NSAP 47th Annual Conference (JOS 2022) CONFERENCE PROCEEDINGS
THEME: SECURING ANIMAL AGRICULTURE AMIDST GLOBAL CHALLENGES

# ASSESSMENT OF PROXIMATE COMPOSITION AND ORGANOLEPTIC CHARACTERISTICS OF MUTTON SAUSAGE PRODUCED FROM DIFFERENT PROCESSING METHODS

**Ribah M. I.[¶], Abdullahi, S. [¶], Anlade, Y.D.R. [¶], and Jega, I. S. [+]**
[¶]Department of Animal Science, Faculty of Agriculture, Kebbi State University of Science and Technology, Aliero, PMB 1144 Birnin kebbi, Nigeria.
[+]Department of Forestry and Fisheries, Faculty of Agriculture, Kebbi State University of Science and Technology, Aliero, PMB 1144 Birnin kebbi, Nigeria.
**Corresponding author:** ibrahim.ribah73@gmail.com **(07036333707)**

## ABSTRACT
*The study was conducted to determine the proximate composition and organoleptic characteristics of mutton sausage produced using three processing methods (cooked, smoked and cooked-smoked). The treatments were replicated four (4) times, 3 replicates were used for organoleptic analysis and one replicate was used for proximate analysis. The experiment was laid down in a completely randomized design (CRD) with the processing methods as the treatments. Organoleptic analysis was conducted using a panel of 10 judges who evaluated the blind coded samples for acceptability, juiciness, flavour and aroma. Proximate analysis evaluated moisture content, ash, lipid, fiber, crude protein, nitrogen and carbohydrate. Results of organoleptic analysis indicated that processing methods of sausage did not significantly (P<0.05) affect any of the parameters investigated. Result for proximate analysis indicated that processing methods had significantly (P<0.05) affected moisture and carbohydrate contents with cooked sausage and smoked sausage samples having higher moisture content (63.8 and 63.3%, respectively). Similarly, cooked sausage samples had higher carbohydrate content (6.6%) than other samples. All other proximate components were not significantly (P>0.05) affected by processing methods. The study concluded that cooked-smoked sausages should be produced for optimization of organoleptic appeal and nutritional benefits.*

**Keywords**: Proximate, Organoleptic, Mutton Sausage, Processing Methods, Smoke

## INTRODUCTION
On a global scale, the estimative production of sheep meat in the year 2016 was relatively low, with less than 14.4 million tonnes, when compared to beef (68 million tonnes), pork (115 million tonnes), and poultry (117 million tonnes (FAO, 2017). In Nigeria, irregular supply of sheep meat has been considered the main reason responsible for its low consumption (Olalgaquiaga *et al*. 2002; Dutra *et al*., 2015). High fat content, low tenderness and the distinct flavour of mutton may result in the decline of its marketing value. Industrialization of culled sheep carcasses in processed meat products is a strategy to stimulate the consumption of the meat of older animals (Guerra *et al*., 2013). There are different kinds of meat products all over the world, among which sausages represent an important part (USDA 2007). Sausages are a meat product usually made from ground meat, often pork, beef, mutton, or poultry, along with salt, spices and other flavorings which are combined at the formulation stage with respect to criteria of composition, technological factors, sensory characteristics, legal regulations, functionality and production cost (Francois *et al*., 2012; Elbakheet *et al*., 2017). Typically, a sausage is formed in a casing traditionally made from intestine but sometimes from synthetic materials. Sausages that are sold raw are cooked in many ways, including pan-frying, broiling and barbecuing. Some sausages are cooked during processing and the casing may then be removed. Sausage making is a traditional food preservation technique. Sausages may be preserved by curing, drying, smoking, or freezing. (Eleonora Trojan *et al*., 2011). Some cured or smoked sausages can be stored without refrigeration. Sausages come in a huge range of national and regional varieties, which differ by their flavoring or spicing ingredients (garlic, peppers, wine, etc.), the meat used in them and their manner of preparation (Oster and Kenneth. 2011).

The quality of meat products depends on the raw meat quality, additives, conditions of production, storage temperature and handling conditions (Woellert Dann, 2019). According to (Olalgaquiaga Perez, *et al.*, 2002) fresh sausages and the raw-semidry forms are produced from diverse kinds of meat such as beef, pork, mutton, chicken, turkey, etc and usually pork fat or fatty tissues. Furthermore, various non-meat ingredients such as salt, herbs, spices, juices, vinegar, and additives like nitrites, phosphates, sorbates, can be added according to the type of sausage, geographical traditions or manufacturing practices. According to (Lawrence and Georgina 2013), the preparation of sausages includes both traditional and non-traditional methods.

Although mutton carcass value is relatively low compared to other competitive meat, world per capital consumption of sheep meat during the past 15 years has decreased steadily while that of other species has increased (USDA, 2007). The characteristic flavour has been cited as one reason for the low consumption of sheep meat, as well as its firm, dense, and dark red colour fibres. Thus, to improve on mutton consumption, research should focus on enhancing its flavouring property (Peery e*t al.*, 2002).

## MATERIALS AND METHODS

### *Study area*

The experiment was carried out at Biochemistry Laboratory, Kebbi State University of Science and Technology Aliero.

### *Experimental design*

The experiment was laid in a completely Randomized design (CRD) which involved three (3) methods of sausage production to produce mutton sausage. The methods served as treatments and was replicated four (4) times.

### *Source of experimental materials*

Three (3) kilograms of fresh mutton was obtained from an apparently healthy animal, purchased from the abattoir in Birnin Kebbi State. Other ingredients including potatoes, cabbage, carrot, cucumber, onions, tomatoes, pepper, salt, curry, umami (cocktail of monosodium glutamate), were also sourced from local a market and taken to the Biochemistry laboratory, of the Department of Animal Science, Kebbi State University Aliero for further processing in to the sausage varieties.

### *Preparation of mutton sausage*

Three kilograms (3kg) of mutton muscle and large intestine were purchased from the central market Birnin Kebbi. The visible fats and connective tissues were washed and the washed meat was cut into manageable pieces. Two kilograms (2kg) of a combination of cabbage, carrot, cucumber, potato, onion, tomato and pepper were chopped and mixed with the cut pieces of the meat. The meat and ingredients were thoroughly mixed together with salt, cocktail of umami, curry and thyme was used. The ingredient was then stuffed into the large intestine. Four (4) replicates of the first treatment were cooked for 20 minutes using a medium volume of fire from a gas cooker. Four (4) replicates of the second treatment were smoked using a charcoal stove until the casing of the product turned brownish in color, and four (4) replicates the last treatment were cooked and then smoked. One sample from each treatment was analysed for proximate composition while the remaining three were used for determination of organoleptic properties.

### *Determination of proximate composition of mutton sausage*

Proximate composition was determined using the procedure of Association of Analytical Chemists (AOAC, 2007).

### *Sensory analysis*

A panel of ten judges was utilized for the sensory analysis of the sausage samples. Each judge was presented with four blind coded cooked samples. Order of presentation was randomized. Acceptability, juiciness, flavour and aroma of the tenderized sausage was evaluated by the panel using Qualitative Descriptive Analysis (QDA) on scale of intensity as described by Stone and Sidel (1993).

### *Data collection*

The judgement of the sensory evaluation panel was used to collect data for sensory properties of acceptability, juiciness, flavour and aroma of sausage. A 30cm measuring ruler was placed on the scale and approximated

the marks made by individual judges for various samples and were quantitatively approximated to values which will be later use for data analysis.

***Data analysis***

Both proximate and sensory data was analysed using General Linear Model (GLM) multivariate analysis. Significant means was separated using Games-Howell Test. SPSS statistical package was e used for the data analysis (SPSS, 2007).

## RESULTS AND DISCUSSION

***Organoleptic characteristics of mutton sausages prepared using different methods***

Table 1 shows the organoleptic characteristics of mutton sausages prepared using different methods. Results indicated that preparation methods of sausages did not significantly (P>0.05) affect any of the tested characteristics. However, higher numerical values of between 6 and 8.4 on a 9-point hedonic scale obtained in the current study indicated that all the parameters tested were favoured across all the preparation methods.

Table 1 Organoleptic characteristics of mutton sausages prepared using different processing methods

| Treatment | Organoleptic Parameters | | | |
|---|---|---|---|---|
| | Acceptability | Juiciness | Flavour | Aroma |
| Cooked-Smoked sausage | 8.400 | 7.500 | 8.500 | 8.000 |
| Cooked Sausage | 8.300 | 8.400 | 8.400 | 8.100 |
| Smoked Sausage | 8.400 | 6.400 | 8.100 | 8.200 |
| SE | 0.235 | 0.600 | 0.242 | 0.313 |

The panellists were not able to detect any significant difference in mutton sausage irrespective of the cooking method employed, however, the score range between 6 - 8.5 signified acceptability of the product. Juiciness which is regarded as the most important sensory attribute affecting meat acceptability (Warkup *et al.*, 2015) had a favourable score of between 6.4 to 8.4 points.

Acceptability of cooked-smoke, cooked and smoked sausage were between the scale of 8.40, 8.30 and 8.30 respectively. This implied that all cooking methods were very much acceptable. However, juiciness in cooked sausage at 8.40 was the highest value indicating that it was highly tasty. Flavour in cooked and smoke was highest at 8.50 indicating that the combined processing given to the samples could have helped in converting the meat protein into flavour compounds thereby giving it the characteristic flavour. Smoked sausage had the highest value of aroma on the hedonic scale at 8.20 indicating it is very much aromatic.

***Proximate composition of mutton sausages prepared using different methods***

Table 2 shows the proximate composition of mutton sausages prepared using different methods. Results indicated that processing methods of sausages had significantly affected (P<0.05) only moisture and nitrogen free extracts (NFE) contents of the sausages. However, no significant effect was observed in ash, lipid, fibre and crude protein contents.

Table 2 Proximate composition of mutton sausages prepared using different processing methods

| TREATMENT | PROXIMATE PARAMETERS (%) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Moisture | Ash | Lipid | Fibre | Nitrogen | Crude protein | NFE |
| Cooked | 63.3[a] | 6.5 | 2.5 | 0.8 | 3.1 | 20.1 | 5.6 [ab] |
| Cooked-Smoked | 56.8 [b] | 10.0 | 3.8 | 1.3 | 3.2 | 20.8 | 6.6 [a] |
| Smoked | 63.8 [a] | 7.0 | 3.5 | 1.2 | 3.2 | 19.9 | 3.6 [b] |
| SE | 1.2 | 1.3 | 0.347 | 0.167 | 0.092 | 0.328 | 0.645 |

a,b= means with different superscripts along the same column differ significantly (P0.05)

The moisture content of mutton sausage sample ranged from 56.80% in cooked-smoked to 63.80% in cooked and smoked were significant at ($P<0.05$) difference. This is ascribed to a temperature-induced, structural shrinkage, which causes fluid to be expelled from the sausage.

However, carbohydrate content significant ($P<0.05$) difference occurred in cooked-smoked, cooked sausage and smoked sausage at 6.6%, 5.6% and 3.6% respectively. From the Table 4.1 no significant effect was observed in ash content, lipid content, fibre content, nitrogen content and crude protein content.

## CONCLUSION AND RECOMMENDATION

The study concluded that cooked sausages and cooked-smoked sausages should be produced for optimization of organoleptic appeal and nutritional benefits.

## REFERENCES

AOAC (2007). Official methods of analysis of AOAC International. Gaithersburg, MD: Association of Official Analytical Chemists.

Dutra, M.P., Palheres, P.C. and Silva, J.R.O. (2013). Technological and quality characteristics of cooked ham-type with sheep meet.

Eleonora, T. and Julian, P., *Tradycyjnewędzenie*Archived 29 September 2011 at the Wayback Machine AA Publishing. 96pages. ISBN 978-83-61060-30-7

FAO (2017). FAOSTAT Database [internet]. Food and Agriculture Organization of the United Nations [cited 2021 May 5]. Available from: http://www.fao.org/faostat/en/#home

François P, Pires CC, Griebler L, et al. Physico-chemical and sensorial properties of fermented *Godwin, Nigel (27 February 2009).* "St David's Day recipes: Glamorgan sausages". *The Daily Telegraph. London.* Archived *from the original on 24May 2012.*

Woellert, D. (2019). Cincinnati Goetta: A Delectable History. Arcadia Publishing. ISBN 9781467142083.

Lawrence, G. (June 2013). Zalzett Malti ~ Maltese Sausage. Archived (2016) at the Wayback Machine. *Tal-Forn*. Retrieved 24 May 2021.

Peery, S.M and Reavis, C.G. (2002). "Vegetarian Sausages". Home Sausage Making (3rd Ed.). North Adams, Mass.: Storey Books. pp. 201–212. ISBN 978-1-58017-471-8. Archivedfrom the original on 11May 2021.

Elbakheet, I.S, Elgasim, A.E. and Algadi, M.Z. (2017). Proximate Composition of Beef Sausage Processed By Wheat Germ Flour. J Food Process Technol 8: 704. doi: 10.4172/2157-7110.1000704

Guerra, I.C.D., Meireles, B.R.L.A., Félex, S.S.S., (2013). Spent lamb meat in the preparation of mortadella with different levels of pork fat. *Cienc Rural*; 42:2288-94.

Olalgaquiaga Perez JR, Bressan MC, Bragagnolo N, (2002). Effect of different lamb breed and their slaughter weights on cholesterol, fatty acid profile and proximate composition. *Food Sci Technol* (Campinas); 22:11-8.

Oster, K.V. (2011). The Complete Guide to Preserving Meat, Fish, and Game:Step-By-step Instructions to Freezing, Canning, and Smoking. Atlantic Publishing Company. ISBN 9781601383433. Archived from the original on 19 November 2020.

Rome, June (2017) FAO, food outlook report, food and agriculture organisation of the United Nations.

USDA (2007). Standards of Identity; see Subparts E, F and G". *Archived from* the original *on 19December2020.*

Warkup CC, Marie S, Harrington G (1995). *Expression of tissue proteinases and regulation of protein degradation as related to meat quality* Ed. A. Quali, D. Demeyer and F.J.M. Smulders. Ecceamst. Ultrechit. The Netherlands. pp. 225-23 View publication.