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Evaluation of Different Stem Portions of Cassava (*Manihot Esculentus*) in the Management of its Establishment and Yield.

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Abstacts: Experiments were conducted at the University of Nigeria, Nsukka (UNN) research farm during the 2007 and 2008 cropping seasons to evaluate different stem portions of cassava varieties for establishment and yield. A randomized complete block design with a 2 x 3 factorial arrangement and four replications per trial was used. The treatments were two early maturing varieties- IITA92/0061 and NR8082, then the stock, middle and top portions of these varieties. The stock significantly ($P \leq 0.05$) out yielded the top and the middle portions in spite of the early and high percent establishment exhibited by the middle. Total average yield was higher in 2008 and this was attributed to early and even distribution of rainfall which led to planting earlier that year. It is clear in this study that stock portions which are traditionally discards after harvest can be good source of planting material. However, further research is needed to screen the stocks of many cassava varieties to confirm our findings.

Key words: Cassava, Stem portions, Stock, Middle, Top

INTRODUCTION

Cassava 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]. Again, cassava and soybean mixture have been[2] shown to improve the diet of farmers as well as soil of their farms.

Improvement in the yield of the crop is vigorously pursued through the development of improved varieties by the National Root Crops Research Institute (NRCRI), Umudike, Umuahia and the International Institute of Tropical Agriculture (IITA), Ibadan. It has been reported [3] that the yield of crops is influenced by quality of planting material and management practices. Udealor and Asiegbu[4] noted that better yields are obtained when improved cassava genotypes are used with suitable cultural practices while the quality of planting material is reflected in the freshness, shape, vigour, vitality, genetic potential, absence of weeds, parasites, pathogens among others.Research in cassava has witnessed tremendous progress with the development of improved varieties of the crop and accompanying improved management recommendations by IITA, Ibadan and NRCRI, Umudike. Some of the improved varieties developed and released include: TMS 90257, TMS 84537, TMS 82/00058, TMS 5395, TMS 30001, TMS 30555, TMS 30572, NR41044, NR83107 NR8083 NR8212 among others[5]

Cassava has biological seeds but it is commonly grown vegetative with stem cutting. The best cuttings for establishment are obtained from plants of 10 – 12 months old and are usually cut 25 cm long[6]. In planting the cassava sticks, about 20 cm are put in the ground while the remaining length is above the ground. Some cassava varieties especially the early maturing type (8-12) months retain their below ground level planted materials at maturity. Farmers usually discard these below ground sticks and use only the above ground sticks as new planting material. Despite well known large number of cassava varieties especially the improved types, planting materials are still constraints to cassava production in our localities.

There was need to explore the possibility of adopting this below ground cassava stem (root-stock) as planting material. The objective of this study therefore, was to evaluate different stem portions of cassava sticks in the establishment, management and yield of cassava.

MATERIALS AND METHODS

The experiments were conducted at the University of Nigeria, Nsukka (UNN) research farm during the 2007 and 2008 cropping seasons. The area is located by latitude 6^0 52^1 N and longitude 7^0 23^1 E, altitude 400 m above sea level and has a humid tropical climate. The mean annual rainfall ranges from 1600 to 2000 mm. The temperature is uniformly high

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throughout the year but the annual mean maximum temperature does not exceed 35^0C[7]. The soil was derived from falsebedded sand stone parent material. It is sandy loam and has been classified as Typic Kandpaleustult or Dystric Nitosol, belonging to Nkpologu series[8] and the vegetation has been described as derived savanna. The experiments were sited in the same location but different fields for the two years. The first experiment was on 12th April 2007 while the second was 3rd March 2008. Land was prepared each year by disc ploughing, harrowing and ridging to obtain a smooth seed bed. It was a randomized complete block design with a 2 x 3 factorial arrangement and four replications per trial. The treatments were two early maturing (6-8 months) IITA92B/0061 and NR8082 cassava varieties and three stem portions of these varieties.

The cassava sticks (planting materials) were obtained from a multiplication plot of the Department of Crop Science UNN that had stayed for 10-12 months in the soil. The stands were pulled out of the soil and the root stock carefully trimmed. Each stand was divided into three portions: the root stock, the middle stick and the top. The stock is the previously planted stem cutting, now the parent material of the shoot and root systems of the harvested cassava. The middle is the stem length from the point of attachment to the stock up to the first leaf petiole attachment to the stem while the top is the leafy stem portion of the plant. The planting materials were cured for two days for the leaves to shade off before planting.

The different stem portions were cut such that the stock was 10 cm in length while middle was 20 cm and top 30 cm. The cut pieces were randomly planted on ridges at the spacing distance of 1 m apart. The planting method for the stock was horizontal placement of the whole length inside the soil. This was to ensure that the stock had sufficient contact with the growing medium. The middle and the top portions were planted at slanting positions in such away that about 10 cm of the lengths were inside the soil. The necessary husbandry practices were carried out. Manual hoe weeding was done three times and fertilizer, NPK-mg, 12:12:12:2 was applied at the rate of 400kg/ha[9]. Each field was harvested at 9 months after planting.

Data Collection: Measurements made were on the establishment count at four weeks interval for twelve weeks, number of stem per stand, number of leaves per stand, weight of tubers per stand and plant height all of which were taken at the time of harvest.

Data Analysis: All data collected were subjected to analysis of variance (ANOVA) according to the procedure for a randomized complete block design (RCBD) experiment using Genstat statistical package.

RESULTS AND DISCUSSION

The meteorological data for the period of study are summarized in Table 1. Rainfall stability was earlier and also higher in intensity in the year 2008 than 2007. This was the main reason for establishing the experiments at different dates and months. The middle portions of the cassava varieties consistently maintained highest percentage establishment counts over time for the average of two years as shown in Figure. 1. The stock ranked second while the top had the least percent establishment. It is evident in this study that the adoption of the middle portion as the conventional planting materials for cassava is related to its ease of establishment and survival after planting. The superiority of the middle portion over others could be attributed to its ability to withstand harsh environment in the field because the stock and top portions sprouted but many died especially when rainfall became heavy and frequent.

Surprisingly, the stock significantly ($P \leq 0.05$) out yielded the top and the middle portions in both years in spite of the early and high percent establishment exhibited by the middle (Table 2). The greater number of stems per stand and leaves per stand (source) produced by the stock was probably responsible for higher tuber yield (sink) in the stock. This result however, does not agree with the report of Mbah et. al [2] that increased number of shoots per plant diverted photosynthates to stem and internodes elongation.

Yield differences existed between the two varieties with NR8082 having significantly ($P \leq 0.05$) greater tuber yield (kg/plant) in both years (Table 3). Generally, the average yield of the two cassava varieties were higher in 2008 than what was obtained in 2007. This could be attributed to early planting in 2008 as the rain came earlier that year. Eke et. al [10] obtained similar result in their search to determine the optimum planting time of okra *Albelmoschus esculentus*) cultivars in the derived savannah.

A combined analysis showed that stock was consistently better than other portions in all the yield indices except plant height in the two cassava varieties and in both years (Table 4). This suggests that the stock is of high quality planting material as it has been reported[3] that the yield of crops is influenced by quality of planting material and management practices. On average, NR8082 had significant greater tuber yield (kg/plant) than IITA92B/0061. Other yield indices, especially number of stems and number of leaves per plant were also observed to be greater in NR8280 than in IITA92B/0061, though differences were not significant. It is clear in this study that stock portions which are traditionally discards after harvest can be good source of planting material. However, further research is needed to screen many cassava varieties to confirm our findings.

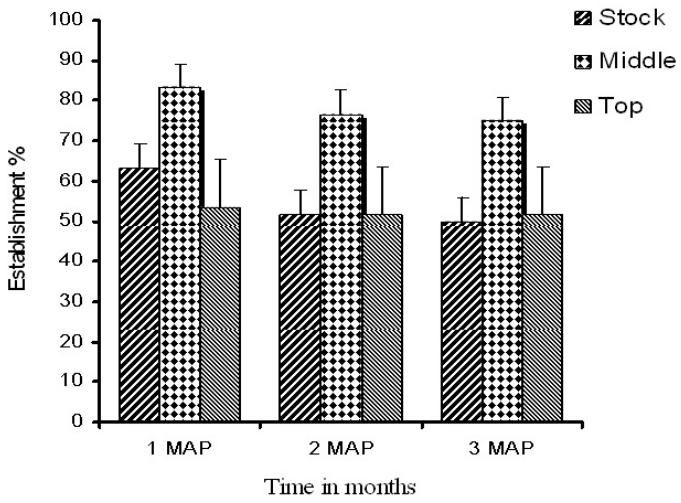

Fig. 1: Average of the establishment counts for the 2007 and 2008 planting seasons

Table 1: Weather records for the site of the experiments

	2007				2008			
Month	Total rainfall (mm)	Soil temp (°C)	Total radiation (cal/cm^2/hr^1)	Wind speed (kmhr^1)	Total rainfall (mm)	Soil temp (°C)	Total radiation (cal/cm^2/hr^1)	Wind speed (kmhr^1)
Jan	4.6	29.2	918.2	124.0	0.0	28.1	949.9	56.5
Feb	0.0	30.4	930.8	151.9	45.0	31.3	849.9	109.5
Mar	3.0	32.6	962.1	163.3	168.2	30.4	919.9	119.4
Apr	173.7	31.0	868.3	167.7	164.7	29.6	811.8	75.1
May	96.6	20.7	818.7	124.2	341.9	28.3	843.1	50.2
Jun	206.4	28.2	745.7	93.0	196.0	27.8	717.1	51.5
Jul	264.8	26.4	560.7	80.9	321.4	26.4	574.8	36.5
Aug	185.5	25.8	544.2	72.3	345.6	25.7	481.3	35.4
Sept	235.6	26.8	676.2	57.5	200.6	26.5	633.8	27.7
Oct	210.6	27.6	760.9	53.9	227.0	26.4	669.6	20.9
Nov	6.1	29.8	849.0	50.7	9.9	28.9	926.9	22.3
Dec	36.1	28.6	746.9	65.9	0.0	28.2	1018.1	64.8

Table 2: Effects of different stem portions of cassava on some yield parameters in 2007 and 2008

Year 2007		Yield parameters			
Stem portions	Number of tubers/stand	Weight of tubers (kg)/stand	Number of stems/stand	Number of leaves/stand	Plant height (cm)
Middle	5.12	2.16	1.88	159.38	1.89
Stock	8.75	4.18	4.95	195.50	1.79
Top	4.7	2.70	1.72	112.25	1.99
Mean	6.19	3.01	2.85	115.71	1.89
S.E.	0.08	0.55	0.15	11.18	0.02

Table 2: Continue

Year 2008					
Middle	5.25	2.33	1.75	160.1	2.0
Stock	8.82	4.0	5.0	198.8	1.86
Top	4.78	2.53	1.95	120.1	2.10
Mean	6.28	2.96	2.90	159.63	1.99
S.E.	0.09	0.65	0.25	10.98	0.05

Table 3: Effects of variety on some yield parameters of cassava (*Manihot esculentus)* in 2007 and 2008

Year 2007		Yield parameters			
Variety	Number of tubers/stand	Weight of tubers (kg)/stand	Number of stems/stand	Number of leaves/stand	Plant height (cm)
IITA92B/0061	6.11	2.73	2.80	157.75	1.88
NR8082	6.10	3.30	2.90	153.66	1.90
Mean	15	3.02	2.85	155.71	1.89
S.E	0.70	0.45	0.12	9.13	0.02
Year 2008					
IITA92B/0061	6.13	2.83	2.91	160.0	1.89
NR8082	5.90	3.48	2.89	184.2	2.0
Mean	6.02	3.15	2.90	174.4	1.99
S.E	0.80	0.55	0.13	9.49	0.03

Table 4: Combined effects of variety and different stem portions of cassava on some yield parameters

Variety	Different portions	Number of tubers/stand	Weight of tubers (kg)/stand	Number of stems/stand	Number of leaves/stand	Plant height (cm)
IITA92B/0061	Middle	5.05	1.77	1.79	178.75	1.90
IITA92B/0061	Stock	8.92	3.64	5.28	192.0	1.75
IITA92B/0061	Top	4.34	2.54	1.35	102.5	2.0
NR8082	Middle	5.19	4.72	1.97	140.0	1.89
NR8082	Stock	8.47	4.25	4.62	199.0	1.83
NR8082	Top	4.55	2.65	2.09	122.0	1.99
S.E		0.12	0.77	0.21	15.6	0.03

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