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Nutritional Composition and Acceptability of Three Varieties of Processed Cow Skin

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Abstract

Three varieties of processed cow skin were prepared and cooked evenly. The sensory qualities of the samples were determined. The data collected were subjected to descriptive and inferential statistics. Results showed there is a significant difference in the taste, flavour, appearance, texture, colour and overall acceptability of the samples. Proximate composition revealed that there are variations in the moisture contents of the cow skin samples. The brown cowhide has the highest moisture content while dried cowhide has the lowest, this may be due to the processing method. The brown cowhide has the lowest mineral ash and crude protein contents while dried cowhide had the highest fat content, highest protein value, highest carbohydrate content and the only sample with crude fibre content. The study concludes that the varieties of cow skin were generally accepted, and the dried cow skin has a great taste. Hence, dried cow skin should be used by food practitioners in cooking dishes apart from smoked cow skin and white cow skin.

Keywords: *Culinary tourism, Food technology, Gastronomy, Meat products, Processed cow skin*

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Introduction

Cow skin, popularly called *ponmo* in Yoruba and *kanda* in Igbo is a local food product enjoyed by many Nigerians. Cow skin is eaten in other West African countries such as Ghana where it is called *welle* (Obiri-Danso, Horgah and Antwi-Agyie, 2008). Cow skin is equally consumed in the Caribbeans where it is added to stews and soups and, well-loved byWest Indians in particular (Funke,2015). It is suitable for preparing Nigerian soups, such as *egusi*, vegetables, *gbegiri*, bitter leaf soups and many more (Adaku,2019)**.** It is an important foodstuff for restaurateurs in the country, as*ponmo* lovers hardly take any food without a lump. Due to health-related problems associated with eating red meat cow skin has become a substitute for red meat in many homes (Adaku, 2019). Hence, Nigerians are simply at home with ponmo consumption.

Cow skin is a commonly consumed food worldwide. Preferences for a type of cow skin, method of dehairing slaughtered animals, and processing dehaired cow skin for consumption differ from country to country and from culture to culture (Durojaiye, 2020). In Nigeria and many other parts of Africa, the habit of eating dehaired cow skin is common. Cow skin is a meat product obtained from the tenderization of the hide of beef or cattle in hot water followed by scraping with a sharp object like a razor blade (Murdock, 2009). Processing of cow skin for human consumption involves different stages such as drying, singeing, scraping, boiling and washing (FAO,1995). Cow skin is tough to eat and requires an arduous process of cooking to tenderize it for human consumption (Oconell, 2016).

Cow skin is an essential delicacy to Africans, and most especially, Nigerians, as it is consumed by all tribes and regions. It features regularly, along with other types of meats, in classic traditional dishes

(Adaku, 2019). Cow skin is very popular though it was regarded as a frugal alternative to meat (Funke,2015). Consumption of cow skin in Nigeria is found across different societal classes and levels depending on financial strength and interest (Udoh, Inyang, &Akpan, 2018). Most Nigerians love to eat cow skin as much, believing that a daily meal without cow skin is incomplete (Funke, 2015).

Author's visit to Lagos State Lairage, Oko Oba, Agege in a verbal interview with the lairage guide, revealed that: There are three (3) types of processed cow skin which are white cow skin, brown cow skin also called ponmo Ijebu and the dried cow skin.

The white cow skin: The cow skin is first plunged into hot water to ease the removal of the hair by shaving off with a sharp blade. After dehairing, the cow skin is further cooked until it becomes tender. After boiling, the skin is soaked in water for several hours which triggers a short stage of fermentation, which also contribute to tenderizing the cow skin. This process produces the white type of cow skin.

The brown cow skin (Ponmo Ijebu): This is traditionally processed in Ijebu Igbo, Ogun State, Southwest Nigeria. The cow skin (hide) is brought from the Northern part of Nigeria, usually in a plump state. The cow skin is subjected to a high level of heat in an open fire to burn out the hide (fur). The cow skin is singed to brown with the use of firewood, this help to soften the cow skin for easy scraping and removal of loose hair from the cowhide. In the process, the cowhide burns until it shrinks to the smallest form and is blackened. After this process, the skin is then washed several times and then placed in a cauldron containing boiling water to boil for hours and cook until it swells back. It is then subjected to final softening by soaking in water until tender enough for cooking and appears appealing to consumers.

The dried cow skin: singeing the cow skin is singed with firewood, this helps to soften the cow skin for easy dehairing. The cow skin is portioned into thin slices to create elongated stripes, which are twisted to create curls. The twisted cowhide is placed in a cauldron containing hot water while stirred to a boil. Afterwards, pat dry, then baked in the oven until pieces are curled and dried. It was also gathered that the pieces may also be fried in oil and then sun-dried.

Many caterers and other food production practitioners use these three varieties of processed cow skin in cooking different delicacies, but no prior research has been carried out on these varieties. This research study intends to examine the sensory properties and overall acceptability and evaluate the nutritional composition of these varieties of processed cow skin.

Materials and Methods

Materials

Ingredients used include water, cow skin (white ponmo, Ijebuponmo or brown ponmo and dried ponmo) Scotch bonnet pepper, chili pepper, onions, vegetable oil, and seasoning and salt these ingredients were sourced from Ilaro abattoir and Sayedero market, Ilaro Ogun State.

Three (3) different samples of cow skin were prepared as Peppered Ponmo. The varieties were produced using dried cow skin, brown cow skin and white cow skin. The recipes used for the preparation are presented in Table 1.

Table 1: Recipes of the three varieties of cow skin

Ingredients	Dried cow skin	Brown cow skin	White cow skin
Cow skin	1000g	1000g	1000g
Scotch bonnet			
Pepper (chopped)	100g	100g	100g
Red bell pepper (diced)	100g	100g	100g
Red tomatoes (diced)			
Onions (sliced)	100g	100g	100g
Ginger (grated)	200g	200g	200g
Garlic (grated)	1tbs	1tbs	1tsp
Vegetable oil	1tsp	1tsp	1tsp
Water	½ L	½ L	½ L
Curry powder	2L	2L	1L
Bouillon seasoning	½ tsp	½ tsp	½ tsp
Salt			
Thyme	2tbs	2tbs	2tbs
Spring onion (sliced)	2tbs	2tbs	2tbs
Preparation time	1tsp	1tsp	1tsp
Cooking time			
Total time	50g	50g	50g
	15 Min	15 Min	10Min
	29 Min	3Hr, 14 Min	44Min
	49Min	3Hr, 29Min	54Min

*g ; grams, *tsp ; tea spoon, *tbs ; table spoon,*ml ; millimetre, *L ;litre, *Min ;minuites, *Hr ;hours

Study Design

Proximate Analysis

The nutrient compositions of the processed hides were determined according to the Association of Official Analytical Chemists (A.O.A.C., 1990).

Sensory Evaluation

Forty (40) panellists making up the staff of the Federal Polytechnic Ilaro were randomly selected and trained for the sensory exercise. The samples of cow skin were coded and displayed for the panellists to taste.

Data Collection

Based on sensory methods and analysis (Iwe, **(**2002), the taste panellist was asked to assess the cow skin for the attributes of; appearance, taste, texture, flavour, crispiness, and overall acceptability on a nine-point hedonic scale. Thus 9 -1 descending order: like extremely 9, like very much 8, like moderately 7, like slightly 6, neither like nor dislike 5, dislike slightly 4, dislike moderately 3, dislike very much 2 and dislike extremely 1. The mouth was rinsed with water after tasting each sample.

Table 2 Distributions of coded varieties of cow skin

Sample A	Sample B	Sample C
Dried Cow skin	**Brown Cow skin**	**White Cow skin**

Data Analysis and Statistical Tools

Results of this study were analyzed in the Factorial Analysis of Variance with two independent variables (cow skin samples and sensory attributes) which was run using the statistical package for social sciences (SPSS Version 22).

Results and Discussion

Results

The result of the proximate composition of processed cowskin as revealed in Table 3 shows, that there were variations in the moisture contents of the cow skin samples. The brown cow skin had the highest moisture content value of (65.69) while dried cow skin had the lowest value of (57.55); Brown cow skin had the lowest mineral ash value (1.78) and crude protein contents value (20.85) while, dried cow skin had the highest fat content (9.11), highest protein value (23.15), highest carbohydrate content (6.37) and it is the only sample with crude fibre content (2.06).

Table 3: Proximate analysis

Sample	Moisture Content	Dry Matter content	Fat Content	Ash Content	Crude Fibre Content	Crude Protein Content	Carbohydrate Content
A	57.55	42.45	9.11	2.06	2.06	23.15	6.37
B	65.69	32.31	8.81	1.78	0.00	20.85	0.77
C	59.50	40.50	8.92	1.96	0.00	21,46	3.31

g/100g sample

Table 4: Descriptive analysis of respondents' score

Sensory attributes	Sample code	Average response				Variance
		Mean	Maximum	Minimum	Range	
Taste	A	8.51	9	7	2	0.36
	B	8.13	9	6	3	0.62
	C	8.15	9	6	3	0.73
Flavour	A	8.41	9	6	3	0.62
	B	7.90	9	7	2	0.30
	C	8.13	9	5	4	0.80
Appearance	A	8.44	9	4	5	0.99
	B	8.18	9	5	4	0.78
	C	8.28	9	5	4	1.03
Texture/ Crispiness	A	8.51	9	6	3	0.51
	B	8.15	9	6	3	0.71
	C	8.31	9	6	3	0.69
Overall Acceptability	A	8.62	9	6	3	0.73
	B	8.41	9	6	3	0.53
	C	8.46	9	7	2	0.31

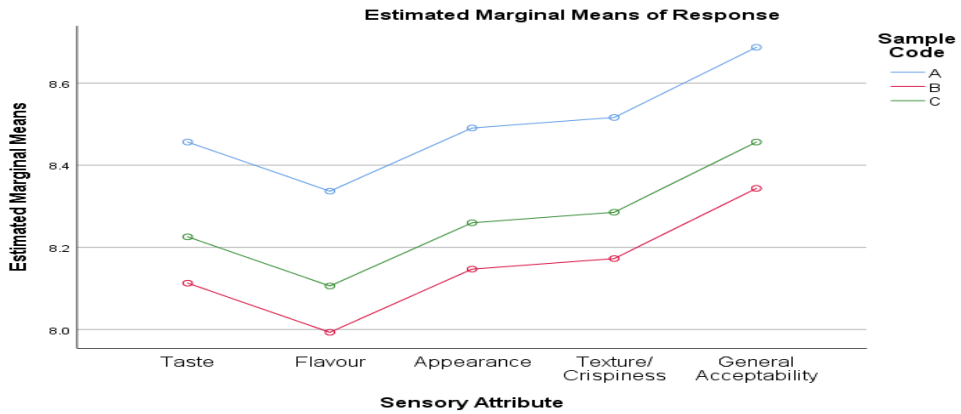

Figure 4: Estimated Marginal Means of the response of samples.

Discussion

Dried cow skin (Dried Ponmo); had the highest fat content, highest protein value, and highest carbohydrate content and it is the only sample with crude fibre content. According to Akwetey, Eremong & Donkoh (2013), cow skin contains protein, fat, as well a reasonable level of minerals depending on the method of processing. The taste has the highest value of average taste, the flavour has the highest value of average flavour, the appearance has the highest value of average appearance; the texture and crispiness have the highest value of average texture and crispiness. In general acceptability, it is the sample with the highest value of average acceptability. The reason for this may not be farfetched due to the method of processing the cow skin; sundried, baked or fried products are usually very tasty.

Brown cow skin (PonmoIjebu); had the highest moisture content, the lowest mineral ash and crude protein contents. The taste has the lowest value of average taste, the flavour has the lowest value of average flavour, and the appearance has the lowest value of average appearance. Thus, texture and crispiness have the lowest value of average texture and crispiness. In the overall acceptability, this sample has the mean value and the lowest value of average acceptability. This may be due to the processing procedure the cow skin was subjected to.

Based on white cow skin; had the average values of moisture content, mineral ash, carbohydrate, protein and fat contents The taste has the average mean value, the flavour has an average mean value, the appearance has the average mean value; the texture and crispiness have the mean value, the general acceptability has the mean value. This could be because the cow skin was prepared in its natural state with no prior processing.

From figure 4: the top line represents dried cow skin; the middle line represents white cow skin, and the bottom line represents brown cow skin.

Test of Hypothesis

The result of this study is interpreted, according to the required information needed in order to carry out the test of the hypothesis. Factorial Analysis of Variance with two independent variables was used and the decision was made based on the (p-value) obtained from the ANOVA table.

Decision rule and conclusion: If the p-value is greater than our chosen significance level (α =0.05), we do not reject the null hypothesis. Rather, we conclude that there is not enough evidence to suggest that the null hypothesis should be rejected.

In the test of Between-Subjects Effects, we are interested in three rows: our 2 main effects and the interaction (Sample Attributes, Sample Code and Sample Attribute*Sample Code) respectively. For this study, the research is focused on the interaction between the two effects (the cows' skin samples represented by sample code and humans after consumption represented by sensory attributes).

Hypothesis I

H_0: There is no significant difference between the sensory attributes of the samples.

H_1: There is a significant difference between the sensory attributes of the samples.

From table 5, the p-value of the interaction of the cross effect between the sample code and the sensory attribute is (0.969) which is greater than the significant value (0.05), this means that the test is not significant, we accept the null hypothesis.

Table 5: Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: Response

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	20.947[a]	14	1.496	2.309	.004
Intercept	40358.771	1	40358.771	62295.201	.000
Sensory Attributes	7.477	4	1.869	2.885	.022
Sample Code	11.962	2	5.981	9.232	.000
Sensory Attributes * Sample Code	1.508	8	.188	.291	.969
Error	369.282	570	.648		
Total	40749.000	585			
Corrected Total	390.229	584			

a. R Squared = .054 (Adjusted R Squared = .030)

Conclusion

The findings of this research work showed that dried cowhide as having the highest values of fat, protein and carbohydrate content. It is the only sample that contains crude fibre. It also came out tops in overall acceptability. It can then be concluded that dried cowhide is nutritionally better than brown cowhide and white cowhide. Evaluation of health implications: contaminants and microbial analysis of the varieties of the processed cow skin is essential due to the processing techniques.

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