

Consumers' Perception, Nutritional and Mineral Composition of Processed Cowhide (Ponmo) as Affected by Different Processing Methods

Ahmed Saheed Ademola^{a)}, Banjoko Ibrahim Kayode, Ahmed Muhammed Motolani, Isiaka Muyideen Ajadi and Ifabiyi John Oluwaseun

Department of Agricultural Technology, Institute of Applied Sciences, Kwara State Polytechnic, Ilorin, Nigeria.

^{a)} Corresponding Author: olobin1@yahoo.com

Received : 2/3/2022

Acceptance : 20/3/2022

Available online: 1/6/2022

Abstract. The study was conducted to determine the influence of different processing methods; scalding and singeing on cowhide. Forty (40) pieces each of white scaled Ponmo and black singed Ponmo were pulled together and randomly subjected for proximate evaluation, organoleptic properties determination and mineral contents determination. Analysis of variance was used to analyze the result in a complete randomize design using Duncan Multiple Range Test to separate the means. The result shows that the nutritional value of white scaled Ponmo was significantly higher ($p < 0.05$) than black singed Ponmo. The colour and flavour were better preferred in white scaled Ponmo, aroma in black singed Ponmo, while there was no significant difference in texture, juiciness and overall acceptability of both products. Mineral contents was significantly higher ($p < 0.05$) in white scaled Ponmo compared to black singed Ponmo. The processing methods used in the study therefore, affects the nutrient, eating qualities and mineral contents of the two final products, with white scaled Ponmo having better consumers' perception and nutritional qualities.

Keywords. Cowhide, Scalding, Singeing, Ponmo, Proximate, Organoleptic, Minerals, Consumers' perception.

I. INTRODUCTION

Slaughtered animals such as cows provide many edible products other than the carcass meat which humans normally consumed. Such products include offal, cowhide, cow head, cow tail and cow foot. Cowhide popularly known as "Ponmo" or "Canda" in Nigeria and Wale in Ghana is one of the highly patronized meat products in most parts of Africa [1]. In Nigeria, the skin of animals attached to the meat or the skin alone is often consumed as delicacies in meals, one skin often consumed is the cow skin or cowhide [2].

Despite the fact that government, concerned organization and individuals have mounted campaign against the habit of Ponmo consumption, since it possess potential damage to the health of the consumers and potentially threaten the leather industry [2]. Consumption of Ponmo is longer seen as a poor man's food in Nigeria where it was associated with the poor and uneducated Yoruba in Southwestern Nigeria, it is consumed by the rich nowadays [3].

Consumers have misconceptions about the nutritional quality of Ponmo with believe that it has no nutrient at all. This is because of inaccurate data in some food composition tables and because of losses that occur during cooking, as well as trimming [4] and the processing methods that is applied to enhance it eating quality and consumers' acceptability.

Cowhides are often processed by skinning, dehairing, washing, boiling, cutting, soaking and cooling [5]. Removal of hairs from cowhide may be processed by flame fueled by firewood and spent engine oil, this contributing to the toxic organic compound such as Polycyclic Aromatic Amines (PAAs), Heterocyclic Aromatic Amines (HAAs), dioxins, furan and benzene [1].

Processing of dehaired cowhide for consumption differs from country to country and culture to culture. In the southwestern part of Nigeria especially Ponmo is firstly processed by dehairing, there are two methods; the first method is dehairing by scalding using hot water then boiled in water for several hours to bring about the initial softening of the hide and later subjected to further processing by frying and cooking. In the second methods cowhide is dehaired by singeing in open flame then boiled in hot water, the boiled singed hide is subjected to final softening by soaking in water until it is tender enough for cooking and looks appealing to consumers.

The purpose of cooking is to make meat palatable, digestible and microbiologically safe [6]. During the process meat undergoes both physical, chemical changes and eating qualities that strongly depend on protein denaturation and water loss [7]. The properties of cooked meat products are also dependent on the composition and characteristics of the muscle, heating methods, as well as time/temperature combination during cooking [8], hence the modification of the nutritional value, physical and chemical properties, and consumers' perception [6].

Knowledge of the nutritional composition of cowhide products as affected by processing methods is very essential for proper nutritional quality counseling. All food products thus require analysis to determine the nutritional composition [9]. Accurate and precise analysis of Ponmo is paramount for proper nutritional labeling of the products. Therefore, this study is aimed at determining the consumers' perception, nutritional and mineral composition of processed cowhide (Ponmo) as affected by different processing methods

II. MATERIALS AND METHODS

The cowhide used for experiment was obtained from freshly slaughtered cow of about 2years of age. The cow was slaughtered conventionally, bled thoroughly by hoisting and hanging, and skinned within one hour post mortem. The skin was divided into equal half for further processing into white and black Ponmo.

• *Processing of White Ponmo*

The first half of the hide was dehaired by scalding using hot water at 100°C and scrapping off the hair on the surface of the skin using sharp object to obtain fine smooth skin, the dehaired skin was rinsed properly to get rid of hair particles, soaked in hot water at 100°C for 60minutes to give a tender and pliable soft skin. The scaled soft cowhide was the cut into 40 smaller pieces 20g each for deep frying in cholesterol free cooking oil at 180°C to 20% moisture content. The fried cowhide was drained off oil and cool down to room temperature, and kept in an airtight container for further analysis.

• *Processing of Black Ponmo*

The second half of the cowhide was dried locally under direct sunlight for three days to 20% moisture content, wood ash was sprinkled on it to prevent flies. Dehairing was done by singeing in a naked flame from Parkiabiblobosa wood fueled by spent engine oil. Burning continue until surface hair was finally burnt off. The singed cowhide was then boiled in water at 100°C for 2hour and left in the water to soak for another 12hour until soft and tender enough for cooking. The soft singed cowhide was cut into 40 smaller pieces 20g each, washed, drained and kept in an airtight container and preserved in refrigerator for further analysis.

• *Organoleptic properties*

The fried white Ponmo was soaked in water at room temperature for 24hour to make soft and tender, the water was changed at 4hour interval. Both the white and black Ponmo were prepared separately for organoleptic properties evaluation. A total of twenty trained panelist age between 18 and 25 years were used to access the Ponmo from differently processing method. The panelists were made to rate each of the replicate of Ponmo from different processing method (white and black Ponmo). Equal bite size from each treatment were coded and served in an odorless plastic plate. The parameter evaluated for include colour, flavour, aroma, juiciness, texture and overall acceptability. The panelist rated the sample on a nine point hedonic scale with maximum score of 9 to extremely high condition while the lowest score of 1 was assigned to the poorest condition [10].

• *Proximate Composition Determination*

The proximate evaluation of both white and black Ponmo to determine constituents like (moisture, Ash, Carbohydrate, Crude protein, crude lipid and crude fibre) was determined according to [11].

• *Minerals Determination*

The mineral content was determined using dry Ash extraction method. Potassium was determined using Jenway digital flame photometer while Phosphorus, Calcium, Magnesium, Zinc and Iron were determined by Spectrophotometric method as described by Carpenter and Hendriide [12].

• *Statistical Analysis*

Data generated from this experiment were organized and processed for Analysis of Variance in a Complete Randomized Design (CRD) using SAS 2002. Duncan's Multiple Range Test was computed to compare the difference among the treatment means at probability level of (0.05).

III. RESULTS AND DISCUSSION

TABLE1. Proximate composition of differently processed Ponmo.

Proximate composition	Processing methods		MSE
	White scaled Ponmo	Black singed Ponmo	
Moisture %	23.80 ^b	67.02 ^a	14.868
Energy %	131.50 ^a	6.80 ^b	12.842
Protein%	30.75 ^a	8.77 ^b	9.632
Total Fat %	3.30 ^a	0.42 ^b	0.001
Ash %	1.48 ^a	0.41 ^b	0.001

^{abc} Means with the same superscript along the same row are not significantly different (P>0.05)

MSE (mean square error): the average differences between the means

TABLE 2. Organoleptic properties of differently processed Ponmo.

Organoleptic Properties	Processing methods		MSE
	White scaled Ponmo	Black singed Ponmo	
Colour	7.00 ^a	2.00 ^b	1.350
Flavour	7.00 ^a	5.00 ^b	1.750
Aroma	4.00 ^b	6.00 ^a	1.250
Texture	6.00 ^a	6.00 ^a	7.750
Juiciness	3.00 ^a	3.00 ^a	3.800
Overall Acceptability	8.00 ^a	6.00 ^a	2.950

^{abc} Means with the same superscript along the same row are not significantly different (P>0.05)

MSE (mean square error): the average differences between the means

TABLE 3. Mineral composition of differently processed Ponmo.

Mineral composition (mg/100g)	Processing methods		MSE
	White scaled Ponmo	Black singed Ponmo	
Potassium	14.80 ^a	4.30 ^b	1.202
Calcium	17.20 ^a	3.60 ^b	5.067
Iron	21.10 ^a	4.30 ^b	1.960
Magnesium	17.20 ^a	4.62 ^b	1.927
Phosphorus	2.10 ^a	0.40 ^b	0.060
Zinc	6.84 ^a	2.24 ^b	0.065

^{abc} Means with the same superscript along the same row are not significantly different (P>0.05)

MSE (mean square error): the average differences between the means

The result of proximate analysis in differently processed cowhide is presented in table1, the black singed Ponmo (BSP) shows significantly high ($p<0.05$) values in percentage moisture content than white scald Ponmo (WSP) while energy value, crude protein, total fat and ash content were significantly high in white scald Ponmo. The percentage moisture content value for WSP and black singed Ponmo (BSP) were 23.80 and 67.02% respectively. It was observed that during the final soaking of the differently processed Ponmo, BSP absorbed more moisture and gain more weight than WSP. This observed difference may also be attributed to frying WSP was subjected to during processing making the collagen fibre to have shrunk and loss more moisture due to high temperature (180°C) of frying. The moisture content range is in accordance with Maduforo, [13] who suggest 66% MC for cooked cowhide. The result of percentage energy content, crude protein, total fat and ash were significantly high ($p<0.05$) in WSP 131.50, 30.75, 3.30 and 1.48% respectively compared to low values in BSP with 6.80, 8.77, 0.42 and 0.41%. The observed differences were attributed to different processing methods. The lower values obtained for BSP was as a result of the high heat intensity from the naked flame used in dehairing (singeing) of the cowhide. This may further be attributed to 24hours over night soaking and washing of BSP which might have eroded the vital nutritional contents. Akwetey [14] suggest that heat intensities from different fuels used in singeing cattle hide contributes to it lower percentage crude protein, ether extract and ash contents. The heat intensity from singeing materials resulted in degradation of essential amino acids of protein [15].

The result of taste panelist on organoleptic properties of differently processed cowhide is presented in table2, the result indicated that the processing methods influenced the sensory scores for colour, flavour, aroma, texture, juiciness and overall acceptability of both WSP and BSP significantly ($p<0.05$). Colour is the first sensory assessment parameter for meat and meat products qualities and consumers' acceptability [6] was significantly different ($p<0.05$). The taste panelist rated a score of moderately light (7.0) for WSP while BSP was rated as just dark (2.0) in appearance on nine point hedonic scale. The darkness observed in BSP was as a result of the naked flame used in singeing the cowhide. Flavour was rated moderately high (7.0) for WSP while BSP was rated (5.0) intermediate flavour. There were also differences ($p<0.05$) in the taste panel score for aroma, while WSP was rated 4.0 (slightly perceptible) BSP was rated 6.0 (slightly strong aroma). The slightly

strong aroma observed in BSP was attributed to the smoke produced by firewood and spent engine oil during singeing. The taste panelist were however, not able to detect any differences in the texture, juiciness and overall acceptability in both products.

The effect of different procession methods on mineral contents of cowhide produced into WSP and BSP is presented in table 3. The result shows that the mineral contents of WSP was significantly high ($p < 0.05$) with values of 14.80, 17.20, 21.10, 17.20, 2.10 and 6.84mg for K, Ca, Fe, Mg, P and Zn respectively. The BSP recorded a significantly lower ($p < 0.05$) mineral contents with 4.30, 3.60, 4.30, 4.62, 0.40 and 2.24 mg for K, Ca, Fe, Mg P and Zn respectively. The low mineral contents observed in BSP may be as a result of burning during singeing, and may also be due to soaking and intermittent changing of water used for soaking. Kwetey [14] observed low levels of Fe, Mn, Cu, Pb and Cd in processed cattle hide compared to minimum permissible level (MPLs). Generally, mineral contents observed in this study were bellow maximum permissible level [16]. Low level of minerals may also be attributed to some other factors like environmental conditions, concentration in soil, feed and drinking water [17].

CONCLUSION

Ponmo is a product of cowhide processing, two types of Ponmo have gain more popularity among the people of Southern Nigeria with the insinuation that Ponmo supplies no nutrients. The study shows that procession methods influenced the nutrient contents and consumers' acceptability of Ponmo in different ways. White scald Ponmo had better colour, flavour and aroma, with high nutrient and mineral contents compared to black singed Ponmo. White scald Ponmo is hereby recommended. This research only considered one out of many means of singeing cowhide for Ponmo in southern part of Nigeria. Other means of singeing includes use of used car tyre, gas, plastic scrap and used engine oil. Therefore, we recommend further research into the effects of these singeing methods on product safety and human health.

FUNDING STATEMENT

This research received no specific grant whatsoever from any funding individual or agency in the public, private or non-profit sectors. The research work is fully funded by the Authors

CONFLICTING INTEREST

The Authors hereby declare that there is no conflict of interest whatsoever, before, during and after the collection of data and writing of this paper.

REFERENCES

- [1] Okiei W, Ogunlesi M, Alabi, F and Osinghuru B (2009). Determination of Toxic Metal Concentrations in Flame Treated Meat Products, Ponmo. Determination of Toxic MAfrican J. Biochem Research, 3(10), 332-339.
- [2] Tijani SA, Ajayi OO (2016). Perception of Stakeholder to the Proposed Ban on Cowhide Consumption in Ogun State Nigeria. Business published 2016. Doi:10.4314/jae.v20i1-15.
- [3] Adeyeye TL, Aye PA (2015). Comprehensive Evaluation of the Consumption of Subcutaneous fat, Skin and Muscle of Bull. J. Chem, Bio and Physical Science 5(4)3963-3988.
- [4] Gerber N (2007). The role of meat in human nutrition to the supply with nutrients particularly functional long-chain n-3 fatty acids. ETH ZURICH ZURICH.
- [5] Joseph JK (2006). Processing Quality and Preference for Ponmo a Popular Cow Skin Product in Southwest Nigeria. J. agric res and dent. 5(1).
- [6] Omojola AB, Ahmed SA, Attoh-Kotoku V, Wonger GSI, Iyanda OD (2014). Effect of Cooking Methods on Cholesterol, Mineral Composition and Formation of Total Heterocyclic Aromatic Amines in Muscovy Drake Meat. Journal of Science of Food and Agriculture, DOI: 10.1002/jsfa.6687.
- [7] Walsh H, Martins S, O'Neil EE, Kerry JP, Kenny T, Ward P (2010). The effects of different cooking regimes on the cook yield and tenderness of non-injected and injected enhanced forequarter beef muscles. Meat sci. 84:444-448.
- [8] Christensen M, Purslow PP, Larsen LM (2000). The effect of cooking temperature on mechanical properties of whole meat, single muscle fibres and perimysial connective tissue. Meat sci. 66:91-96.
- [9] Nielson SS (2011). Food Analysis (4th edition). (S.S Neilson Ed) New York USA; Springer Science Business Media. Doi:10.1007/978-1-4419-1478-1-8.
- [10] Mahendraker NS, Khabade VS, Dani NP (1988). Studies on the effect of fattening on carcass characteristics and quality of meat from Bannu-lamb. J. Food Sci. Technol. 25: 228-230.
- [11] AOAC (2005). Official Method of Analysis. 18th Edition, Association of Officiating Analytical Chemists, Washington DC, Method 935.14 and 992.24.
- [12] Carpenter CE, Hendriide DG (2003) Mineral analysis in food analysis 3rd addition Kluwer Academy. Plenum publisher, New York pp 191-198.

- [13] Madufo AN (2016). Proximate and free fatty acid composition of selected animal products from two markets in the AshieduKeteke sub metro in Accra. University of Ghana <http://ugspace.ug.edu.gh>.
- [14] Akwetey WY, Eremong DC, Donkoh A (2013). Chemical and Nutritional Composition of Cattle Hide (Walle) using Different Processing Methods. *J. Anim.Sci.Adv* 2013, 3(4):176-180.
- [15] Girard JP (1992). Smoking Technology of Meat and Meat Products. Ellis Horwood Ltd. Chinchester, England.
- [16] USDA (2006). Specific Maximum Levels of Contaminants in Food. Foreign Agric Services. GAIN Report Global GAIN Report No. CH6064.
- [17] Obiri-Danso K, Hogard JN, Awtor-Agyei P (2008). Assessment of Contamination of Singed Hides from Cattle and Goats by Heavy Metals in Ghana. *Afri.J.Envi.Sci.and Tech.* 2(8)pp 217-221.