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Comparative Study of Proximate and Mineral Compositional Values of Processed Cow Hide and Soya Bean Cheese

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ABSTRACT

Proximate and mineral compositional values of *processed* of processed *cow hide and soya bean cheese were carried out and compared. Analysis were carried out on boiled samples of the cheese (BC) and the hide (BH) just as fried forms of the cheese (FC) and the hide (FH) were also analyzed. Generally, soya bean cheese was found to be more be richer in protein and fat than processed cow hide while processed cow hide have more fiber and carbohydrate than soya bean cheese. On the other hand the processed hide in either form was found to have more fiber and carbohydrate. In this work, the result of protein, fat, and carbohydrate content of BC was 17.76%, 30.63% and 1.07% respectively, while higher values recorded in FC as 22.73%, 43.53% and 1.27% respectively. Carbohydrate contents recorded for BH and FH was 11.37% and 10.32% while fiber content was 5.92% and 32.62% respectively. The moisture in BH is more than the moisture in FH but the moisture contents recorded in all the fried samples were relatively lower The record of the ash content in all samples indicated the presence inorganic materials, thus the result of mineral composition of some metals carried out with Atomic Absorption Spectrophotometer detect the presence of more calcium ion 30 -35 mg/l and magnesium ion 12 -13 mg/l in cheese a diary product, while very small amount ions of zinc 0.6 - 0.7mg/l and manganese 0.14 – 0.17mg/l was recorded. Both samples of hide also contain the metal ions as in cheese in addition to iron ion in various quantities*

Keywords: Soya bean cheese, processed cow hide, proximate analysis, Atomic absorption spectrophotometer

INTRODUCTION

Soybean (*Glycine max*) is among the major industrial and food crops grown in every continent. Soybean cultivation has expanded as a result of its nutritive and economic importance and diverse domestic usage. It is also a prime source of vegetable oil in the international market. Soybean has an average protein content of 40% and is more protein-rich than any of the common vegetable or animal food sources found in Nigeria. Soybean seeds also contain about

20% oil on a dry matter basis, and this is 85% unsaturated and cholesterol-free (Ifesan *et al*., 2012, Siulapwo *et al*., 2014).

Cheese is a diary and highly nutritive food product. It is a popular food product started as an accidental curdling accidental curdling of milk. Cheeses are made from milk processed from soya bean and cattle udder (Neetal *et al.*, 2015). It is refered to as nutritive dense food and it is a popular and tradition food product in Africa and Asian countries. It is known by different local names *wara* in West Africa and *tufu* and sufu in Asia. Although the nutrient in cheese basically has been reported to depend on among other factors, the source of milk. Cheese generally contains fat and casein constituents as these are contain in the original milk. These nutrients are retained in curd during the cheese production (Maijalo *et al*., 2016; Nazim *et al.*, 2013). The soft like cheese curd, is made into a variety of products by frying, drying and freezing and is consumed daily in the same manner as high-protein foods in western cultures. The making of cheese is also way of intentionally processing the milk and converts the perishable form to a stable and storable product, the cheese, (Neetal *et al*., 2015)

Hides and skin play a very important socio-cultural role among people. Animals skin, mostly cow skin, are used for clothing and sometimes as mats and other handicrafts. Raw hides/skins are provided as by-product of the meat industry, (Fagbohun *et al*., 2016).

In spite of the economic potential of hides and skins as raw material for leather production, they are used for human consumption. Hide/skins are processed into "ponmo", a delicacy consumed by all social classes (Amiatu and Feleke, 2017).

It has been reported that meat with high percentage collagen or elastin would have relatively lower intrinsic biological value, yet there is another demonstration that for human consumption, connective tissue might not be nutritionally disadvantageous, unless the ratio of connective tissue to muscle tissue nitrogen is more than one, (Tijani and Ajayi, 2016).

Akwetey et al. (2013) described

cattle hide, popularly known as “ponmo” in South-Western Nigeria, and “welle” in Southern Ghana and as a delicacy in several parts of Africa. He added that removal of hair from cattle hide in Nigeria is traditionally done by tenderization in hot water followed by scraping to obtain “ponmo” while in Ghana, and other African countries, singeing is preferred because it maintains the carcass hide for consumption and evokes meat flavors that are highly acceptable.

The two consumable products (cheese and hide) are popular staple item especially as alternative to other expensive similar product such as meat, egg and fish. (Alemnash *et al*.,2018; Okorie and Adedokun., 2013) The research concerning the products is very limited, therefore the present study goes into a promoting laboratory information on the two products.

This work may be of help to consumers of these product and industrialists aiming to improve the product in better packaging form.

MATERIALS AND METHOD

Collection of Samples

Processed cow hides were obtained at abattoir at Ipata market, Ilorin, Nigeria. The finished consumable product "ponmo" was processed by traditional boiling in water followed by shaving.(Ebenezer *et al*., 2018) The primarily boiled sample was tagged boiled processed hide (BH) and the fried one was tagged as fried processed hide (FH). The two forms of the consumable cow hide were used in this work. In the case of cheese, soya bean was obtained to prepare cheese as practice indigenously (Maijalo *et al*., 2016). The steep water for the preparation (i.e. coagulation milk protein) was obtained from steep water from processing of pap from maize. Two samples of soya cheese were used, boiled cheese (BC) and Fried cheese (FC).

The chemicals used in this research were of analytical grades, while the water was glass distilled before use.

Analysis of Sample

Moisture Content

Each sample (2 g) of (soya bean cheese and cow hide) was weighed into preweighed oven-dried Petri-dishes which were later transferred into oven (model?) and dried at 105^0C to constant weight. The dried samples were cooled in a desiccator and the loss in weight was recorded as percent moisture (AOAC, 2000).

Ash Content

Five grams of each sample was weighed into pre-weighed oven-dried crucibles. The crucibles were placed in a Muffle furnace , and the temperature was set at 600^oC, each of the samples were left in the oven until they became white. Thereafter, the crucibles were removed and cooled in a desiccator, after which their weights were taken and percentage ash was subsequently determined (AOAC, 2000).

Fat Content

10 g of sample was placed into a soxhlet extractor. The extractor was placed into a pre-weighed dried distillation flask. Then the solvent (n-hexane) was introduced into the distillation flask .. The setup was held in place with a retort stand clamp. Cooled water jet was allowed to flow into the condenser and the heated solvent was refluxed for lipid in the soxhlet chamber to be extracted When the lipid was observably extracted; to concentrate the lipid; the flask was then oven dried to constant weight and re-weighed to obtain the weight of lipid.

The same procedure was done for processed cow hides.

Crude Fiber

Crude fiber was determined in accordance with AOAC (2000) procedure. 2 g of the sample was treated with 20 ml of 1.25 M H_2SO_4 and boiled for 30 minutes. The resultant mixtures was filtered under suction and the residue washed with hot distilled water and boiled again for another 30 minutes with 1.25 M NaOH. The digested

sample was then washed severally with hot distilled water. The washed sample was scrapped into a crucible, dried at 100 ^{o}C for 1 hour, cooled and weighed. The loss in weight on incinerator was taken as the weight of the crude fiber.

Crude Protein

After oven dried of each 2 g sample was transferred into 650 ml kjeldahl flask. Then 0.5 ml of concentrated H_2SO_4 and half Kjeldahl catalyst tablet were added, after which the samples were digested by heating until the digest was clear, that is, from light green to grey white. The heating was allowed to continue for another 2 minutes to ensure complete digestion then they were cooled and the volume was made up to 50 ml with distilled water. Boric acid of 5ml of was transferred into 100 ml conical flasks (as receiving flask) and 3 drops of mixed indicators were added.. Then the receiving flask was placed is such a way that the tip of the condense tube is below surface of boric acid. Thereafter, 5 ml of the digested sample was transferred in to the mark ham distiller. This was followed by the addition of 10 ml of 40% NaOH. 50 ml of the distillate was collected into the receiving flask and titrated against 0.025 M H_2SO_4. The blank was titrated against the acid as well. The percentage of Nitrogen was subsequently determined (AOAC, 2000).

Calculation**:** %N = titer value x1.4x100

Carbohydrate

Carbohydrate was determined by weight difference. Thus: % carbohydrate = 100 – (% moisture + % ash + % fat + % crude protein + % crude fiber).

Mineral Content

Each sample of 2g were weighed into a clean digestion flask. \ Concentrated HNO_3 and of concentrated HCl in ratio 3:1 was added to the sample in the digestion flask. The whole sample was heated in a hot plate until all brownish fumes expelled out (nitrogenous compounds) which confirmed that the sample is digested and the sample was allowed to cool at room temperature and a few mLs of distilled water was added and the mixture was filtered into 250 ml standard flask and it was transferred into plastic reagent bottles for AAS analysis on a Perkin Elmer Atomic Absorption Spectrometer.

Analyses were carried out in triplicate, and for each parameter the means value of the three replicates were recorded for the respective parameter. The student t-test was used for statistical analysis. Difference was considered significance if the value of P was less than 0.05.

Results and Discussion

The results of the analysis are presented in Table 1 and 2.The result of protein, fat, and carbohydrate content of BC is 17.76%, 30.63 and 1.07% respectively (Table 1). This is relatively higher in FC (22.73%, 43.53 and 1.27%) for protein, fat, and carbohydrate content respectively. The changes were due to lower moisture content in fried sample 1.76% which was 2.73%, in BC. These results are similar to the value obtained by Ifesan *et al*. (2012).The cheese in either form retains substantial amount of protein from the original seeds. Both cheese are much richer in protein than the processed hide. The processed hide in either form is rich in fiber, a good source of roughage in meal.

On the other hand in the case of processed hide the protein content is relatively lower. The processed hide of course in either form is rich in fiber a good source of roughage in meal. Ten percent of 10% carbohydrate was recorded for the samples of processed hide. The moisture contents recorded in all the fried samples were relatively lower due to drying effect of frying.This encourages product preservation.

Table 1: Nutritional composition (%) of Boiled Cheese (BC), Fried Cheese (FC), Fried Hide FH and Boiled Hide (BH)

CONSTITUENTS	**BC** (%)	**FC** (%)	**FH** (%)	**BH** (%)
Moisture content	46.56±0.2065	29.70±0.0807	27.15±0.0531	65.32±0.0463
Ash content	2.73±0.0091	1.76 ± 0.0408	10.07± 0.0620	1.08± 0.0852
Crude protein content	17.76 ± 0.3743	22.73 ±0.3569	10.64± 0.2150	6.84± 0.2094
Crude fiber content	1.25 ±0.2455	1.02 ±0.0032	32.62±0.1355	5.92± 0.1083
Fat content	30.63±0.0155	43.53 ± 0.0615	9.20± 0.0650	9.47± 0.0846
Carbohydrate content	1.07 ± 0.3622	1.27 ± 0.3326	10.32 ± 0.0573	11.37 ± 0.0755

Values are means ± standard deviations of triplicate determinations.

The record of the ash content in all samples indicates presence of inorganic materials such as mineral component. Thus the analyses of some metals were carried out. The results indicate the presence of much calcium and magnesium ions in cheese a diary product. Very small amount of zinc and manganese ions were also recorded for cheese. Both samples of hide also contain metal ions as found in cheese in addition to iron ion in various quantity as recorded in table 2. This of course depends on different processing methods (Addo *et al*., 2019)

Table 2: Mineral composition of Boiled Cheese (BC), Fried Cheese (FC), Fried Hide (FH) and Boiled Hide (BH)

MINERALS	**BC** (mg/L)	**FC** (mg/L)	**FH** (mg/L)	**BH** (mg/L)
Mn	0.6000	0.7000	ND	0.1000
Fe	ND	ND	0.900	0.1000
Ca	35.000	30.000	1.3000	9.600
Mg	13.200	12.400	8.3000	2.5000
Zn	0.1700	0.1400	2.9000	0.0600

ND means not detected

CONCLUSION

Proximate and mineral compositional values of were carried out on processed cow hide and soya bean cheese. The content values were indicated and compared. The results obtained thus give some laboratory information that may be required for further utilization and treatment of these items.

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