NIGERIAN AGRICULTURAL JOURNAL
ISSN: 0300-368X
Volume 53 Number 3, December 2022 Pg. 188-193
Available online at: http://www.ajol.info/index.php/naj
https://www.naj.asn.org.ng


# Physicochemical and Sensory Properties of Meat Floss Developed from Rabbit Meat and Different Oils

**[*1]Adediran, O. A. and [2]Abdul, O.**

[1]Department of Animal Science, University of Ibadan, Ibadan, Nigeria
[2]College of Vocational Education and Entrepreneurship, Lagos State University of Education, Lagos, Nigeria
[*]Corresponding Author's email: dimu4ever@yahoo.com

**Abstract**
Meat floss is a shredded meat product that is light, easy to pack and nutrient retaining which is produced traditionally from beef, in this study it was produced from rabbit meat to optimize the benefits associated with rabbit meat such as low fat, cholesterol and sodium. This study evaluated the physicochemical and sensory properties of rabbit meat floss (RMF) produced with different oil types. RMF was produced from rabbit meat by cooking, cooling, shredding and deep-frying was done in three cooking oils (Refined palm oil, soya oil and canola oil). The proximate composition (%) of the freshly prepared meat floss was determined. RMF types were assessed for sensory, and physicochemical properties alongside Thiobarbituric Acid Reactive Substances (TBARS[mg/100g]), in a completely randomized design. Only Ether extract was significantly different among the RMF, with Soya oil (62.00) being higher than others It was observed that TBARS was also higher in RMF with Soya oil (3.62) than others. There were no significant study differences across the sensory parameters. This showed that cooking oil type had no significant difference on the crude protein content of the product, or the ash content. The rabbit meat floss across all oil types were well accepted, with Soya oil standing out as the best for rabbit meat floss production.

***Keywords: Rabbit meat, rabbit meat floss, refined palm oil, soya oil, canola oil***

## Introduction

Meat is the edible part of the skeletal muscle of an animal that is healthy at the time of slaughter (Olaoye, 2011). It is a nutritious and valuable food, and rich in protein which makes it an ideal medium for the growth and proliferation of meat spoilage microorganisms and common food-borne pathogens (Adzitey *et al*., 2010). The high nutrients and moisture content make meat prone to spoilage that can be prevented by value addition (Anna *et al*., 2005). This involves all the processes involved in prolonging the shelf-life of meat. Meat left unprocessed or untreated will spoil within several hours or days. This led to the need to process meat right from prehistoric times because not all the game animals would be consumed at once hence the need to process and preserves the meat to be consumed at a later time. Dehydration is one of the first forms of meat preservation (Kassim and Omojola, 2020), either by sun-drying, smoking, and deep frying for products such as meat floss. Therefore, the need for meat processing is a result of the need to preserve meat (Vandendriessche, 2008) and increase the shelf life.

Meat processing is the production of meat products from lean meat, animal fat and certain non- meat additives. Currently, meat processing does not just serve to increase shelf life, now the additives enhance the flavour, appearance and nutritional quality of the product. Meat processing can create meat products from all edible livestock parts including the lean meat which is made tasty, attractive, nourishing and shelf-stable, making the product last longer periods without refrigeration at room temperature such as canned heat sterilized products, slightly dried products, products with a low level of moisture and other preserving effects increasing the shelf life. (Mahendra *et al*., 2018). Shelf-stable meat products such as dried meat foods like *biltong* from South Africa, *kundi* and *danbunama* from Nigeria, *charqui* from South America, rousong from Vietnam (name varies between regions) which can be conveniently stored and transported without refrigeration are excellent for developing countries and regions without adequate power provisions for refrigeration.

Meat floss falls in the group of intermediate moisture meat products having less than 20% moisture produced by cooking, pounding(shredding), and frying with the addition of spice (Ogunsola and Omojola, 2008). It is quite common in Northern Nigeria where it is processed primarily from the thigh muscle (semitendinosus muscle) of cattle and called *dabunnama*. It is commonly consumed by the upper echelon of the society Northern Nigeria.

Meat floss is a dried meat product with good nutritive value and varying shelf stability at room temperature which can be consumed by the general public as a snack or in the combination with other foods as the protein source in daily diet. Meat floss has a light and fluffy texture, easy-to-pack and without any reheating or further preparation (Ockerman and Li, 1999). Majority of processed meats are traditionally made from beef, pork, or a combination of the two. Rabbit meat is high in protein, low in calories, and low in fat and cholesterol, making it a delicacy and a healthy food product that is easy to digest. Often promoted as a healthier alternative to beef and pork; it is recommended for both the young and the elderly (DalleZotte, 2000). It also has lesser sodium levels. As a result, it is recommended for heart disease patients, hypertension individuals, geriatrics, and specific diets for weight loss. It is a good source of B vitamins (B2, B3, B5, B12) as well as lipid-soluble vitamins A and E. (Combes, 2004). Rabbit meat is very low in uric acid, being recommended even to people with gout, besides it has a low content of purines (Hernandez *et al*., 2007).

There have been to some extent research in the production of meat floss with beef, chevron, mutton and pork but production of meat floss from rabbit meat is still a largely undocumented. The oil type used in meat processing influences the shelf-life and nutritive value because the oil is absorbed and becomes part of the product (Mihaela *et al*., 2010). Oil type also affects oxidation causing harmful changes in foods as a result of lipid oxidation such as loss of flavour or production of off flavours, loss of colour, nutrient value, and accumulation of compounds, which may be harmful to consumers (Wasowicz, 2004). Therefore this study was designed to investigate the physicohemical and sensory properties of meat floss developed from rabbit meat using three oil types.

## Materials and Methods

### *Experimental Site*

This experiment was carried out at the Department of Animal Science, University of Ibadan, Nigeria, in the Animal products and processing laboratory.

### *Sample Collection*

Twelve unsexed and mature chinchilla rabbits were purchased from a reliable source in Ibadan, Oyo State. The rabbits were fasted and rested before slaughtering. They were slaughtered under hygienic conditions in the Animal products and processing laboratory of the Department of Animal Science using the kosher means of slaughtering. After slaughter, the rabbits were hoisted for efficient bloodletting by gravitational force and the pumping effect of the heart. The rabbits were skinned, eviscerated, trimmed of excess fat and deboned. Samples for the determination of water holding capacity, thermal shortening and cooking loss were collected randomly and the parameters were determined.

### *Meat Floss Preparation*

This involved all the steps involved in the conversion of the carcass to the final product which is the meat floss such as spice mixture preparation, meat preparation, cooking, shredding, frying, de- oiling (draining of excess oil) and packaging.

### *Cooking and Shredding Recipe Preparation*

Two recipes were prepared, Cooking Recipe and Shredding Recipe, shown in Table 1 and Table 2. The recipes were formulated/prepared based on previous work by Kassim and Omojola (2020) where a similar recipe was used in the production of meat (beef) floss. All the ingredients for the recipes were locally sourced from a well patronized open market. Each ingredient was pulverized, measured and thoroughly mixed as needed for each of the two recipes. The cooking and shredding recipes were kept separate in airtight plastic containers until used.

### *Cooking*

The already cleaned meat was put into a pot and placed on the gas burner for cooking and the cooking recipe was added in the ratio of 1g of spice to 100g of meat. 80g of spice was added in total to the meat (8kg), thinly sliced fresh onions of 800g (approximately 80g on a dry matter basis) were added and water was added in the ratio of 25cl to 1000g of meat. The meat was cooked until the broth dried in the meat ensuring the meat was properly cooked for about 40 minutes. The meat samples were removed and allowed to cool at room temperature before weighing.

### *Shredding*

The cooked and cooled meat samples were shredded by pounding with a local mortar and pestle. The shredding recipe was added in the ratio of 50g of spice to 1000g of meat. These were weighed and added a little at a time as pounding progressed to ensure proper and uniform mixing of the recipe. The pounding was intense and consistent until the meat strands disengaged and were beaten to shreds. After shredding the meat was weighed and separated into three equal parts for frying in the different oil types.

### *Frying*

The shredded meat was separately deep-fried in three different oil types namely; Refined palm oil, Soya oil and Canola oil which were preheated to 180ºC (the ratio of oil to meat was 1 litre to 1000g of meat). The meat samples were fried until a golden brown colouration was obtained.

### *Draining of Excess Oil*

After frying each batch of shredded meat until golden brown, the products were poured into a colander and pressure was manually applied to squeeze out part of the frying oil, the product was later transferred into a cheesecloth where it was pressed with clean, washed and dry hands to remove more of the excess oil to prevent the final product from sticking together. The meat floss from each oil type was poured into separately marked trays, allowed to cool and separated into strands.

***Meat Quality Studies***

Cooking loss, thermal shortening, water holding capacity (WHC), sensory evaluation, and proximate analysis were all investigated in terms of meat quality.

***Cooking Loss***

Cooking loss was measured by taking known weight of the fresh meat sample and loosely tying in polyethene bags and placing in boiling water for 20 minutes. The meat sample[s] were removed and allowed to cool to room temperature. The samples were re-weighed and cooking loss was calculated as:

$$\text{Cooking loss } (\%) = \frac{\text{Initial weight of meat} - \text{Final weight of meat}}{\text{Initial weight of meat}} \text{ X } 100 \text{ ...... (1)}$$

***Thermal Shortening***

Thermal shortening was determined by exposing meat samples of known length and thickness to moist heat cooking for 20 minutes in preheated water. After cooking for 20 minutes and equilibrating to room temperature, the lengths of meat samples were re-measured. The length difference was expressed as thermal shortening using a modified method by Mahendrakar *et al.* (1988).

$$\text{Thermal Shortening } (\%) = \frac{\text{Initial length of meat} - \text{Final length of meat}}{\text{Initial length of meat}} \text{ X } 100 \text{ ....(2)}$$

**Water Holding Capacity**

This was determined using the press method described by Suzuki *et al*., (1991). 1g of raw meat samples were sandwiched between two sheets of Whatman No. 1 filter paper. The meat in the filter paper sandwich was pressed for 1 minute with a vice between two plexi glasses. The amount ofwater released from the samples was calculated indirectly by comparing the area of wet filter paper to the area of the pressed meat samples.

The water holding capacity was calculated thus:

$$\text{WHC} = 1 - \frac{\text{Total area - Meat area}}{\text{Meat area}} \text{ X } 100 \text{ ..... (3)}$$

***Oxidative Rancidity***

This was evaluated using the modified method described by Witte *et al*., (1970). 1g of sample was weighed into a test tube and homogenized with 2mls of distilled water. 2.5mls of Trichloroacetic acid (TCA) was added into each test tube and centrifuged at 2000 revolutions per minute for 10 minutes. 1ml of the centrifuged sample was decanted into a test tube and 1ml of Thiobarbituric acid (TBAR) was added to the test tubes. The mixture was further boiled for 35mins and poured into a curvet. A UV-VIS spectrophotometer was used to read the samples at 532nm wavelength. The results were expressed as mg malondialdehyde/kg sample.

***Sensory Analysis***

This was evaluated by panelists consisting of a 15 member semi-trained panel, according to the procedures of AMSA (1995). They comprised both male and female from the undergraduate and postgraduate students of the Department of Animal Science, University of Ibadan. They were given unsalted cracker biscuits and water to clean their mouths in-between tasting rabbit meat floss samples. On a clean saucer, the panelists were presented with rabbit meat floss from various oil types in a sequential fashion. Each treatment's meat floss was evaluated independently of the other. Colour, flavour, tenderness, ropiness, juiciness, texture, and overall acceptability were all rated on a 9-point hedonic scale by the panelists.

***Statistical Analysis***

All data obtained were subjected to statistical analysis using SAS 2000 package while means were separated with Duncan Multiple Range Test. Statistical significance was set at $P<0.05$.

**Results and Discussion**

***Results***

***Physical properties of rabbit meat used in meat floss production***

Cooking loss, Thermal Shortening and Water Holding Capacity of rabbit meat used in meat floss production are shown in Table 3.

***Oil absorption and production cost of rabbit meat floss produced with different oil types***

The value for oil absorption shown in Table 4 was highest in refined palm oil (62.50), followed by 60.00% each for canola oil and soya oil. Soya oil had the least production cost while Canola oil had the highest production cost.

***Proximate composition of Rabbit meat floss prepared from different oil types***

The proximate composition of rabbit meat floss prepared from different oil types is shown in Table 5. There was no significant difference ($P>0.05$) between the dry matter contents of the different meat floss from the different oil types and ranged between 89.15 and 81.73%. The crude protein of the meat floss from different oil types ranged between 38.72 and 37.11% were not significantly (P>0.05) different. The ash contents ranged between 6.20 and 3.75% were not significantly (P>0.05) different.

The ether extract had no significant difference (P>0.05) between meat floss produced from refined palm oil (56.83%) and canola oil (54.50%), but these were significantly less (P<0.05) than 62.00% of soya oil.

***Effect of cooking oil type on TBARS value (mg/100g) of rabbit meat floss***

The effect of cooking oil type on TBARS (mg/100g) of rabbit meat floss is shown in Table 6. There were significant differences (P<0.05). Rabbit meat floss prepared with Soya oil had significantly higher TBARS of 3.62mg/100g, while the values for Canola oil and Refined palm oil were similar.

***Effect of cooking oil types on sensory properties of rabbit meat floss***

The results of the sensory evaluation of rabbit meat floss produced with three cooking oil types as assessed by the panelists are expressed in Table 7. There were no significant differences (P>0.05) observed for aroma, flavour, taste, juiciness, roppiness, and overall acceptability of rabbit meat floss prepared with canola oil, soya oil, and refined palm oil.

***Discussion***

The Cooking loss, thermal shortening and water holding capacity recorded for rabbit meat used in this experiment were all within normal range and similar to observations by (Bizkova and Tumova, 2010)

The crude protein for rabbit meat floss from this study (38.72-37.11%) was higher than that obtained from meat floss from beef, chevon and pork (25, 23 and 25% respectively) obtained by USDA (2001) but falls within the range of 38.92-41.21% reported by Ogunsola and Omojola (2008). However, the ether extract and ash from this study was very high compared to 1.86-1.98% and 0.95-0.98% obtained by Akhter *et al.* (2009). This difference is a result of the different meat types used in meat floss preparation, the higher values for crude protein, ash and ether extract is an indication of how the product is rich in nutrients. The moisture content of this study (18.27- 10.85%) of the different meat floss produced falls above the range of values 8.60-13.56% obtained by Huda *et al*., (2012).

The thiobarbituric acid reactive substances (TBARS) values have been commonly considered as an index of lipid rancidity. The quantitative production of malondialdehyde during oxidation of fat in food is responsible for TBARS values. The level of malondialdehyde generated in meat/ stored meat products can be determined using the TBARS assay (Ahn *et al*., 1998). It was observed that rabbit meat floss produced with soya oil had the highest TBARS value (3.62). This is in agreement with earlier observations by Yang *et al*., 2005 who reported that soybean oil had the second highest iodine number (an index of susceptibility to lipid oxidation) among different edible oils and fats. No significant differences were observed for aroma, flavour, taste, juiciness, ropiness and overall acceptability by the taste panels. However, rabbit meat floss with prepared soya oil had marginally higher aroma and acceptability than canola and refined palm oil.

**Conclusion**

The results obtained from this study indicate that rabbit meat floss produced with soya, canola and refined palm oils are acceptable for consumption, and it can be adopted as a means for the promotion of the consumption of rabbit meat to extend the health benefits associated with rabbit meat to people more.

**References**


Adzitey, F., Teye, G. A., Ayim, A. G. and Addy, S. (2010). Microbial quality of Chevon and mutton sold in Tamale metropolis of Northern Ghana. *Jour. Applied Sci. and Environ. Mgt*., 14 (4): 53-55.

Ahn, D. U., Olson, D. G., Lee, J. I., Jo, C., Wu, C. and Chen, X. (1998). Packaging and Irradiation Effects on Lipid Oxidation and Volatiles in Pork Patties. *Jour. Food Sci*., 63(1): 15-19.

AMSA (American Meat Science Association) (1995). Research guidelines for cookery, sensory evaluation and instrumental tenderness measurements of fresh meat. Chicago: National Livestock and Meat Board. Pp. 1–33.

Anna, A. M., Lackshmannan, V., Mendiratta, S. K., Anjaneyulu, A. S. R. and Bisht, G. S. (2005). Development and quality characteristics of extruded tripe snack from buffalo rumen meat and corn flour. *Journal Food Science Technology*, 42: 263-267.

Bizkova, Z. and Tumova, E. (2010). Physical characteristics of rabbit meat: A review. *Scientia Agriculturae Bohemica (Czech Republic)*. http://sab.czu.cz/cs/ (Accessed 23/10/2022).

Calkins C. R. and Hodgen J. M. (2007). A fresh look at meat flavour. *Meat Sci*., 77(1): 63 - 80.

Combes, S. (2004). Valeur nutritionnelle de la viande de lapin. *Prod Anim*., 17: 373–383.

Dalle Zotte, A., (2000). Main factors influencing the rabbit carcass and meat quality. In *Proceedings 7th World Rabbit Congress*, *July Valencia*, *Spain*,

*Vol. A*. Pp. 507-537.
Hernandez, P. (2007). Enhancement of Nutritional Quality and Safety in Rabbit Meat. *9th World Rabbit Congress*, 1287.
Huda, N., Fatma, Y., Fazillah, A. and Adzitey, F. (2012). Chemical composition, colour and sensory characteristics of commercial serunding (Shredded Meat) in Malaysia. *Pakistan Jour. Nutri*., 11(1):1-4.
Kassim, O. R. (2013). Development and quality evaluation of meat floss from beef, chevon and pork. P h. D thesis. Department of Animal Science, University of Ibadan. Pp. 22.
Kassim, O. R. and Omojola, A. B (2020). Effects of cooking oils and packaging media on quality of meat floss. *Nigerian Journal of Animal Production*, 47(3):323 – 335.
Mahendra, P. (2018). Application of Various Techniques for Meat Preservation. *Journal of Experimental Food Chemistry*, 4: 1-6.
Mahendrakar, N., Khabade, V. S. and Dani, N. P. (1988). Studies on the effect of fattening on carcass characteristics and quality of meat from Banner lambs. *Jour. Food. Sci. Technol*., 25: 228- 231.
Mihaela, G., Mira, T., George, B., Petru, N., and Vasilica, S. (2010). Nutritional and health aspects related to frying (1). *Romanian Biotechnology Letters*, 15 (6): 5675-5682.
Ockerman H., and Li C. T. (1999). The evaluation of palatability of dehydrated meat product-meat floss. Research and Reviews. Meat Special Circular Ohio State University, Department of Animal Sciences, *Extension Bulletin*, *Pp. 172*-199.
Ogunsola O. O. and Omojola A. B. (2008). Qualitative evaluation of Kilishi prepared from beef and pork. *African Journal of Biotechnology*, 7(11):1753-58.
Olaoye O. J. (2011). Meat: An overview of its composition, biochemical changes and associated microbial agents. *Int. Food Res. J*., 18(3): 877 – 885.
Rehm, S. and Espig, G. (1991). The cultivated plants of the tropics and subtropics. Verlag Josef margrave/CTA. Pp. 552.
Suzuki, A., Koima, N. and Ikeuchi, Y. (1991). Carcass composition and meat quality of Chinese purebred and European X Chinese crossbred pigs. *Meat Sci*., 29: 31-41.

**Table 1: Composition of the cooking recipe used for meat floss production (g/100g)**

| Ingredients/seasoning | Scientific/Botanical names | Quantity (g/100g) |
|---|---|---|
| Salt | Sodium Chloride | 10.00 |
| Maggi | Maggi | 15.00 |
| Thyme | *Thymus vulgaris L.* | 12.50 |
| Curry | *Murraya koenigii (L.) Spreng.* | 12.50 |
| Onions | *Allium cepa L. var. cepa* | 50.00 |
| Total | | 100.00 |

***Source: Kassim and Omojola (2020)***
**** All botanical names according to Rehm and Espig (1991)***

**Table 2: Composition of shredding recipe used for meat floss production (g/100g )**

| Ingredients/seasoning | Scientific/Botanical names | Quantity (g/100g) |
|---|---|---|
| Red Pepper | *Piper nigrum* L. | 35.00 |
| Maggi | Maggi | 30.00 |
| African Nut Meg | *Monodora myristica* (Gaertn.) Dunal | 2.50 |
| Ginger | *Zingiber officinale Rosc*. | 4.00 |
| Garlic | *Allium sativum* L | 3.00 |
| Cloves | *Syzygium aromaticum* (L.) Merr. et L.M.Perry) | 2.50 |
| Curry powder | *Murraya koenigii* L. | 3.50 |
| Thyme leaves | *Thymus vulgaris* L. | 2.50 |
| Salt | Sodium Chloride | 5.00 |
| Onions | *Allium cepa* L. var. cepa | 12.00 |
| Total | | 100.00 |

***Source: Kassim and Omojola (2020)***
**** All botanical names according to Rehm and Espig (1991)***

**Table 3: Physical properties of rabbit meat used in meat floss production**

| Parameters | Rabbit meat |
|---|---|
| Cooking loss (%) | 31.12±4.15 |
| Thermal shortening (%) | 27.09±2.95 |
| Water holding capacity (%) | 82.41±2.52 |

***Values are mean±SD.(n=5)***

**Table 4: Oil absorption and production cost of rabbit meat floss produced with different oil types**

| | Rabbit meat floss | | |
|---|---|---|---|
| | **Refined palm oil** | **Canola oil** | **Soya oil** |
| Oil absorption (%) | 62.50 | 60.00 | 60.00 |
| Production Cost (Naira/kg) | 24,142 | 25,568.7 | 20,287.45 |

**Table 5: Proximate composition of rabbit meat floss prepared from different oil types**

| Parameters | Refined palm oil | Canola oil | Soya oil | SEM |
|---|---|---|---|---|
| Dry matter | 89.15±9.12 | 83.10±10.39 | 81.73±0.25 | 6.45 |
| Crude protein | 38.72±10.61 | 37.82±10.20 | 37.11±11.06 | 6.38 |
| Ash | 6.20±2.47 | 4.50±0.17 | 3.75±0.35 | 0.25 |
| Ether extract | 56.83±1.04$^{b}$ | 54.50±1.00$^{b}$ | 62.00±2.78$^{a}$ | 0.58 |

***$^{a,b}$ Means with the same superscript are not significantly different (P>0.05)***

**Table 6: Effect of cooking oil type on TBARS value (mg/100g) of rabbit meat floss**

| Cooking oil type | TBARS(mg/100g) |
|---|---|
| Canola oil | 2.90±0.20$^{b}$ |
| Refined palm oil | 2.89±0.21$^{b}$ |
| Soya oil | 3.62±0.51$^{a}$ |

***$^{a, b, c}$ Means with the same superscript are not significantly different (P>0.05)***

**Table 7: Effect of cooking oil types on sensory properties of rabbit meat floss**

| | Rabbit meat floss from different cooking oil types | | |
|---|---|---|---|
| **Sensory parameters** | **Canola oil** | **Soya oil** | **Refined palm oil** |
| Aroma | 4.43±1.82 | 4.50±1.94 | 4.01±1.68 |
| Flavour | 5.22±2.20 | 5.05±1.03 | 4.95±1.37 |
| Taste | 6.61±2.09 | 6.49±2.40 | 6.37±1.50 |
| Juiciness | 5.10±2.07 | 4.91±2.10 | 4.63±1.42 |
| Ropiness | 5.48±2.13 | 5.57±2.24 | 5.28±1.54 |
| Overall Acceptability | 6.58±1.59 | 6.74±2.51 | 6.42±1.25 |

***$^{a,b,}$ Means with the same superscript are not significantly different (P>0.05)***