.40	1.29	31.1	51.49	6.15	1.72	53.6

Table 7: Effect of number of nodes and spacing (cm) on weed dry weight (g/m^2) at 10 and 16 WAP in 2004

	Intra-row spacing (cm)							
	10 WAP				16 WAP			
No. of nodes	20	30	40	Mean	20	30	40	Mean
1	26.83	43.33	52.40	40.86	18.07	80.90	76.27	58.41
2	7.23	6.83	23.90	12.66	15.33	34.40	58.90	36.21
3	14.50	25.47	6.83	15.60	43.63	21.23	21.51	28.59
4	8.30	5.23	7.23	6.92	28.23	21.87	18.23	22.78
Mean Intra-row spacing (cm)	14.22	20.22	22.59		26.17	39.60	43.73	
	10 WAP				16 WAP			
Std. error of diff. between 2 node (N) means	4.95				11.04			
Std. error of diff. between 2 intra-row spacing (S) means	4.28				9.56			
Std. error of diff. between 2 (N) x 2 (S) means	8.57				19.13			

DISCUSSION

The sweetpotato plant is highly adaptable to wide range of environment and thrives best in the tropical areas. Umudike at 122 m above sea level falls within the altitude range that sweetpotato can be grown (Onwueme, 1978). The sandy clay loam, acidic medium and other chemical properties typical of Umudike soil appeared consistent with the observations of Woolfe (1992) that sweetpotato crop prefers sandy loam soil, a soil pH of 5.6-6.6 and is sensitive to alkaline and saline conditions. The low nutrient status of the site, especially for nitrogen and potassium in both years may be attributed to the cropping sequence of 4 years continuous cropping with cassava crop being the last in the sequence before the introduction of the sweetpotato crop. Cassava being a root crop has high demand for potassium and nitrogen (Asher *et al*., 1980). The annual rainfalls, temperature range and relative humidity appeared consistent with the environmental requirement for sweetpotato growing area (Onwueme and Charles, 1994).

There was marked increase in percentage emergence with increase in number of nodes in both season (2003 and 2004) and at 2 WAP larger plant propagules (3 and 4 nodes) had attained their maximum percentage emergence especially in 2003. The smaller propagule sized plants (1 and 2 node cuttings) had all their nodes below ground level and as such it took some time for their sprouts to get to the surface of the soil while the larger sizes of 3 or 4 nodes with one or two nodes, respectively above the surface of soil showed visible sprouts.

The 4-node cuttings had more number of roots initiated at 7 WAP in both season. Higher node cuttings (2, 3 and 4 nodes) had at least two of their nodes below ground portion where primary cambium activity resulted in the initiation of tuberous roots from adventitious roots (Wilson, 1982). Walworth and Carling (2002) had reported that early initiation of tuberous roots increased the yield of tuber crops. The influence of spacing on number of tuberous roots was not significant although closer spacing of 20 cm tended to have more number of roots. In 2004, however, wider spacing (30 or 40 cm) gave significantly ($p<0.05$) higher fresh root yield at 13 and 15 WAP. Closer spacing probably resulted to competition for nutrient and light and hence depressed fresh root yield produced at 20 cm spacing. Amber (1994) also showed from his work on 3 clones at different plant populations that the number of tubers increased proportionately with plant density but tuber size decreased. Interaction effect which was observed at 17 and 15 WAP in 2003 and 2004, respectively indicated that smaller plant sizes yielded higher fresh root weight at narrow spacing and larger propagule sizes recorded higher fresh root weight at wider spacing.

The 2-node cuttings compared favourably with 3 and 4- node cuttings in terms of number and yield of marketable (>100g) and total storage root yield and gave higher yield than 1-node cutting. With the consistent higher yield with 2-node cuttings in both seasons, more plantable units will be provided by the use of the 2-node cuttings, which would ensure saving planting materials, especially during the scarce period as well as covering large hecterage of land. Nwokocha *et al*. (1999) had stressed on the economics of using the 2-node cuttings to alleviate scarcity of planting material. With regard to effect of spacing, high marketable number of roots and storage root yield were obtained at closer spacing of 20 cm and this was consistent with the total number and yield of tuberous roots in all cases. This indicates that the density of plant propagules could be increased to 50,000 stands per hectare to enhance yield of sweetpotato. Belehu (2003) in his study on effect of density and cultivar on sweetpotato yield obtained yield of 81.6 t/ha with increase from 50,000 to 100,000 stands /ha indicating potentials to increase yield by increasing sweetpotato planting density.

Although sweetpotato is a planophile with ability to suppress weeds, yield losses of up to 90% had been reported if weeding is delayed during its initial slow early growth period (Akobundu, 1981). At 10 WAP, high density of weeds occurred in 1-node cutting at wide intra-row spacing plots, probably due to few sprouts that results in low ground coverage. This enabled high weed emergence. The low weed density and biomass where 2, 3 or 4 node cuttings were planted was probably due to high leaf area index (LAI) with heavy ground cover that suppressed the weeds at 10 and 16 WAP. This effect was also evident when propagule sizes were planted at narrow intra-row spacing of 20 cm, which had less weed situation compared to wider spacing.

CONCLUSION AND RECOMMENDATION

From the results of the experiment, marketable and total storage root increased with increased number of nodes but yield was still high at 2-node cutting below which there was a significant reduction in root yield. Intra-row spacing had no effect on marketable and total storage root yield but increased significantly the unmarketable yield at a closer spacing of 20 cm compared with the wider spacing of 30 and 40 cm. Higher propagule sizes resulted in the highest storage root yield although smaller sizes of 2-node cuttings, which gave high yield could be adopted as planting material where plant propagules are scarce or in short supply for timely planting of sweetpotato.

Based on the conclusion drawn from the trial, the following recommendations were be made:

Propagule size and spacing vs growth and yield of sweet potato

1. The use of smaller propagule sizes such as 2-node cutting could give reasonable yield where planting material is inadequate.
2. Where 2-node cuttings were used, 20 cm intra-row spacing is recommended for improved yield.

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