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EFFECTS OF STORAGE DURATION ON THE QUALITY AND GROWTH DYNAMICS OF SWEETPOTATO (*Ipomoea batatas* (L.) Lam.) PLANTING MATERIAL IN THE HUMID AGROECOLOGY OF SOUTHEASTERN NIGERIA.

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ABSTRACT

Sweetpotato (*Ipomoea batatas* (L.) Lam.) productivity in humid agroecologies is largely dependent on the quality of vine cuttings used as planting materials. This study evaluated the influence of storage duration of sweetpotato vines on sprout count, plant vigour, and growth dynamics at the National Root Crops Research Institute, Umudike, Nigeria, during the 2024 and 2025 cropping seasons. The experimental site was characterized by low soil fertility, with total nitrogen ranging from 0.109% to 0.19%, organic carbon from 1.08% to 1.107%, and organic matter from 1.86% to 1.904%. Available phosphorus increased from 15.6 to 23.10 mg/kg, while soil pH declined from 5.86 to 4.60, indicating increasing soil acidity that may influence nutrient availability. The cropping seasons were marked by adequate rainfall (1,388.6 mm) and favorable temperature conditions, with mean maximum temperatures ranging from 30.24°C to 31.96°C and minimum temperatures from 21.94°C to 23.01°C. The experiment was laid out in a randomized complete block design with a split-plot arrangement consisting of five storage durations (0, 2, 4, 6, and 8 days) and two varieties (Umuspo-3 and TIS 87/0087), replicated three times. Results showed that shorter storage durations (0 to 2 days) significantly enhanced sprout count and early plant vigour compared to prolonged storage (6 to 8 days). Sprout count declined progressively with increased storage duration, with the lowest values recorded at 8 days. Plant vigour followed a similar trend, although partial recovery was observed at later growth stages. Growth parameter such as number of branches was not significantly affected by storage duration, indicating a compensatory growth response. Sweetpotato virus disease incidence remained low and was not significantly influenced by storage duration. The study concludes that prolonged storage beyond 4 days reduces planting material viability and early crop establishment. Therefore, planting within 0 to 2 days after vine harvest is recommended for optimal sweetpotato production under humid agroecological conditions.

Keywords: *Sweetpotato, vine storage, sprout count, plant vigor, humid agroecology, growth dynamics*

INTRODUCTION

Sweetpotato (*Ipomoea batatas* (L.) Lam.) is a major root crop widely cultivated in tropical and subtropical regions due to its adaptability to diverse environmental conditions, high yield potential, and nutritional importance. It serves as a staple food and an important source of income for smallholder farmers, particularly in Sub-Saharan Africa (FAO, 2022; Low *et al.,* 2020). The crop is rich in carbohydrates, dietary fibre, vitamins, and essential minerals, making it critical in addressing food and nutritional insecurity.

Unlike seed-propagated crops, sweetpotato is vegetatively propagated using vine cuttings. Consequently, the quality of planting materials plays a vital role in determining crop establishment, growth, and yield. The physiological condition of vine cuttings at planting, including their moisture content, carbohydrate reserves, and health status, directly influences sprouting ability and early vegetative growth (Gibson *et al.,* 2021).

In practical farming systems, vine cuttings are often stored for varying durations before planting due to constraints such as transportation delays, labour limitations, or unfavorable weather conditions. During storage, physiological changes such as moisture loss, respiration, and depletion of stored carbohydrates occur, which may adversely affect the viability and performance of the planting materials (Tumwegamire *et al.,* 2022).

Short-term storage has been reported to promote callus formation at the cut ends of vines, enhancing root initiation and establishment. However, prolonged storage may lead to desiccation, reduced metabolic activity, and increased susceptibility to pathogens, thereby reducing planting material quality (Ndolo *et al.,* 2020; Mwanga *et al.,* 2021). These effects are more pronounced in humid agroecologies where high temperatures and relative humidity accelerate physiological deterioration.

Sprout count and plant vigour are critical indicators of planting material quality and establishment success. Growth parameters such as branching, vine elongation, and leaf area development determine canopy formation and photosynthetic efficiency, which ultimately influence root yield. However, information on the optimal storage duration of sweetpotato vine cuttings under humid conditions remains limited and inconsistent.

This study therefore aimed to evaluate the influence of storage duration on sprout count and growth dynamics of sweetpotato under humid agroecological conditions.

MATERIALS AND METHODS

The experiment was conducted under rain-fed condition from July 2024 to November 2024 and July 2025 to November 2025 at the Research Farm of National Root Crops Research Institute, Umudike, located on latitude $05^{0}29^{'}$N and longitude $07^{0}33^{'}$E with an altitude of 122m above sea level (Asumugha *et al.,* 2006). During the 2024 and 2025 cropping seasons (July–November), the study area received a total rainfall of 1,388.6 mm. The mean maximum temperature during the cropping period ranged between 30.24°C and 31.96°C, while the mean minimum temperature ranged between 21.94°C and 23.01°C.

Total nitrogen ranged from 0.109 in 2024 to 0.19% in 2025, The organic carbon content showed a marginal increase from 1.08% in 2024 to 1.107% in 2025, while organic matter also increased slightly from 1.86% to 1.904% across the two seasons. Available phosphorus increased from 15.6 mg/kg in 2024 to 23.10 mg/kg in 2025.

Experimental Design

The trial was laid as a split plot in a randomized complete block design (RCBD) with Main plot as two varieties Umuspo-3 (mother's delight) and TIS 87/0087 and subplot as storage durations (0, 2, 4, 6, and 8 days) with three replicates. Healthy vine cuttings were harvested and stored in moist sacks bag and kept under a shade for specified durations before planting.

The plot size was 3 m × 3 m and sweetpotato vines were planted at 1 m × 0.3 m spacing. N.P.K fertilizer (15:15:15) was applied at 400 kg/ha at four weeks after planting (4 WAP). Data collected included:

Sprout count (4 and 8 WAP), plant vigour (1–5 scale), number of branches,) and sweetpotato virus disease (SPVD) score.

Statistical Analysis

Data collected were subjected to analysis of variance, and means were separated using LSD at 5% probability level.

RESULTS AND DISCUSSIONS

The analysis of variance (Table 1) indicated that variety and storage duration significantly ($p<0.05$) affected sprout count of sweetpotato at 4 and 8 weeks after planting (WAP). The trend was the same in both cropping seasons. However, except sprout count as 8WAP, the interaction between variety and storage duration significantly affected sprout count of sweetpotato at the sample ages in both cropping seasons.

The result indicated that fresh (Day 0) and short-term stored (Day 2) vines produced the highest number of sprouts. A marked decline was observed as storage duration increased, particularly at 6 and 8 days.

This reduction in sprouting ability is likely due to desiccation stress and depletion of energy reserves required for bud initiation. Storage conditions can accelerate physiological deterioration, thereby reducing meristematic activity and sprout emergence. Similar findings have been reported where prolonged storage negatively impacted sprouting and viability of planting materials (Ravi and Indira, 1999; Low *et al.,* 2020).

Recent evidence also indicated that poor storage conditions can lead to rapid quality deterioration and reduced regeneration capacity of sweetpotato planting materials (Adebayo *et al.,* 2024). The sharp decline observed at 8 days suggests a critical storage threshold beyond which vine viability is severely compromised.

TABLE 1: Sprout count of sweetpotato varieties as influenced by storage duration evaluated in 2024 and 2025 cropping seasons.

Storage durations	SPC at 4WAP		
	Variety		
	TIS87/0087	Umuspo 3	MEAN
Day 0	30.0	29.0	29.5
Day 2	29.0	27.7	28.3
Day 4	28.7	15.0	21.8
Day 6	29.0	20.7	24.8
Day 8	17.3	8.7	13.0
Mean	26.8	20.2	
LSD for Variety	1.7		
LSD for S. duratn	2.7		
LSD for interaction	3.9		

SPC at 8WAP		
Variety		
TIS87/0087	Umuspo 3	MEAN
30.0	29.0	29.5
29.0	27.7	28.3
28.7	15.0	21.8

[illegible]	[illegible]	[illegible]
29.0	20.7	24.8
17.3	8.7	13.0
26.8	20.2	
1.7		
2.7		
3.9		

2025

Storage durations	SPC at 4WAP		
	Variety		
	TIS87/0087	Umuspo 3	**MEAN**
Day 0	28.0	25.0	**26.5**
Day 2	28.7	26.7	**27.7**
Day 4	23.7	25.0	**24.3**
Day 6	26.7	9.0	**17.8**
Day 8	15.7	14.7	**15.2**
Mean	**24.5**	**20.1**	
LSD for Variety	3.3		
LSD for S. duratn	5.2		
LSD for interaction	7.4		

SPC at 8WAP		
Variety		
TIS87/0087	Umuspo 3	**MEAN**
26.0	21.3	**23.7**
26.0	19.3	**22.7**
21.7	19.7	**20.7**
19.0	4.7	**11.8**
8.3	12.3	**10.3**
20.2	**15.5**	
3.7		
5.8		
NS		

The results (Table 2) showed that variety, storage duration and their interaction had no significant (p>0.05) effect on number of branches per plant at the sampled ages of 4, 6, 8 and 12 weeks after planting (WAP) in the two cropping seasons except at 12WAP in 2025 cropping season. TIS 87/0087 gave the highest number of branches compared to umuspo 3 (mother's delight) sweetpotato variety.

This suggests that branching in sweetpotato is largely controlled by genetic factors and environmental conditions rather than pre-planting storage duration. Similar observations have been made in previous studies, where varietal characteristics played a dominant role in determining branching patterns (Laurie *et al.,* 2018; Mwanga *et al.,* 2021).

The lack of significant response also indicates that once plants are successfully established, they are capable of maintaining normal vegetative development irrespective of initial storage stress.

TABLE 3: Number of branches of sweetpotato varieties as influenced by storage duration evaluated in 2024 and 2025 cropping season.

Storage durations	NOB at 4WAP			NOB at 6WAP			NOB at 8WAP			NOB at 12WAP		
	Variety			Variety			Variety			Variety		
	TIS87/0087	Umuspo 3	**MEAN**	TIS87/0087	Umuspo 3	**MEAN**	TIS87/0087	Umuspo 3	**MEAN**	TIS87/0087	Umuspo 3	**MEAN**
Day 0	1.0	1.2	1.1	5.4	6.3	5.8	7.9	7.3	7.6	7.8	7.8	7.8
Day 2	1.8	1.4	1.6	9.5	7.1	8.3	8.9	9.1	9.0	7.9	6.9	7.4
Day 4	1.9	2.4	2.2	10.1	12.7	11.4	9.2	10.0	9.6	5.5	9.3	7.4
Day 6	2.3	1.2	1.8	12.0	6.4	9.2	9.6	9.4	9.5	8.9	8.6	8.8
Day 8	1.8	1.7	1.7	9.2	8.8	9.0	10.0	9.7	9.8	8.2	7.3	7.8
Mean	1.8	1.6		9.2	8.2		9.1	9.1		7.7	8.0	
LSD for Variety	NS			NS			NS			NS		
LSD for S. duratn	NS			NS			NS			NS		
LSD for interaction				NS			NS					

NOB = Number of branches

2025

Storage durations	NOB at 4WAP			NOB at 6WAP			NOB at 8WAP			NOB at 12WAP		
	Variety			Variety			Variety			Variety		
	TIS87/0087	Umuspo 3	**MEAN**	TIS87/0087	Umuspo 3	**MEAN**	TIS87/0087	Umuspo 3	**MEAN**	TIS/0087	Umuspo 3	**MEAN**
Day 0	0.7	0.7	**0.7**	2.0	0.7	**1.3**	3.0	3.3	**3.2**	6.3	4.7	**5.5**
Day 2	0.3	1.3	**0.8**	2.3	1.7	**2.0**	3.0	4.0	**3.5**	4.7	4.3	**4.5**
Day 4	0.7	1.3	**1.0**	3.0	2.7	**2.8**	4.0	3.7	**3.8**	5.0	5.3	**5.2**
Day 6	0.7	1.0	**0.8**	1.3	1.7	**1.5**	3.3	2.3	**2.8**	6.3	3.0	**4.7**
Day 8	0.3	0.0	**0.2**	1.7	1.3	**1.5**	2.7	2.0	**2.3**	6.0	3.7	**4.8**
Mean	**0.5**	**0.9**		**2.1**	**1.6**		**3.2**	**3.1**		**5.7**	**4.2**	
LSD for Variety	NS			NS			NS			0.96		
LSD for S. duratn	NS			NS			NS			NS		
LSD for interaction	NS			NS			NS			NS		

NOB = Number of branches

Except variety in 2025 cropping season, (Table 3) storage duration and the interaction between variety and storage duration had no significant effect (p>0.05) on virus disease score at the sampled ages in both cropping seasons. TIS 87/0087 sweetpotato variety exihibited the lowest virus disease score. The trend was the same at all the sampled ages 2025 cropping season.

This indicates that storage duration did not predispose vine cuttings to viral infection.

The low SPVD scores observed may be attributed to the use of healthy, disease-free planting materials and proper handling during storage. Previous studies have shown that virus incidence in sweetpotato is primarily influenced by the initial health status of planting materials and vector activity rather than storage practices (Gibson and Kreuze, 2015).

This finding suggests that maintaining clean seed systems is more critical for disease management than modifying storage duration.

TABLE 4: Sweetpotato virus disease score as influenced by storage duration evaluated in

2024 and 2025 cropping season

Storage durations	SPVD at 4WAP			SPVD at 6WAP			SPVD at 8WAP			SPVD at 12WAP		
	Variety			Variety			Variety			Variety		
	TIS87/0087	Umuspo 3	**MEAN**	TIS87/0087	Umuspo 3	**MEAN**	TIS87/0087	Umuspo 3	**MEAN**	TIS87/0087	Umuspo 3	**MEAN**
Day 0	1.3	1.3	1.3	1.3	1.7	1.5	1.3	1.3	1.3	1.3	1.3	1.3
Day 2	1.0	1.7	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Day 4	1.0	1.0	1.0	1.3	1.7	1.5	1.3	1.7	1.5	1.7	1.7	1.7
Day 6	1.3	1.0	1.2	1.3	1.3	1.3	1.0	1.3	1.2	1.7	1.3	1.5
Day 8	1.0	1.0	1.0	1.3	1.0	1.2	1.3	1.0	1.2	2.0	1.0	1.5
Mean	1.1	1.2		1.3	1.4		1.3	1.3		1.6	1.3	
$LSD_{for\ Variety}$	NS			NS			NS			NS		
$LSD_{for\ S.\ duratn}$	NS			NS			NS			NS		
$LSD_{for\ interaction}$	NS			NS			NS			NS		

2025

Storage durations	SPVD at 4WAP			SPVD at 6WAP			SPVD at 8WAP			SPVD at 12WAP		
	Variety			Variety			Variety			Variety		
	TIS87/0087	Umuspo 3	**MEAN**	TIS87/0087	Umuspo 3	**MEAN**	TIS87/0087	Umuspo 3	**MEAN**	TIS87/0087	Umuspo 3	**MEAN**
Day 0	1.3	2.0	**1.7**	1.3	2.0	**1.7**	1.3	1.7	**1.5**	2.0	3.3	**2.7**
Day 2	1.3	2.3	**1.8**	1.3	2.3	**1.8**	1.0	1.7	**1.3**	2.0	2.7	**2.3**
Day 4	1.7	1.7	**1.7**	1.7	1.7	**1.7**	1.0	2.7	**1.8**	2.0	3.0	**2.5**
Day 6	1.3	1.3	**1.3**	1.3	1.3	**1.3**	1.0	1.0	**1.0**	2.0	2.3	**2.2**
Day 8	1.0	1.3	**1.2**	1.0	1.3	**1.2**	1.0	1.3	**1.2**	2.3	2.7	**2.5**
Mean	**1.3**	**1.7**		**1.3**	**1.7**		**1.1**	**1.7**		**2.1**	**2.8**	
$LSD_{for\ Variety}$	0.4			0.4			0.4			0.4		
$LSD_{for\ S.\ duratn}$	NS			NS			NS			NS		
$LSD_{for\ interaction}$												

SPVD = Sweetpotato virus disease
1 – no symptoms, 2 – very mild symptoms, 3 – moderate symptoms, 4 – severe symptoms, 5 – very severe infection

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