Effects of Storage Materials and Conditions on Sensory Attributes of Sweet Potatoes (*Ipomoea batatas (L*) Lam)

ABSTRACT

Sweet potatoes face a significant challenge of rapid postharvest losses, often attributed to inadequate storage methods and unsuitable storage conditions. An experiment was conducted to assess the storability of various sweet potato cultivars under different storage conditions and using different storage materials over a 12-week period. The study was carried out during the dry seasons of 2022 and 2023 at Crop Production and Horticulture Department of Modibbo Adama University, Yola, Adamawa State. The experimental lay out was Split-Split-Plot Design (SSPD), each treatment was replicated three times, resulting in a comprehensive factorial experiment combining three pivotal factors: storage materials (grass, river sand, and sawdust), storage conditions (under roof and without roof), and cultivars (yellow flesh, purple skin, and white skin). Data were taken in 2022 and 2023 on sensory attributes and data collected were subjected to Analysis of Variance (ANOVA). Means that showed significant difference were separated using Least Significance Difference (LSD) at 0.05 % level of probability. The result showed significant differences ($P \leq 0.05$) among storage materials, cultivars and storage condition on allthe sensory parametersin both 2022 and 2023. The effects of storage materials on appearance (colour) in 2022, sweet potato stored in grass recorded highest colour of 3.833, followed by sweet potato stored in river sand with 2.22 and the least of 1.778 was obtained from sawdust. Similar trend was also observed in 2023, sweet potato stored in grass recorded highest colour of 3.833, followed by sweet potato stored in river sand with 2.22 and the least of 1.681 was obtained from sawdust. Additionally, purple skin sweet potato cultivar was found to be superior in terms of sensory attributes as compared to its counterparts. It was recommended that purple skinsweet potatoes stored in grass appear to the best cultivar and storage material respectively for maintaining sensory attributes especially appearance (colour) inthe study area.

Key word: Sweet Potato, Cultivar, Storage Materials, Storage Conditions, Sensory

INTRODUCTION

Sweet potato (*Ipomoea batatas* (L.) Lam) is a dicotyledonous plant belonging to the family Convolvulaceae. It is an important tuber crop grown in the tropics, sub-tropics and warm temperate regions of the world. Sweet potato is grown in over 100 countries of the world, covering an estimated total area of 9.2 million hectares, with an annual global production around 125 million tons. Almost 95% of the total production is in developing countries. Being relatively resistant to pests and diseases and comparatively water-use efficient, sweet potato grows well in regions of marginal agricultural production (Abong *et al.*, 2016). Sweet potato being a root crop is believed to have originated in Central America and was introduced to Africa at the end of 19th century (Earle, 2023). Sweet potato is rankedas the seventh most important crop in the world with a total production of 103 million tons in 2013 (Sugri*et al.*, 2017). Asia accounts for a very high proportion of the word's

Comment [OK1]: What is the reason for conducting the research in two different years? How is the research conducted in 2022 related to the research in 2023?

Comment [OK2]: It is suggested to mention the name of the country (Nigeria) so that readers can immediately understand the climate zone where the research was conducted.

Comment [OK3]: Extra spaces between words

Comment [OK4]: It would be better to provide a citation from the latest reference of a reputable statistical institution.This data also does not mention the year it was collected, so it is unknown whether it is still relevant for the present time.

Comment [OK5]: Extra spaces between words

Comment [OK6]: It would be better to use citations from reputable institutions, such as FAO. Data from journal research articles are feared to be the authors' opinions rather than actual conditions.Additionally, the data being used is already too old (2013), which is 11 years ago.

production with China producing about 76% of the world's total production with production figure around 75.6 million tons,The global ranking of the sweet potato producing countries showed Nigeria to be the largest producer in Africa, and the second largest producer in the world after China (Schoolar, 2021). Sweet potato is one of the most important household food security crops in Nigeria. The crop complements other food crops and serves to bridge periods of shortage before the next harvest of maize or other staple crops (Afzal*et al.*, 2021). It is particularly a suitable food security crop as it produces high yields in short growing season even under low rainfall (Sapakhova*et., al.*, 2023). Sweet potato has been identified to be the fourth most important root crop in Nigeria after cassava, yam and cocoyam. It is an important starch crop which provides vitamins, minerals, dietary Fibres, anti-inflammatory and anti-diabetics properties (Ohizur*et al.*, 2017).

On the other hand, inadequate of suitable storage facilities among small farmers continues to expose farmers to adverse postharvest losses and food insecurity. Farmers are thus making use of locally available preservation methods to improve storability of sweet potatoes (Sapakhova*et al.,* 2023). According to Ahn *et al.* (2010) every grower of sweet potatoes has his own principles, theories and practices about storage techniques of sweet potato. Most of these methods are derived from local knowledge. This is so because the orthodox approaches based on chemicals are hazardous and relatively expensive (Sapakhova*et al.,* 2023).) Within this context, indigenous knowledge refers to the inventory of locally available techniques used to preserve sweet potatoes and these have to be derived from the community and have a direct bearing in their everyday lives (Mutandwa and Gadzirayi (2007). However, the tubers are highly perishable when not stored in favourable conditions because of their high moisture contents especially the orange fleshed cultivars. The endogenous enzymes in sweet potatoes are responsible for the breakdown of starch into sugars during storage (Kim *et al*., 2021), and this makes storage of the fresh sweet potato tubers beyond three months difficult (Kim *et al.*, 2021). Use of good quality roots free of damage, disease, and avoiding temperature build-up in the stores were found to be the main factors that improve storability of fresh sweet potato under tropical conditions (Abewo, 2021).

Pit storage can generally be considered to be cheap for the rural communities since it requires minimum materials. The modifications of the various storage methods were because the methods that are being practiced do not completely prevent deteriorations and changes in the composition of the potatoes but only succeed in slowing down the rate of deterioration. According to Degebasa (2020) the pit storage method appeared to be the best traditional

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method because deteriorations such as sprouting, moisture loss and pathological losses were minimal compared to other storage methods. During long-term storage of sweet potato tubers, biochemical and physiological processes take place resulting in qualitative and quantitative changes (Grace *et al*., 2014 and Abidin *et al*., 2016). In order to make it available for consumption all year round, it should be stored at the right humidity and temperature. Dandago and Gungula (2011) and Mbah and Eke-Okoro (2015) reported that in temperate-climate regions, with production limited to the summer season and constant sales, sweet potato tubers can be stored throughout the entire year, provided that some conditions are met regarding temperature and ambient humidity in the storage environment. The only available storage methods for sweet potatoes are by leaving the crop in the ground and harvesting it only when needed and trench storage (Abu and Adzigiwe, 2021). Dandago and Gungula (2011) and Fufa*et al.* (2021), reported that there is also dearth of information on nutrient changes during storage of most root and tuber crops in Nigeria. Storage of sweet potatoes for a period of four months results in decrease in moisture, starch, and vitamin, while there is increase in sugar (Sachez, *et al.*, 2021). Due to these attributes of sweet potato, more improved and efficient cheap and affordable preservation methods and treatments to avoid spoilage is of paramount importance to local farmers. Given these, this study was carried out with the objectives to determine the effects of storage materials and conditions on proximate compositions of sweet potato.

MATERIALS AND METHODS

Experimental Site

The experiment was conducted in the Crop Production and Horticulture Department at Modibbo Adama University, Yola, Adamawa State. The sensory was conducted in the Food Science and Technology Department, Modibbo Adama University, Yola, Adamawa State. Yola is located at approximately Latitude 9.21° N and Longitude 12.30° E, located in the northern guinea savannah of Nigeria at an Altitude of 185.5 m above the sea level, within the Northern Guinea Savanna Zone of Nigeria (GPS Essential, 2023).

Sources of Materials

The sweet potato cultivars (Yellow flesh, Purple skin and White skin) were obtained from a farm gate in Shelleng Local Government Area of Adamawa State of Nigeria, Saw dust were bought from Yola North Local Government Area Adamawa State timber market, river sand were collected from river side in Girei Local Government Area of Adamawa state, grass were collected from the premises of the University, digital weighing balance and digital

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Comment [OK12]: This sentence is not suitable for describing the research implementation method. In the title and methodology section, the method used is sensory evaluation, not proximate analysis. Additionally, further explanation is needed regarding why sensory analysis was employed. What sensory indicators were utilized and why?

Comment [OK13]: Comma mark

Comment [OK14]: It would be beneficial to provide an explanation of the climate and microclimate of this location, perhaps including details on the range of air temperature and humidity. This information would further assist readers in understanding the research context.

Comment [OK15]: Is the font size correct?

Comment [OK16]: Not capital letter

Comment [OK17]: It would be better if more detailed information about the sawdust could be provided, such as the type of wood it comes from, whether it is a mixture or a specific type. Differences in the bioactive molecules in the wood could affect the results obtained. Similarly, the particle size of the sawdust could influence airflow and other factors.

Comment [OK18]: Extra spaces

Comment [OK19]: The same as saw dust, it would be better if more detailed information of river sand could be provided.

Comment [OK20]: The same as saw dust. Each type of grass might contain different types and compositions of bioactive molecules. Was it freshly cut or dried grass?

thermometer were purchased from Jos the Plateau State of Nigeria. Digital hygrometer was purchased from northern scientific laboratory in Jimeta.

Pit Preparation for Sweet Potato Storage

The sizes of the pits were chosen to suit local climatic conditions and are modifications of traditional pits. A pit was dug with uniform sizes of 60 x 60 x 70 cm for the whole treatment and replicated three times in which the treatments were laid out as follows in the pit: Sweet potato (Yellow Flesh) stored inpit with Saw dust under roof, Sweet potato (Purple Skin) stored in a pit with Saw dust under roof, Sweet potato (White Skin) stored in a pit with Saw dust under no roof,Sweet potato (Purple Skin) stored in apit with Saw dust under no roof, Sweet potato (Yellow Flesh) stored in a pit with river sand under no roof, Sweet potato (Purple Skin) stored in a pit with river sand under roof, Sweet potato (Yellow Fresh) stored in a pit with river sand under roof,Sweet potato (Purple Skin) stored in a pit with river sand under roof, Sweet potato (Yellow Flesh) stored in a pit with grass under on roof, Sweet potato (Purple Skin) stored in a pit with grass under no roof, Sweet potato (Yellow Flesh) stored in a pit with grass under roof,Sweet potato (Purple Skin) stored in a pit with grass under roof. The depth of covering materials of potatoes was one centimeter each in both under roof and under no roof.One (1) kilogram (kg) of river sand, 1 kg of saw dust and 2 kg of grass were used as storage materials.

Treatments and Experimental Design

The experiment was laid out in a Split- Split- Plot Design (SSPD) with storage conditions assigned to the main plot while cultivars and storage materials were allotted to subplot and sub-sub- plot respectively. Each treatment was replicated three times. The experiment consisted of three factors namely; storage materials (grass, river sand and sawdust), storage conditions (under roof and under no roof) and cultivars (yellow flesh, purple skin and white skin) which were factorially combined together to give a 3x3x 2 factorial experiment.

Sensory evaluation

Colour, taste, aroma and overall acceptability determination

Sensory evaluation was carried out on the primary product (sweet potato) with the help of 20 semi-trained panelists who were chosen from the students and staff of the Department of Food Science and Technology at Modibbo Adama University in Yola. The panelists were instructed to rank the sweet potato according to their quality attributes, which

Comment [OK21]: It is necessary to add information about the type, brand, manufacturer, and country of production for both instruments.

Comment [OK22]: Type, brand, manufacturer, and country of production

Comment [OK23]: How about explaining this section using a table so that readers can more easily understand the research design? For example, the columns could represent sweet potato cultivars and the rows could represent the materials used. Then, the intersections of the columns and rows could be divided into two categories: under roof and no roof.

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Comment [OK34]: It would be better if the standard use for semi-trained panelists is explained here.

include appearance (colour), taste aroma and the overall acceptability. This was done using a 5-point hedonic scale where 1=very poor and 5=very good. The data was subjected to Analysis of Variance and means separated by LSD (Steel and Torrie, 1980).

Data Analysis

All data collected from the experiment were subjected to analysis of variance (ANOVA) at 95% confidence level using Gestart Discovery Edition 4 software. Significant differences between means were separated using Least Significant Difference (LSD) at 5 % level of probability ($P<0.05$).

Results

The result on sensory attributes of sweet potato after experiment in 2022 and 2023 are presented in Table 1 and 2 respectively. In case of appearance (colour), there were significant differences ($P\leq0.05$) among the storage materials on colour in 2022 and 2023. In 2022, sweet potato stored in grass recorded highest colour of 3.833, followed by sweet potato stored in river sand with 2.22and the least of 1.778 was obtained from sawdust. Similar trend was also observed in 2023, sweet potato stored in grass recorded highest colour of 3.833, followed by sweet potato stored in river sand with 2.22 and the least of 1.681 was obtained from sawdust.There were also significant differences ($P\leq0.05$) among the cultivars on colour in 2022 and 2023. In 2022, purple skin recorded highest mean value of 3.056, followed by yellow flesh with 2.500 while the least of 2.278 was recorded from white skin. However in 2023, purple skin recorded highest colour of 3.00, followed by white skin with 2.92 while the least of 2.00 was recorded yellow flesh. There were also significant differences ($P\leq0.05$) among the storage conditions on colour of sweet potato in both 2022 and 2023. In 2022, under roof storage had the highest colour of 4.22 while the no under roof storage recorded the least of 1.00. Similarly, the same trend was observed in 2023, under roof storage had the highest colour of 4.00 while the no under roof storage recorded the least of 1.00.

There were significant differences ($P\leq0.05$) among the storage materials on taste in 2022 and 2023. In 2022, sweet potato stored in grass recorded highest taste of 3.833, followed by sweet potato stored in river sand with 2.333 and the least of 1.722 was obtained

Table 1: Effects of Storage Materials and Conditions on Sensory Attributes of Sweet Potatoes in 2022

Treatments	Colour	Taste	Aroma	Overall Acceptability
Storage material (A)				

Comment [OK35]: "Taste aroma" or "taste and aroma"? Were the sweet potatoes served raw or cooked? If cooked, what was the cooking method? If raw, did the panelists taste the raw sweet potato?

Comment [OK36]: I'm sure there are many more recent references on sensory evaluation. Books written by Meilgaard are one example, although there are many other more recent references available.

Comment [OK37]: Hopefully, the researchers understand that sensory evaluation data is in the form of ordinal scales, so it is less suitable for using parametric tests. However, considering that this study uses SSPD, which falls under True Experimental Design, and the data can be considered quite robust, I will defer the question to the relevant research institution from the researcher's original campus: Are the obtained data justified for using parametric tests?

Comment [OK38]: What parameters did the panelists use to assess whether they liked the appearance (color) or not? Was it hue, chroma, and value? Or another parameter? My question is, were the appearance (color) indicators sufficiently valid to address the objective of this study? Or did the panelists' assessment of appearance (color) lean more towards their preference for color rather than the degree of quality decline of the sample?

Comment [OK39]: The same questions are also posed for taste.An explanation is needed regarding the taste parameters used by the panelists, whether it's possible for an unpleasant taste to emerge as the sample's quality deteriorates, or else.

Grass	3.833	3.833	4.234	4.00
River Sand	2.22	2.333	3.222	2.389
Saw dust	1.778	1.722	2.142	1.833
P<F	0.001	0.001	0.001	0.001
LSD	0.556	0.398	0.200	0.199
Cultivars (B)				
Yellow flesh	2.500	2.611	2.922	2.722
Purple skin	3.056	2.833	3.123	3.056
White skin	2.278	2.444	2.532	2.444
P<F	0.001	0.001	0.001	0.001
LSD	0.221	0.232	0.245	0.232
Storage conditions (C)				
No under roof	1.00	1.00	4.62	4.00
Under roof	4.222	4.259	5.22	4.489
P<F	0.001	0.083	0.001	0.001
LSD	0.220	0.1906	0.200	0.174
Interaction				
A x B	*	*	NS	NS
A x C	*	*	*	*
B x C	*	*	*	*
A x B x C	*	*	*	*

Key: ** = Significant

Table 2: Effects of Storage Materials and Conditions on Sensory Attributes of Sweet Potatoes in 2023

Treatments	**Colour**	**Taste**	**Aroma**	**Overall Acceptability**
Storage material (A)				
Grass	3.833	3.833	4.00	4.00
River Sand	2.22	2.00	3.00	2.389
Saw dust	1.681	1.722	2.10	1.833
P<F	0.001	0.001	0.001	0.001
LSD	0.556	0.398	0.200	0.199
Cultivars (B)				
Yellow flesh	2.00	2.40	2.00	2.622
Purple skin	3.00	2.30	3.00	3.00
White skin	2.92	2.00	3.10	2.96
P<F	0.001	0.001	0.001	0.001
LSD	0.220	0.192	0.231	0.231
Storage conditions (C)				
No under roof	1.00	1.00	1.00	3.438
Under roof	4.00	4.00	4.22	4.387
P<F	0.001	0.001	0.001	0.001
LSD				

Interaction				
A x B	NS	*	*	*
A x C	*	*	*	*
B x C	*	*	*	*
A x B x C	*	*	*	*

Key: ** = Significant

from sawdust. Similar trend was also observed in 2023, sweet potato stored in grass recorded highest taste of 3.833, followed by sweet potato stored in river sand with 2.00 and the least of 1.722 was obtained from sawdust. There were also significant differences (P≤0.05) among the cultivars on taste in 2022 and 2023. In 2022, purple skin recorded highest mean value of 2.833, followed by yellow flesh with 2.611 while the least of 2.444 was recorded from white skin. However in 2023, yellow flesh had the highest taste of 2.40, followed by purple skin with 2.30 while the least of 2.00 was recorded white skin. There were also significant differences (P≤0.05) among the storage conditions on taste of sweet potato in both 2022 and 2023. In 2022, under roof storage had the highest taste of 4.259 while the no under roof storage recorded the least of 1.00. Similarly, the same trend was observed in 2023, under roof storage had the highest taste of 4.00 while the no under roof storage recorded the least of 1.00.

There were significant differences (P≤0.05) among the storage materials on aroma in 2022 and 2023. In 2022, sweet potato stored in grass recorded highest aroma of 4.234, followed by sweet potato stored in river sand with 3.222 and the least of 2.142 was obtained from sawdust. Similar trend was also observed in 2023, sweet potato stored in grass recorded highest aroma of 4.00, followed by sweet potato stored in river sand with 3.00 and the least of 2.10 was obtained from sawdust. There were also significant differences (P≤0.05) among the cultivars on aroma in 2022 and 2023. In 2022, purple skin recorded highest mean value of 3.123, followed by yellow flesh with 2.922 while the least of 2.532 was recorded from white skin. However in 2023, white skin had the highest aroma of 3.10, followed by purple skin with 3.00 while the least of 2.00 was recorded yellow flesh. There were also significant differences (P≤0.05) among the storage conditions on aroma of sweet potato in both 2022 and 2023. In 2022, under roof storage had the highest aroma of 5.00 while the no under roof storage recorded the least of 4.62. Similarly, the same trend was observed in 2023, under roof storage had the highest taste of 4.22 while the no under roof storage recorded the least of 1.00.

Comment [OK40]: Same questions.

There were significant differences (P≤0.05) among the storage materials on overall acceptability in 2022 and 2023. In 2022, sweet potato stored in grass recorded highest overall

acceptability of 4.00, followed by sweet potato stored in river sand with 2.389 and the least of 1.833 was obtained from sawdust. Similar trend was also observed in 2023, sweet potato stored in grass recorded highest aroma of 4.00, followed by sweet potato stored in river sand with 2.389 and the least of 1.833 was obtained from sawdust. There were also significant differences ($P \leq 0.05$) among the cultivars on overall acceptability in 2022 and 2023. In 2022, purple skin recorded highest mean value of 3.056, followed by yellow flesh with 2.722 while the least of 2.444 was recorded from white skin. However in 2023, purple skin had the highest aroma of 3.00, followed by white skin with 2.96 while the least of 2.622 was recorded yellow flesh. There were also significant differences ($P \leq 0.05$) among the storage conditions on overall acceptability of sweet potato in both 2022 and 2023. In 2022, under roof storage had the highest overall acceptability of 4.489 while the no under roof storage recorded the least of 4.00. Similarly, the same trend was observed in 2023, under roof storage had the highest taste of 4.387 while the no under roof storage recorded the least of 3.438.

Discussion

The research examined the effects of storage materials, cultivars, and storage conditions on the sensory evaluation of stored sweet potatoes. The findings shed light on how these factors influence various sensory attributes such as colour, taste, aroma, and the overall acceptability of boiled sweet potatoes. The effect of storage materials on the sensory attributes of boiled sweet potatoes was studied. Results indicated highly significant differences in colour, taste, aroma, and acceptability among sweet potatoes stored in different materials. Sweet potatoes stored in grass generally recorded higher ratings for colour, taste, aroma, and acceptability compared to those stored in river sand or sawdust. This implies that the choice of storage material significantly affects the sensory quality of stored sweet potatoes.

Comment [OK41]: So it was boiled. Please add an explanation to the sensory analysis method.

Comment [OK42]: Please state the reason

The influence of cultivars on the sensory attributes of boiled sweet potatoes was examined. Significant differences were observed in colour, taste, aroma, and acceptability among different cultivars. Purple-skinned sweet potatoes generally recorded a higher mean score across sensory attributes compared to yellow-fleshed or white-skinned sweet potatoes. This indicates the importance of cultivar selection in determining the sensory quality of boiled sweet potatoes after storage.

Comment [OK43]: Agree, but please state the reason

The effect of storage conditions on the sensory attributes of boiled sweet potatoes was examined. Sweet potatoes stored under roof conditions generally recorded higher mean scores across sensory attributes compared to those stored under no roof. This implies that proper storage conditions are essential for maintaining the sensory quality of stored sweet

potatoes. This result confirms the postulation of Jiru and Usmane (2021), who reported that during storage, both chemical composition and organoleptic characteristics changed because of storage conditions. Similarly, Sugri*et al.* (2017) narrated that storage conditions affect some organoleptic attributes; notable among them is the texture of the sweet potato tuber. The significant impact of storage materials on the sensory attributes of sweet potatoes aligns with previous studies. For instance, Njoku (2019) found that storage in sawdust resulted in better retention of colour and taste compared to other materials like sand or mud. The present study corroborates these findings, demonstrating that grass storage yielded superior sensory outcomes across colour, taste, aroma, and overall acceptance compared to river sand and sawdust.

Comment [OK44]: Please state the reason

The variation in sensory scores among cultivars underscores the importance of cultivar selection in sweet potato storage. The preference for purple-skin sweet potatoes observed in this study resonates with research conducted by Smith (2017), who reported that purple-fleshed sweet potatoes exhibited higher levels of antioxidants and flavour compounds, potentially contributing to their superior sensory appeal. However, the lower scores for white-skinned cultivars in this study contradict findings from Park (2020), who found that certain white-fleshed sweet potato cultivars exhibited desirable sensory attributes, emphasising the need for further investigation into cultivar-specific factors influencing sensory quality.

Comment [OK45]: The discussion would be more focused if there were explanations about the standard parameters used by the panelists in assessing appearance (color).

The influence of storage conditions on sensory attributes, particularly the superiority of under-roof storage, aligns with the findings of Phillip *et al.* (2021), who demonstrated that controlled environmental conditions, including temperature and humidity, contributed to better colour retention and reduced spoilage in stored sweet potatoes. While the present study did not observe significant differences in taste between storage conditions in 2023, the overall trend suggests that under roof storage provides more favourable conditions for maintaining sensory quality.

Comment [OK46]: Insignificant means insignificant. Please state the reason for this finding

The significant interactions observed between storage materials, cultivars, and storage conditions emphasise the complex interplay of these factors in determining sweet potato sensory attributes. This aligns with the findings of Wang *et al*. (2021), who highlighted the interactive effects of storage environment and cultivar genotype on sweet potato quality traits. Understanding these interactions is crucial for optimising storage practices and enhancing sweet potato quality throughout the supply chain. Therefore, the findings of this study underline the importance of considering storage materials, cultivars, and storage conditions in sweet potato storage management to preserve sensory quality. By leveraging

insights from this research and existing literature, stakeholders can implement strategies to enhance sweet potato quality and marketability.

The yellow flesh cultivar received relatively high scores across all sensory attributes compared to other cultivars stored in grass. This aligns with previous studies indicating that the yellow flesh cultivar tends to exhibit favourable sensory qualities, possibly due to its flavour profile and texture (Smith, 2017). The purple skin cultivar showed the highest scores for colour, taste, aroma, and overall acceptance among all cultivars stored in grass. This suggests that purple-skin sweet potatoes stored in grass maintain their sensory quality exceptionally well, possibly due to factors such as antioxidant content and flesh texture (Philip *et al.*, 2021). The white skin cultivar received comparatively lower scores across sensory attributes. This could indicate that white-skin sweet potatoes may be more susceptible to sensory deterioration during storage in grass compared to other cultivars, possibly due to differences in starch content or susceptibility to microbial spoilage (Park, 2020).

The yellow flesh cultivar showed moderate scores across sensory attributes, indicating a relatively average sensory profile compared to other storage materials. This contrasts with the higher scores observed for the yellow flesh cultivar stored in the grass, suggesting that storage material significantly influences sensory outcomes. Purple skin and white skin cultivars exhibited variable sensory scores, with some attributes scoring higher than others. This variability underscores the importance of considering both cultivar and storage material interactions in determining sensory quality.

All cultivars received lower scores across sensory attributes compared to other storage materials. Sawdust storage appears to have a detrimental effect on sensory quality, as evidenced by the consistently lower scores across all cultivars and sensory attributes. This aligns with findings by Njoku (2019), who reported that sawdust storage resulted in inferior sensory attributes compared to other materials. The p-values indicate that the interaction between storage materials and cultivars significantly affects sensory attributes, highlighting the importance of considering both factors in sweet potato storage management. In the final analysis, the interaction between storage materials and cultivars significantly influences the sensory quality of stored sweet potatoes. Grass storage, particularly for purple skin cultivars, appears to preserve sensory quality effectively, while sawdust storage leads to inferior sensory outcomes across all cultivars. These findings underscore the importance of selecting appropriate storage materials to maintain sweet potato sensory quality.

Comment [OK47]: Your data in tables 1 and 2 indicate the opposite.

Comment [OK48]: Or the types and composition of the bioactive components of the grass used in this study

Comment [OK49]: Please relate the discussion to the standard parameters used by the panelists during the sensory evaluation.

Comment [OK50]: Please recheck this sentence, it doesn't make sense.

Comment [OK51]: Please state the reason

The table presents the interaction between storage materials and storage conditions on sensory evaluation during the 2022 season. Results indicated that 'No Roof' received the lowest scores across all sensory attributes. This suggests that storing sweet potatoes in grass without a roof exposes them to unfavourable environmental conditions, leading to sensory deterioration. Lack of protection from elements like sunlight, moisture, and pests may contribute to this decline in sensory quality (Philip *et al.*, 2021). The under-roof condition showed significantly higher scores for all sensory attributes compared to the no-roof condition. This indicates that providing a roof over grass storage improves sensory quality, likely by protecting it from adverse environmental factors. This finding aligns with previous research highlighting the importance of controlled storage environments in preserving the sensory attributes of stored produce (Philip *et al.*, 2021).

No Roof and Under Roof Conditions yielded similar sensory scores, indicating that the storage condition did not significantly impact sensory quality in river sand storage. This suggests that river sand may provide some inherent protection against environmental factors, irrespective of whether a roof is present or not. However, the sensory scores remained relatively low, suggesting that river sand storage may not be optimal for preserving sweet potato quality compared to other materials. Similar to river sand storage, sawdust storage did not exhibit significant differences in sensory scores between no roof and under roof conditions. However, the overall sensory scores were slightly higher compared to river sand storage, indicating that sawdust may offer better protection against environmental factors. Nonetheless, the scores are still relatively low, suggesting that sawdust storage alone may not be sufficient to maintain optimal sensory quality.

The low p-values (<0.001) indicate that the interaction between storage materials and storage conditions significantly affects sensory attributes, emphasising the importance of considering both factors in sweet potato storage management. The interaction between storage materials and storage conditions plays a crucial role in determining the sensory quality of stored sweet potatoes. Grass storage with a roof provided the best sensory quality, highlighting the importance of controlled storage environments in preserving sensory attributes. River sand and sawdust storage exhibited lower sensory scores, suggesting that additional measures may be necessary to optimise sensory quality in these storage conditions.

Conclusion

The study revealed, the comprehensive investigation into the effects of storage materials, cultivars, and storage conditions on sensory attributes during the 2022–2023 dry seasons provides valuable insights for optimising storage practices. The findings underscore

Comment [OK52]: Good explanation. However, please remember that the materials used (sawdust, grass, and river sand) can block sunlight even in no-roof conditions. What are the main environmental factors that might influence the research conducted? Is it the differences in temperature, humidity, or other factors?

Comment [OK53]: Please note that this data is only for storage using grass material.

Comment [OK54]: For river sand material

Comment [OK55]: Please state the reason. Could this be related to the type and composition of bioactive compounds in the sawdust? Please compares it with the data from grass material.

the significant influence of storage materials on sensory attributes. Specifically, grass storage emerges as a favourable option for better sensory attributes compared to other materials like river sand or sawdust. Moreover, the study highlights the importance of cultivar selection, purpule skin sweet potatoes consistently displaying superior attributes across different storage setups.Furthermore, the differences seen between storage materials, cultivars, and storage conditions show how important it is to have comprehensive storage protocols that consider these different factors to get the best storage results and reduce postharvest losses. By leveraging the insights from this study, stakeholders can develop targeted storage management strategies tailored to specific storage environments and crop characteristics, ultimately enhancing the quality and marketability of stored sweet potatoes throughout the supply chain.

Comment [OK56]: This is the third sentence in a row that starts with a conjunction. It doesn't read well.

References

Comment [OK57]: It is recommended to use referencing software such as Mendeley and Zotero to ensure correct citation formatting.

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