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Nutritional Evaluation of a Dehydrated Shredded Meat Product, (Danbunama)

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Abstract: The qualitative effects of different oil types used in processing of danbunama, a dehydrated shredded meat product in relation to its palatability, physical, chemical and nutritional attributes are the focus of this study. The effect of different oil types on the sensory qualities of the product was carried out using semitendinosus part of beef. The three different oil types used, decolorized palm oleic oil (T_1) local bleached palm oil (T_2) and pure groundnut-oil (T_3) were subjected to lipid oxidation analysis to determine the Thiobarbituric acid value (TBA) peroxide and acid values at 1st, 3rd, 6th and 9th weeks of storage. Sensory evaluation showed that there were no significant differences amongst the oil types used on the parameters tested for. The proximate analysis of danbunama determined showed its moisture range to be 4.22-4.50%, crude protein% range of 38.9-43.5%, T_1 differed significantly from that of T_2 and T_3, the crude fat% differed significantly for all oil types. Lipid oxidation in T_3 (0.70±0.01) was significantly higher at week 6 while T_1 (0.81±0.01) recorded a significantly higher value at week 9. Danbunama can be prepared from any of the oil types and with proper packaging, the nutritional status of the product at week 1 does not significantly differ from that at week 9. The product is a nutritive meal or snack, easy to carry requiring no sophisticated packaging and is quite stable at room temperature. Rancidity will not pose a treat if good quality raw materials are utilized during processing.

Key words: Danbunama, oil - types, storage, nutrition and rancidity

Introduction

The term intermediate moisture meat product is used to describe meat product that have less than 20% of moisture present in it after it has been processed with any of the preservation methods. Danbunama, is an intermediate moisture meat product processed by cooking, pounding and then pan frying with addition of spice. It is peculiar to the Northern part of Nigeria. It is processed principally from semitendinosus or part of cattle (beef). This meat product is commonly consumed by the elites of the Hausa communities found in Nigeria and is usually served at parties. It is a meat product that developed as a means of preserving cooked meat in the absence of facilities for refrigeration storage by the Hausa people. It is a meat product that has good nutritive value and relative shelf stability at room temperature. It can serve as a snack or combined with other food as part of daily diet for the general populace. It also gives convenience to travelers and campers because of its advantages of being light weighted, easy-to-pack and ready-to-eat. (Ockerman and Li, 2000).

Danbunama has its ally in other cultures: The meat floss, made from lean pork meat called Machana in Mexico, a combination of cured meat and floss snacks (called "niu rou kang") is a product of Shanghai China. Travelers to these countries abroad have access to buy these meat products and several other meats snacks in their general markets, super markets and stores. (Chang *et al*., 1996).

Due to the fear consumers have about fat intake and cholesterol, frying as a method of processing meat is not very popular amongst meat processors. The oil types used for frying in this work were subjected to various test of its quality. The locally bleached palm oil, pure groundnut oil and refined vegetable oil were used for the experiment to determine their safety in the production of danbunama.

Materials and Methods

The processing of danbunama: For each preparation of danbunama 2kg semitendinosus muscle part of matured male cattle was used, this was trimmed to remove any surface dirt and visible fat, cut into small chunks of average weight of 140g, rinsed once and boiled with 2 or 3 medium sized onions (equivalent to 180g) and a little quantity of water that would cook the meat leaving very little stock (the meat must not be submerged in water). The cooking was done at 100°C, for $2^1/_2$hours to the point when the meat was thoroughly cooked such that it would break when pressed with the thumb and the forefinger. The cooked meat was transferred into the mortar (a local wooden device for pounding food), thinly sliced onions were added, a level teaspoon of spice mixture (5g) was added, pounding (with the pestle) was intensive and consistent on the meat pieces until the meat strands disengaged and were beaten to shreds. The spice mixture consisted of 4 cubes of maggi, 1 level teaspoon salt (5g), added to dried pepper, dried ginger, black pepper and cloves in the ratio of 5:1:1:1.

Table 1: Sensory analysis of prepared shredded meat, danbunama

Parameters	T_1	T_2	T_3
Aroma*	3.67±0.89	3.83±1.27	4.00±0.95
**	4.50±0.52	4.50±0.67	4.50±0.67
Texture*	3.75±1.22	3.00±1.04	3.67±0.98
**	3.83±1.03	3.92±1.08	3.33±1.07
Taste*	3.83±1.19	3.75±1.36	4.00±1.21
**	4.42+0.51	4.50±0.67	4.42±0.67
Juiciness*	3.17±1.11	3.92±0.90	3.42±0.79
**	4.08±1.00	4.00±0.74	4.17±0.58
Overall acceptability*	3.83±0.83	4.0±1.000	3.83±0.94
**	4.08±0.67	4.58±0.67	4.42±0.51

* Values at week 1. ** Values at week 3. T_1 = refined deodorized palm oleic oil (Turkey brand). T_2 = locally bleached palm oil. T_3 = Pure groundnut oil. Means in the same row for same attributes are not significantly different.

The shredded meat was divided into three equal parts, for each oil type that was used for stir-frying of meat at 70 strokes per minutes for 20 minutes (the frying was done such that the pounded meat formed a paste with the oil at the beginning of frying). The three oil types were: The refined decolorized palm oleic oil (Turkey brand) T_1, the locally bleached palm oil, T_2 and the Purified groundnut oil T_3.

After frying each batch of the shredded meat for 20 minutes with continuous stirring, the oil was drained out by application of pressure on the fried pounded meat that was poured into a colander so that the oil easily drained out, thereby preventing the final product from sticking together, leaving a dry and spongy product. The meat was spread out on a tray, allowed to cool, separated into strands and 1 level teaspoon of spice mixture was again added to taste.

Packaging: Danbunama so obtained from the different oil treatments were packaged in airtight containers (polyvinyl chloride bags and plastic containers).

Chemical composition: Moisture, crude fat and protein were determined by the AOAC (1985) methods. The TBA value was determined by photometry method (1944) peroxide value by iodometry method and acid values (AOAC, 1985).

Sensory evaluation: A group of ten panelists cutting across staff and students (aged between 25 and 45) from the University of Ibadan, Ibadan, Nigeria were used to evaluate the shredded meat floss prepared from the oil types. A five point hedonic scale where 1 = dislike a lot and 5 = like very much was used in scoring (IFT, 1981) Organoleptic properties evaluated included aroma, texture, taste, juiciness and overall acceptability. Sensory evaluation was done on freshly prepared danbunama samples.

Statistical analysis: The sensory analysis and other corresponding data were subjected to analysis of variance (ANOVA), SAS and Duncan rating test.

Table 2: Proximate analysis of danbunama from three oil types at week 0

	Nutrient Compositions		
	Moisture	Crude Fat	Crude Protein
T_1	7.37±0.12^a	37.83±0.02^b	41.21±0.01^a
T_2	7.16±0.01^b	35.57±0.05^c	39.64±0.05^b
T_3	6.50±0.01^c	40.85±0.05^a	38.92±0.02^b

Means with different superscripts in the same column are significantly different. ($P < 0.05$)

Table 3: Thiobarbituric acid, peroxide and acid values at 6 and 9 weeks

	Parameters		
	TBA	Peroxide	Acid value
AT 6 WEEKS			
T_1	0.38±0.001^b	1.99±0.141^b	2.76±0.01^a
T_2	0.39±0.040^b	2.84±0.028^a	2.63±0.21^a
T_3	0.50±0.008^a	1.95±0.071^c	2.75±0.02^b
AT 9 WEEKS			
T_1	0.81±0.006^a	1.00±0.028^b	2.89±0.01^b
T_2	0.47±0.018^c	1.05±0.141^b	3.06±0.04^a
T_3	0.70±0.003^b	1.21±0.071^a	3.00±0.02^a

Means with the same superscript along the column are not significantly different ($P < 0.05$). Unit is in ug/g.

Results and Discussion

Results obtained in the study are summarized in Tables 1-3. Table 1 shows the analysis of sensory evaluation conducted at week zero. Organoleptic traits evaluated for did not show any significant differences with oil types used in processing of Danbunama.

The results of the chemical proximate analysis as presented in Table 2, showed that significant differences were observed in the percentage moisture, crude fat and crude protein content of danbunama prepared from the three oil types.

Table 3 gives the thiobarbituric acid (TBA), peroxide and acid values at 6 and 9 weeks.

The profile of the proximate composition of the danbunama produced from the three oil types proved the product to be a very shelf stable product, its low moisture percentage promotes its ability to stay at room temperature in spite of its high level of protein and fat combined. The sensory evaluation of danbunama for aroma, texture, taste, juiciness and overall acceptability showed no significant difference for the different oil types. The taste especially did not seem to differ for all oil types. The fact that danbunama is a relatively new product might be responsible for the insignificant difference in its overall acceptability. Ockerman and Li (2000) in a similar study of pork meat floss, reported that consumers preferred a modified cooking floss to the traditional preparation but reported no significant preference for meat floss with higher level of lard inclusion.

The three parameters evaluated for lipid oxidation were the TBA, peroxide and acid values. The acid value is a

measure of the amount of free acids present in a given amount of oil. It can be overestimated if other acid components are present in the system (such as amino acids in meat). The peroxide values measures the amount of peroxides, which are primary products, formed in the initial stages of oxidation of lipids therefore giving an indication of the progress of oxidation in the oil. The peroxide value was significantly higher in the locally bleached oil. The Thiobarbituric acid value determines the extent of lipid oxidation, the TBA value of 1.0 is considered as the threshold level for rancidity in pork floss (Ockerman, 1985). Thiobarbituric acid reactive substance (TBARS) amount increases with storage days (Pie *et al*., 1990) and inappropriate storage conditions of meat products, together with the action of light and oxygen accelerate oxidation. The peroxide values also increase with storage. During the course of oxidation peroxide values reach a peak and then decline (Yan and White, 1990), the formation of peroxide is the initiation of lipid oxidation. The acid values involve the formation of acids in lipid oxidation this is an indication of hydrolytic rancidity (Table 3) these values also increased markedly with storage.

In conclusion, danbunama in this study was observed to have exceeded the nine-week period, which was the duration of this study. Further work could be carried out to determine exactly at what point of storage that spoilage would set in and how long it takes the oil used in processing to become rancid thus rendering the product inedible. The product properly bottled and kept in a cool place is quite stable at room temperature.

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