EFFECT OF COOKING ON THE NUTRITIONAL QUALITY OF COWHIDE (PONMO) AND BEEF SOLD IN BUKURU, JOS-SOUTH LOCAL GOVERNMENT

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ABSTRACT

Slaughtered animals such as cows provide many edible products including meat and cowhide which is processed and consumed as a delicacy in many African countries including Nigeria. The nutritional quality of meat has been undisputed for ages. However, the contribution of the processed cowhide (ponmo), an affordable substitute for meat, to human nutrition has remained contradictory with many believing it has no nutrients at all. When protein sources such as meat are cooked, there is a reduction in its weight and nutrients due to cooking loss. This work compared the nutritional quality of the meat and ponmo and also assessed the effect cooking on nutrient quality. Samples were collected, packaged and taken to the laboratory raw while a portion was cooked before being transported to the laboratory for analysis. Proximate composition was analyzed using standard procedure as described by[8].The result shows that moisture content was statistically ($p<0.05$) higher in fresh meat and cowhide samples compared to that of the cooked samples. Crude protein was higher ($p<0.05$) in meat samples than cowhide. Lipid was significantly higher in cooked forms of both beef and cowhide while cooked cowhide showed a significantly higher ($p<0.05$) N.F.E. values compared to beef. Cooking significantly reduced reduced the M.E. in of cowhide. From the result, it was concluded that the nutritive value of cowhide especially in terms of protein content, lipids, and mineral content was lower compared to that of beef while. However, cowhide compared favorably with beef in terms of M.E. and N.F.E. in the study area. It also shows that cooking as a processing method significantly affects nutrient quality such as Lipids, M.E. and N.F.E.

Keywords: Meat, Cowhide, Nutrition, Proximate composition, cooking

Description of problem

Deficiency of protein in most African countries is mainly the cause on malnutrition in both adult and children[1]. and this can be reduced to minimum with the availability of good quality meat[2]. While the nutritional quality of beef is well-established as a high-quality source of protein, essential minerals, and energy[3], the nutrient composition of cowhide ("ponmo"), a popular delicacy consumed across Nigeria and West Africa, which is considered an affordable substitute for beef remains conflicting[4]. Its widespread acceptance is driven by cultural preferences, taste, texture, and its relatively lower cost compared to conventional muscle meat[5]. This is because cowhide primarily consists of collagen, connective tissue, and indigestible fibre, which may not adequately meet dietary protein and micronutrient requirements, therefore, the increasing substitution of beef with cowhide raises public health and nutritional concerns, particularly in vulnerable populations that rely on it as a major protein source. When protein sources such as meat and cowhide is cooked there is always reduction in its weight and nutrients, and this is referred to as cooking loss. Thus, cooking loss has both negative and positive effects to the consumer and the meat industry, because the

meat products tend to loss a large amount of proteins and several essential minerals, and this causes drop in its nutritional quality, and subsequently lowers its purchasing value[6,7]. This work therefore seeks to breach the knowledge gap on the true dietary implications of replacing beef with cowhide in daily meals and the effect of cooking on final nutrient composition.

Materials and method

Study area

The study was carried out in Jos South Local Government Area of Plateau state, Nigeria. The area is located between latitude $8^0$45'00" and $9^0$50'00" North and longitude $8^0$41'00" and $8^0$58'00" East of the Greenwich Meridian.

Experimental design

Data analysis

The experiments were conducted in triplicated and the data obtained was expressed as mean ± standard deviation. Results obtained were statistically analyzed for statistical difference using statistical Product and Service Solutions (SPSS) version 23 and differences were analyzed using the Turkey's HSD post hoc test.

Result and discussion

The proximate composition of cooked and uncooked beef and cowhide is presented in Table 1. Moisture content was observed to be significantly ($p<0.05$) high in fresh beef (73.47 ± 1.08%) compared to cooked beef (57.27 ± 0.52%), while cowhide samples maintained significantly ($p<0.05$) lower values (62.05 ± 1.95% in fresh and 58.06 ± 0.39% in cooked samples) compared with beef samples even though the cooked cowhide was lower. This shows that cooking reduced the water content of both beef and cowhide, which is consistent with heat-induced water loss reported in other animal products[9]. These values however, are significantly high agreeing with reported values by[2]. This is indicative of a high water-holding capacity which may provide a thriving environment for the growth of microorganisms result in quick deterioration.

Freshly slaughtered meat and cowhide were purchased from three different locations in Bukuru market. Both the cowhide and meat purchased were divided into two halves each. One half was immediately taken to the laboratory raw after purchase while the other half was subjected to cooking for 20 minutes. The water used for cooking drained and samples were allowed to cool before being taken for analysis.

Determination of Proximate Parameters

Proximate analysis was carried out on all the samples to determine their nutrient composition. Moisture, crude protein, ash, crude fibre, nitrogen free extract (N.F.E.), metabolisable energy (M.E.), lipid content, calcium and phosphorus were determined using standard methods as describe by AOAC[8].

Crude protein was found to be significantly higher in both raw and cooked beef compared to cowhide. This finding suggests that beef is a superior source of protein compared to cowhide which is consistent to earlier findings by[3] and [5] who reported similar findings and suggested that cowhide could not serve as an adequate substitute in terms of protein quality to beef. Fresh beef had the highest crude fibre (5.24 ± 0.07%), however this value significantly dropped in the cooked sample which decreased after cooking (1.81 ± 0.08%). In contrast, cowhide crude fibre was lower in the fresh sample (1.26 ± 0.05%) but increased in the cooked sample (2.28 ± 0.12%). The low crude fibre in the cowhide especially in the uncooked sample is in agreement with the report of[4] who suggest reported that fibre in cowhide are mostly structural collagen and connective tissues which contributes little or no dietary nutrient when consumed.

Table 1: Proximate composition of fresh raw and cooked beef and cowhide.

Sample	Fresh Cow meat	Fresh Cow Hide	Cooked cow meat	Cooked cow Hide
Moisture Content	73.47 ± 1.075^a	62.05 ± 1.951^b	57.27 ± 0.522^c	58.06 ± 0.386^c
Crude Protein	40.34 ± 0.245^a	33.09 ± 0.251^c	37.74 ± 0.115^b	32.23 ± 0.435^c
Crude Fibre	5.24 ± 0.074^a	1.26 ± 0.050^d	1.81 ± 0.076^c	2.28 ± 0.121^b

Lipids	0.55±0.0116^{c}	0.32±0.0116^{d}	1.44±0.047^{b}	1.77±0.080^{a}
Ash	1.29±0.046^{a}	0.26±0.146^{b}	1.06±0.216^{a}	0.64±0.163^{b}
M.E	84.19±2.919^{c}	139.81±3.023^{b}	102.33±2.157^{a}	100.67±3.055^{a}
N.F.E	0.25±0.050^{c}	0.97±0.023^{b}	0.18±0.014^{c}	4.52±0.150^{a}
Calcium	1.71±0.056^{a}	0.42±0.066^{c}	0.58±0.027^{c}	0.72±0.091^{b}
Phosphorus	0.08±0.01^{a}	0.013±0.006^{b}	0.02±0.007^{b}	0.07±0.006^{a}

Key: M.E; Metabolisable Energy, N.F.E.; Nitrogen Free Extract
All values are expressed as mean ± standard deviation. Values with different superscript in the same row indicate statistical significance at $p<0.05$.

Lipid content increased after cooking in both beef and cowhide, with cooked cowhide recording the highest value (1.77 ± 0.08). The increase may be due to concentration effects following to cooking which occur due to water loss and heat-induced fat redistribution. Nevertheless, lipid values remained low across all samples, classifying both beef and cowhide as lean animal products.

Ash content was significantly higher in beef than in cowhide, indicating that beef provides a more reliable mineral source. This is further corroborated by similar observation in calcium and phosphorus contents, with beef being significantly richer in both minerals. Adequate calcium and phosphorus intake is essential for skeletal development and metabolic processes[10], and the low levels observed in cowhide suggest that it may contributes significantly lower amount of minerals to daily mineral requirements.

Metabolizable energy (ME) values showed an interesting trend. Fresh cowhide had higher ME (139.81 ± 3.02 kcal/100 g) than fresh beef (84.19 ± 2.92 kcal/100 g), but cooking reduced cowhide ME to 100.67 ± 3.06 kcal/100 g, which was comparable to cooked beef (102.33 ± 2.16 kcal/100 g). This may be explained by higher nitrogen-free extract (NFE) in cooked cowhide (4.52 ± 0.15%) relative to cooked beef (0.18 ± 0.01%). This suggests that cowhide, though inferior in protein and minerals, may provide relatively higher energy when processed. This could further be explained by the relatively lower water content of cowhide observed in the moisture content which signifies a higher dry matter concentration which in most cases translates to higher energy value.

Conclusion and application

Based on the proximate composition of both the raw and cooked forms of beef and cowhide sold in Bukuru market, this study shows that;

I. There exist a nutritional difference between beef and cowhide ("ponmo") commonly sold in Bukuru, Jos South LGA with Beef nutritionally superior to cowhide in terms of crude protein, ash, calcium, and phosphorus contents,
II. Cowhide, on the other hand showed higher metabolizable energy content in its fresh form, probably due to its dry matter concentration and nitrogen-free extract.
III. Even though cowhide remains a culturally acceptable delicacy, it should not as a primary replacement for beef especially as primary source of dietary protein and minerals.

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