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Comparative Analysis and Acceptability of Porridge Prepared with Varieties of Tubers (White Yam, Cocoyam, Sweet Potato, Bitter Yam, and Water Yam)

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Abstract

This study assessed the comparative analysis and acceptability of porridge prepared with varieties of tubers of yam, sweet potato, cocoyam, water yam and bitter yam. The objective is to assess the comparative and acceptability of porridge made from varieties of tubers. The data for this study was collected using sensory sheet and the data were analyzed using descriptive statistics and inferential tools, including one-way ANOVA (CRD) with SPSS 20. In the sensory analysis, all values showed no significant differences across parameters (P> 0.05). Porridge produced with sample (A) recorded high value in general acceptability (8.08±1.214), appearance (7.98±0.948), and texture (7.92±1.183) followed by sample E (bitter yam) with the mean of (7.98±1.378) in overall acceptability compared to other samples in this research. In conclusion this study indicates that sample of porridge produced from sample A had the highest value in overall acceptability, appearance and texture to sample B,C,D,E respectively, thereby increasing the chance of using sample A (yam) in porridge production for human consumption having possessing high sensory attributes. It is therefore concluded that the use of yam for porridge should be encouraged for better quality dishes as it possesses high attributes in terms of nutritional value and it should be encouraged for sale in any food service operation. Therefore, it is recommended that farmers should increase the production of yam making it more available for more production and for the consumption of the masses. There should be provision of processing equipment to farmers in order to aid more production and availability of tubers for consumption to the public.

Keywords: Acceptability, comparative, porridge, preparation, sensory, tubers, varieties

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Introduction

Porridge is a traditional home-cooked dish, well-liked in eastern and southern Nigeria. In the western region, Asaro is a popular version (Osinkolu, 2022). Pottage is a very easy-to-cook, low-cost, and nutritious cuisine that contains carbohydrates, which when broken down, produce energy needed for most Nigerians' daily activities (Osinkolu, 2022). Any desired type of tuber, such as white yam, cocoyam, sweet potato, bitter yam, or water yam can be used to prepare it. Roots and tubers, including cocoa yam (Colocasia esculenta), water yam (Dioscorea alata), sweet potatoes (Ipomoea batatas), white yam (Dioscorea rotundata), and bitter yam (Dioscorea dumetorum), are essential household foods and tuber crops in many developing nations. They all contain substantial quantity of fibre and starch (Owusu-Darko et al., 2014).

The ideal comfort food is this Nigerian Yam Porridge. It is made with yam and a few other readily available ingredients, which makes it incredibly flavorful, rich in nutritious nutrients and leaving you wanting more. A comfortable taste and solidity are achieved by fortifying yam pottage with vegetables, salad, or meat (sweet point of view, 2020).

Cocoyam belongs to the Araceae family (Rao, et al, .2010). It is a plant grown in the tropics and subtropical regions (Onyeka, 2014). It is grown

mainly for its edible roots although all parts of the plants is important (Rao, et al., 2010). It is more rich in protein, minerals and vitamins when compared to other tuber crops (Yam and Cassava). Cocoyam pottage is called Asaro koko in Yoruba, ede in Igbo and dankalin turawa in Hausa. It is smaller in size when compared to Yam and it has a stronger flavour which requires more spice.

Bitter Yam (Dioscorea dumetorum) is a tuber crop gown in West Africa especially in Nigeria and Cameroon (Medoua et al., 2005. It is an important food crop in Nigeria and Africa as a whole (Fasidi & Bakare, 2005).

Water Yam (Dioscorea alata) is an important stable tuber crop, it is white in colour and has a loose (watery) texture (Karuna et al 1996). When compared to other species of yam it has more water content.

Sweet potatoe (Ipomea batatas), belongs to the Convolvulaceae family. It is a starchy tuber with sweet taste (Purseglove, 2002). The young shoots and leaves are eaten as vegetables. It is a staple food in different parts of the world; they are rich in fibre, potassium, vitamins and some other important nutrients.

Pottage is a common food eaten by different tribes in Nigeria, although it is common amidst the Yoruba speaking part of Nigeria (9jafoodie.com). Pottage is being preferred for its taste, aroma, colour and its health benefits. The food industry has been saddled with the responsibility of developing foods that are of nutritional benefit and acceptable for day to day consumption (Omotayo & Denloye, 2002). The main objective of this study is to carry out the sensory analysis of pottage prepared with varieties of tubers: yam, cocoyam, sweet potato, bitter yam, water yam and to check its acceptability by the consumers.

Materials and Method

Participants in the descriptive research were from The Federal Polytechnic in Ilaro, Ogun State. The study was carried out in The Federal Polytechnic demonstration kitchen. Selected employees from The Federal Polytechnic in Ilaro, Ogun State and staff who works in the hospitality demonstration kitchen participated in the qualitative research.

A total of 50 respondents/panellists were used in this study, and the data for the primary source was collected using a sensory assessment sheet with a nine-point hedonic scale. Analysis of variance (ANOVA) was then used to determine significant difference between the samples.

Recipes

Pottage (Yam)

i. 2kg sweet potatoes
ii. 1 cup of water
iii. 166ml palm oil
iv. 2 cube seasoning
v. Salt to taste
vi. 2tbsp blended mixed pepper
vii. 2 bulb of Onions
viii. 2 round smoked Fish
ix. 2tbsp Crayfish
x. 20g Green vegetables (optional)

Method of Preparation Yam Porridge

The yam was peeled cut and rinsed; the yam was rinsed well enough until the water is clear. The yam was then cut into medium-sized chunks about 2 inches thick. Afterwards the yam was put in a cookware then placed on fire to cook. Blended mixture of red pepper, bell pepper, tomato, and onions was added to the yam on fire, also salt was added to taste, seasoning and required amount of water was added, and it was covered and allowed to cook for 10 minutes on medium to high heat preferably. Little amount of palm oil was added together with sliced onions, smoked fish and crayfish and was allowed to cook on low heat to avoid burning. The mixture was mashed with a spatula to get a well-mixed and sticky texture. Lastly green vegetables were added and were allowed to simmer for 1 minute. The yam porridge was dished and served in a dishware.

Recipes

Porridge (Sweet Potatoes)

i. 2kg sweet potatoes
ii. 1 cup of water

iii. 166ml palm oil
iv. 2 cube seasoning
v. Salt to taste
vi. 2tbsp blended mixed pepper
vii. 2 bulb of Onions
viii. 2 round smoked Fish
ix. 2tbsp Crayfish
x. 20gGreen vegetables (optional)

Method Of Preparation Sweet Potato Porridge

The yam was then cut into medium-sized chunks about 2 inches thick. Afterwards the yam was put in a cookware then placed on fire to cook. Blended mixture of red pepper, bell pepper, tomato, and onions was added to the yam on fire, also salt was added to taste, seasoning and required amount of water was added, and it was covered and allowed to cook for 10 minutes on medium to high heat preferably. Little amount of palm oil was added together with sliced onions, smoked fish and crayfish and was allowed to cook on low heat to avoid burning. The mixture was mashed with a spatula to get a well-mixed and sticky texture. Lastly green vegetables were added and were allowed to simmer for 1 minute. The yam pottage was dished and served in a dishware.

The sweet potato porridge was dished and served in a dishware.

Recipe

Pottage (Cocoyam)

i. 2kg cocoyam
ii. 1 cup of water
iii. 166ml palm oil
iv. 2 cube seasoning
v. Salt to taste
vi. 2tbsp blended mixed pepper
vii. 2 bulb of Onions
viii. 2 round smoked Fish
ix. 2tbsp Crayfish
x. 20g Green vegetables (optional)

Method Of Preparation Cocoyam Porridge

The cocoyam was peeled cut and rinsed, the cocoyam was rinsed well enough until the water is clear. The cocoyam was then cut into medium-sized chunks about 2 inches thick. Afterwards the cocoyam was then put in a cookware, placed on fire. Blended mixture of red pepper, bell pepper, tomato, and onions was added to the cocoyam on fire also salt, seasoning and required amount of water was added, and it was covered and allowed to cook for 10 minutes on medium to high heat preferably. Little amount of palm oil was added together with sliced onions, smoked fish and crayfish and was allowed to cook on low heat to avoid burning. The mixture was mashed with a spatula to get a well-mixed and sticky texture. Lastly a green vegetable was added and was allowed to simmer for 1minute. The cocoyam porridge was dished and served in a dishware.

Recipe

Porridge (Bitter Yam)

i. 2kg bitter yam
ii. 1 cup of water
iii. 166ml palm oil
iv. 2 cube seasoning
v. Salt to taste
vi. 2tbsp blended mixed pepper
vii. 2 bulb of Onions
viii. 2 round smoked Fish
ix. 2tbsp Crayfish
x. 20g Green vegetables (optional)

Method of Preparation Bitter yam Porridge

The bitter yam was peeled, cut, and rinsed. The bitter yam was rinsed well enough until the water is clear. The bitter yam was cut into medium-sized chunks about 2 inches thick. Afterwards the bitter yam was put in a cookware then placed on fire. Blended mixture of red pepper, bell pepper, tomato, and onions was added to the bitter yam on fire also salt, seasoning and required amount of water was added, and it was covered and allowed to cook for 10 minutes on medium to high heat preferably. Little amount of palm oil was added together with sliced onions, smoked fish and crayfish and was allowed to cook on low heat to avoid burning. The mixture was mashed with a spatula to get a well-mixed and sticky texture. Lastly the green vegetables was added and was allowed to simmer

for 1minute. The bitter yam porridge was dished and served in a dishware.

Recipe

Porridge (Water Yam)

i. 2kg water yam
ii. 1 cup of water
iii. 166ml palm oil
iv. 2 cube seasoning
v. Salt to taste
vi. 2tbsp blended mixed pepper
vii. 2 bulb of Onions
viii. 2 round smoked Fish
ix. 2tbsp Crayfish
x. 20g Green vegetables (optional).

Method of Preparation Water Yam Porridge

The water yam was peeled, cut and rinsed. The water yam was rinsed well enough until the water is clear. The water yam was cut into medium-sized chunks about 2 inches thick. Afterwards the water yam was put in a cookware then placed on fire. Blended mixture of red pepper, bell pepper, tomato, and onions was added to the water yam on fire also salt, seasoning and required amount of water was added, and then it was covered and allowed to cook for 10 minutes on medium to high heat preferably. Little amount of palm oil was added together with sliced onions, smoked fish and crayfish and was allowed to cook on low heat to avoid burning. The mixture was mashed with a spatula to get a well-mixed and sticky texture. Lastly green vegetables were added and were allowed to simmer for 1minute. The water yam porridge was dished and served in a dishware.

Results

Sensory Evaluation

Note: The test between treatment effects as shown from the Anova table indicated no significance difference in the mean response of all the identified sample types in terms of their measured characteristics of Appearance, Texture, Taste, Aroma and General acceptability at 5% level of significance.

Table 1: Descriptive Statistics of Sensory Evaluation Results

Samples Treatment	A	B	C	D	E	Grand Mean
Appearance	7.98±0.948	7.9±1.005	7.44±1.373	7.54±1.220	7.8±1.114	7.732±1.161
Texture	7.92±1.183	7.74±1.534	7.64±1.453	7.7±1.404	7.9±1.389	7.780±1.441
Taste	7.86±1.183	8.04±1.076	8.18±0.910	8.16±1.027	8.26±1.036	8.100±1.059
Flavor	7.96±1.296	7.64±1.213	7.76±1.193	7.84±1.189	8.04±1.183	7.848±1.223
General acceptability	8.08±1.214	7.9±1.330	7.92±1.074	7.98±1.225	7.98±1.378	7.972±1.250

Source: Extracted from XLStat Output, version 5.03

REPRESENTATION OF SAMPLE VARIETIES**:** SAMPLE A: Yam Pottage, SAMPLE B: Sweet potato pottage, SAMPLE C: Cocoyam pottage, SAMPLE D: Water yam pottage, SAMPLE E: Bitter yam pottage

Table 2: Sensory attribute of yam pottage prepared with selected varieties of yam tubers *(Dioscorea spp)*

Treatment A	Appearance	Texture	Taste	Flavour	General acceptability
Mean	7.98±0.948	7.92±1.183	7.86±1.183	7.96±1.296	8.08±1.214

Source: Extracted from XLStat Output, version 5.03

The result of the analysis of variance (ANOVA) showed that there was no significant different across all treatment estimated for all the parameters considered in this study (< 0.05).

Appearance

All values were numerically different (P > 0.05) across all treatment. The mean value of (7.98±0.948) was obtained for appearance.

Texture

All values were numerically different (P > 0.05) across all treatment. In this study mean score of (7.92±1.183) was obtained for texture.

Taste

All values were numerically different (P > 0.05) across all treatment. From this result, mean value of (7.86±1.183) was obtained.

Flavour

All values were numerically different (P > 0.05) across all treatment. Mean value of (7.96±1.296) was obtained.

General acceptability

All values were numerically different (P > 0.05) across all treatment. General acceptability has the highest value of (8.08±1.214) in Table 3.

Table 3: Sensory attribute of sweet potato pottage prepared with selected varieties of sweet potato tubers (Ipomoea batatas).

Treatment B	Appearance	Texture	Taste	Flavour	General acceptability
Mean	7.9±1.005	7.74±1.534	8.04±1.076	7.64±1.213	7.9±1.330

Source: Extracted from XLStat Output, version 5.03

The result of the analysis of variance (ANOVA) conducted showed that there was no significant different across all treatment estimated for all the parameters considered in this study (i.e, P < 0.05).

Appearance

All values were numerically different (P > 0.05) across all treatment. The value of (7.9±1.005) was obtained for appearance.

Texture

All values were numerically different (P > 0.05) across all treatment. In this study, the value of (7.74±1.534) was obtained.

Taste

All values were numerically different (P > 0.05) across all treatment. From this result, the highest value of (8.04±1.076) was obtained in this table.

Flavour

All values were numerically different (P > 0.05) across all treatment. The value of (7.64±1.213) was obtained for flavour.

General acceptability

All values were numerically different (P > 0.05) across all treatment. The value of (7.9±1.330) was obtained for general acceptability.

Table 4: Sensory attribute of cocoyam pottage prepared with selected varieties of cocoyam tubers (Xanthosoma spp)

Treatment C	Appearance	Texture	Taste	Flavour	General acceptability
Mean	7.44±1.373	7.64±1.453	8.18±0.910	7.76±1.913	7.92±1.074

Source: Extracted from XLStat Output, version 5.03

The result of the analysis of variance (ANOVA) conducted showed that there was significant different across all treatment estimated for all the parameters considered in this study (i.e, P < 0.05).

Appearance

All values were numerically different (P > 0.05) across all treatment. The value of (7.44±1.373) was recorded for apppearance.

Texture

All values were numerically different (P > 0.05) across all treatment. In this study, the value of (7.64±1.453) was recorded for texture.

Taste

All values were numerically different (P > 0.05) across all treatment. From this result, the value of (8.18±0.910) was recorded for taste.

Flavour

All values were numerically different (P > 0.05) across all treatment. The value of (7.76±1.913) was recorded for Flavour.

General acceptability

All values were numerically different (P > 0.05) across all treatment. Value of (7.92±1.074)

was recorded for general acceptability.

Table 5: Sensory attribute of water yam pottage prepared with selected varieties of water yam tubers (Dioscorea alata)

Treatment D	Appearance	Texture	Taste	Flavour	General acceptability
Mean	7.54±1.220	7.7±1.404	8.16±1.027	7.84±1.189	7.98±1.225

Source: Extracted from XLStat Output, version 5.03

The result of the analysis of variance (ANOVA) conducted showed that there was no significant different across all treatment estimated for all the parameters considered in this study (i.e, P < 0.05).

Appearance

All values were numerically different across all treatment. The value of (7.54±1.220) was recorded for appearance.

Texture

All values were numerically different across all treatment. In this study, texture recorded the value of (7.7±1.404).

Taste

All values were numerically different across all treatment. From this result, taste recorded the highest value of (8.16±1.027) in this table.

Flavour

All values were numerically different across all treatment. Flavour recorded the value of (7.84±1.189).

General acceptability

All values were numerically different across all treatment. General acceptability recorded the value of (7.98±1.225).

Table 6: Sensory attribute of bitter yam pottage prepared with selected varieties of bitter yam tubers (Dioscorea alata).

Treatment E	Appearance	Texture	Taste	Flavour	General acceptability
Mean	7.8±1.114	7.9±1.389	8.26±1.036	8.04±1.183	7.98±1.378

Source: Extracted from XLStat Output, version 5.03

The result of the analysis of variance (ANOVA) conducted showed that there was no significant different across all treatment estimated for all the parameters considered in this study (i.e, $P < 0.05$).

Appearance

All values were numerically different across all treatment. The value of (7.8±1.114) was recorded for appearance.

Texture

All values were numerically different across all treatment. In this study texture recorded the value of (7.9±1.389).

Taste

All values were numerically different across all treatment. From this result, taste recorded the highest value in this table (8.26±1.036)

Flavour

All values were numerically different across all treatment. Flavour recorded the value of (8.04±1.183).

General acceptability

All values were numerically different across all treatment. General acceptability recorded the value of (7.98±1.378).

Hence, it can generally be said that all the pottage samples were generally acceptable as the means were found to be within the limiting evaluation of "very much likened", although Yam pottage has the highest value of overall acceptability.

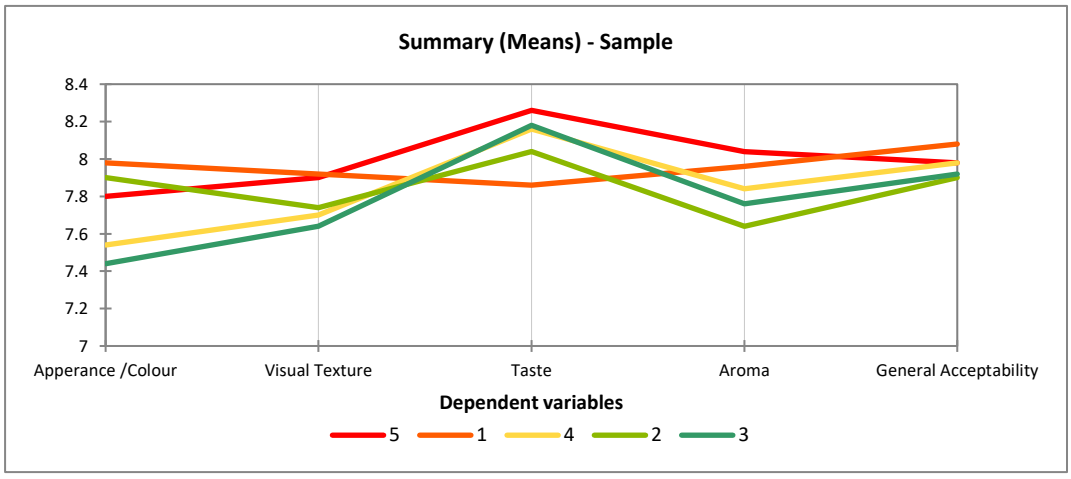

Figure. 1: Mean plot of the five (5) samples based on their measurement characteristics

The mean plot of the samples can be depicted in figure. 1 showing those samples that are best rated in terms of colour, visual texture, taste, aroma and general acceptability. However, findings revealed from the plot that the samples tastes were rated higher than the color, texture, aroma and overall acceptability. This was considered irrespectively of the sample under investigation.

Table 7: Analysis of variance (ANOVA) result of the samples

	Appearance /Color	Visual Texture	Taste	Aroma	General Acceptability
R^2	0.032	0.006	0.017	0.013	0.003
F	2.032	0.366	1.075	0.833	0.155

Pr> F	0.090	0.833	0.369	0.505	0.961

Source: Extracted from XLStat Output, version 5.03

Result of the anova test as shown in table 4 implies from the respective R^2 that about 3.2% variation in the color can be explained by the samples pottage under investigation; as visual texture, taste, aroma and general acceptability was found to determine the sampled pottage by 0.6%, 0.017% and 0.013% respectively. The F-test statistic with associated p-value of 0.090, 0.833, 0.369, 0.505 and 0.961 (greater than 0.05level of significance) for colour, visual texture, taste, aroma and general acceptability implies that there is no significant difference in the five samples of the pottage specie taking their characteristics into consideration. Hence, since the samples indicated no significance difference, post-hoc test of comparison is of no necessity.

Discussion

This study assessed the comparative analysis and acceptability of pottage prepared with varieties of tubers of yam, sweet potato, cocoyam, water yam and bitter yam and also researched on the best method of preparation of the pottage was done in order to compare the sensory properties using in terms of appearance, visual texture, taste, aroma and general acceptability. Based on appearance, findings indicated that all the pottage prepared were scored higher during the sensory evaluation process as their mean response score and standard deviations was with minimum of 7.44±1.373, higher than the threshold of 6.0, implying that they were "very much" likened. In terms of the visual texture, the yam pottage was found to be rated highest as all the mean response with associated standard deviations were also higher as they were found to be above the threshold of 6.0. However, bitter yam pottage gave the highest taste as shown from the mean response 8.26 followed by cocoyam, water yam, sweet potato and yam pottage. In addition, bitter yam pottage was found to be most acceptable in terms of aroma with mean response of 8.04 followed by water yam pottage amongst others. Hence, findings showed that generally, yam pottage was found to be most acceptable as evidenced from the highest mean response score of 8.08, in terms of appearance, texture and general acceptability, these findings corroborate with findings of Tortoe *et al.*, 2014 that porridge with fairly balanced proportion of cowpea and soybean and greater amount of yam flour (60-70%) had the highest overall acceptability. The test between characteristics effect as shown from the Anova table indicated no significance difference in the mean response of all the identified sample types in terms of their measured characteristics of appearance/color, visual texture, taste, aroma and general acceptability).

Conclusion and Recommendation:

Therefore, based on the results obtained by the empirical analysis of the data collected, the following conclusions are therefore arrived at that samples B-C (sweet potato pottage, cocoyam pottage, water yam pottage and bitter yam pottage) are generally acceptable in appearance, visual texture, taste, and aroma. Sample A (Yam pottage) was found to be the most generally acceptable among the recipe; The use of yam for pottage should be encourage for dishes better quality as it possess high attribute in terms of nutritional value such as vitamins C, phosphorus, manganese, vitamin B-complex, potassium, vitamin A, calcium, copper, iron and protein. Therefore, it should be encouraged for sale in any food service operation.

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