Effect of Animal Species on the Quality and Quantity of Kilishi Meat Products in Mubi North Local Government Area of Adamawa State

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Abstract—The effect of Animal Species on the Quality and Quantity of Kilishi Meat Products was studied. Fresh meat of cattle, sheep, goats and camel were purchased from Mubi abattoir and were used to prepare kilishiusing slurry prepared from groundnut cake, pepper, maggi, ginger and other spices. Proximate composition of all the meat samples were carried out, storage yield of kilishi product was determined, sensory evaluation was also done. The results revealed that there was no significant (P>0.05) difference in yield of Kilishi prepared from different animal species. However, after one month of preservation, the yield of Kilishi from the various animal species differed significantly (p<0.05). Camel meat yields the highest quantity of Kilishi; both of initial (0.50kg) and final (0.61kg) weight. However beef (cattle meat) produced the best Kilishi. Also the result of the taste panel revealed that there was no significant difference (p>0.05) between the models, species, weeks, replication and their interaction.

Keywords—kilishi meat product, animal species, Quality, Quantity and Mubi north.

I. INTRODUCTION

Kilishi is an intermediate moisture meat that has a suitable concentration of dissolved solids that binds the moisture in it sufficiently to inhibit the growth of spoilage organism, thus it is a ready-to-eat convenience meat product possessing excellent shelf life stability at room temperature. Making handling and marketing of the product ‘convenient for consumers and retailers alike.(Igene J.O. 1990; Olusola, 2006). It is a traditional, sun dried Nigerian and Saharan African meat product processed using lean beef in combination with plant ingredients. It contains about 46% meat and 54% non-meat ingredients. A finished product contains about 50% protein, 7.5% moisture. 18% lipid and 9.8% fibre/ash respectively (Igene, J.O 1988; Igene et al, 1993)

The product came about as a means of preserving meat in the absence of facilities for refrigerated storage, by the early Fulani and Hausa herdsman. In Northern Nigeria, the producing states of kilishi include: Borno, Kano, Sokoto, Kaduna and Bauchi. This is made possible because the weather is favourable, Consumer demand is high and more than 70% of the Nigerian cattle population of 10 million can be found in these states (Alaku and Igene 1983). However its production in the southern states is limited to the dry season (between October and December). The product has gained popularity even today in all major urban as well as rural centres particularly in the Northern parts of Nigeria where it is sold in the streets and in some supermarkets the only traditional Nigerian meat product to attain such status (Igene et al., 1990).

Meat makes a valuable contribution to diet in developing countries because of its nutritional importance, as a source of protein, having high biological value, an excellent source of many nutrients; especially protein, fat, B-vitamin, Iron, Zinc and Vitamin A and essential and Non-essential amino-acid needed to build, maintain and repair body tissues (Alonge, 1984). Protein malnutrition is a major public health problem in developing world: diets in these parts predominantly starch, the major food crops being roots and tubers (Arberoumand and Deokule, 2009).

Meat deterioration begin soon after it has been slaughtered due to chemical changes, enzymatic action and the action or presence of micro-organisms (bacteria, yeast and mould) which may result in oxidative rancidity, discoloration, moldiness, off flavor, slimness etc., the major source of these deteriorative changes are the micro-organism and these render the meat unacceptable and unfit for human consumptions (Forrest et al., 2001).

In Nigeria there is a preferential consumption of different types of meat by communities due to a combination of factors bordering on religious belief, culture, food habits, sex of animal, age at slaughter, socio-economic factors and individual variation (Ajiboyeet et al., 2011). Meat being nutritious, with high moisture content and nearly neutral pH is a good culture medium for many micro-organisms.
(bacteria, yeasts and moulds) and as such, classified among perishable foods whose contamination with spoilage organisms are almost unavoidable (Ikeme, 1990). This makes meat preservation more difficult than other types of food as it may result in oxidative rancidity, discolouration, off flavour, sliminess etc. The kind and amount of spoilage organisms in meal depends upon the availability of nutrients, presence of oxygen, temperature, pH at storage and generation interval of the spoilage micro-organism under given environment etc. (Forrest et al., 2001). It is necessary to minimize deterioration in order to prolong the time during which acceptable levels of quality are maintained. This depends upon the processing and preservative method used and the inherent properties of the meat in question (Forrest et al., 2001).

This study therefore aimed at assessing the proximate composition, storage yield of Kilishi from different animal species and also examines the consumer sensory ratings of the kilishi meat products.

II. METHODOLOGY

Experimental Site

The study was conducted at the meat science laboratory Adamawa State University, Mubi within the north eastern guinea savannah zone of Nigeria located on latitude 10° North and between longitudes 13° 30 east at latitude of about 305 meters above sea level. The dry season of the area commences early October and last April while wet season begins from May and attains peak between July and August and declines in September. The mean annual rainfall is about 1050 mm. The relative humidity is extremely low (20-30%) between January and March but reaches peak of about 80% in August and September. The maximum temperature 40% particularly in April while the minimum temperature is about 1 °c between December and January (Adebayo and Tukur. (1999).

Source: Adebayo and Tukur (1999).

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**Kilishi Preparations**

A sharp knife was used to trim off visible fats, nerves, blood vessels and connective tissues. It was then sliced into a very thin continuous sheet of 0.5-1mm length and 0.5-2mm thick.

The meat was then spread on a wire mash and allowed to dry for 24 hours. This is followed by soaking the dried sliced meat into the already prepared slurry. The meat is then spread again on the wire mash and was allowed to be sun dried for 10 hours and this roasted for 5 minutes at temperature of 850°C, finally it was sun dried again for 10 hours and weighed (fig. 2).

<table>
<thead>
<tr>
<th>Ingredients/spices</th>
<th>Reference formulation (Fe)</th>
<th>Treatment (proportion %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weight (g)</td>
<td>Proportion (%)</td>
</tr>
<tr>
<td>Defatted groundnut dough</td>
<td>1980</td>
<td>68.0</td>
</tr>
<tr>
<td>Onion</td>
<td>420</td>
<td>14.0</td>
</tr>
<tr>
<td>Ginger</td>
<td>180</td>
<td>6.0</td>
</tr>
<tr>
<td>Dried (hot) pepper</td>
<td>90</td>
<td>3.0</td>
</tr>
<tr>
<td>Cloves</td>
<td>60</td>
<td>2.0</td>
</tr>
<tr>
<td>Candle wood</td>
<td>60</td>
<td>2.0</td>
</tr>
<tr>
<td>Black pepper</td>
<td>60</td>
<td>1.0</td>
</tr>
<tr>
<td>Salt</td>
<td>30</td>
<td>1.0</td>
</tr>
<tr>
<td>Curry powder</td>
<td>60</td>
<td>2.0</td>
</tr>
<tr>
<td>Mg cube</td>
<td>60</td>
<td>1.0</td>
</tr>
<tr>
<td>Ratio (Groundnut dough: spices)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Fig. 2: Flow chart of the preparation of kilishi

**Proximate Analysis of meats from different animal species**

Equal weight (1kg) each of fresh boneless meat from camel, beef, sheep and goat was purchased from Mubi abattoir was used in the preparation of Kilishi. Part of this was also used to determine the dry matter content by oven drying at 72°C for 48 hours, protein, fat, and ash content as described by Association of Official Analytical Chemist (AOAC, 1990).

**Determination of the quantity of Kilishi produced from meats of various animal species.**

The prepared kilishi from each of the four animal’s species were roasted at room temperature and were then weighed and recorded separately. After one month in storage they were weighed again before the final evaluation by the taste panelist. Any change in colour and appearance was monitored up to the end of the experiment.

**Sensory evaluation**

A fifteen persons taste panel was constituted to rate the quality of the Kilishi based on each character as palatability, tenderness, juiciness, flavour, colour and acceptability. Structural questionnaire was administered. Marks were awarded and designated as follows: 1, 2, 3 and 4 for poor, fair, good and very good respectively.

**Statistical Analysis**

Data on yield of Kilishi and palatability scores obtained from taste panel were statistically analysed using the model.
Proximate composition of meat from four animal species

Table 1: shows the proximate composition of meat from four animal species.

<table>
<thead>
<tr>
<th>Species</th>
<th>Dry matter %</th>
<th>Protein %</th>
<th>Fat %</th>
<th>Ash %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>15.00</td>
<td>28.93</td>
<td>15.21</td>
<td>8.0</td>
</tr>
<tr>
<td>Sheep</td>
<td>13.30</td>
<td>27.88</td>
<td>14.00</td>
<td>7.20</td>
</tr>
<tr>
<td>Goat</td>
<td>18.50</td>
<td>28.00</td>
<td>10.45</td>
<td>7.11</td>
</tr>
<tr>
<td>Camel</td>
<td>20.80</td>
<td>28.61</td>
<td>11.32</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Dry matter content
The dry matter value of 20.80% obtained on camel meat in this study is lower than the value reported by Oguntana and Akinleye (1995) and Olumo (1995) respectively. The difference could be due to the age, sex, and marbling of the meat. The mutton dry matter value (13.30%) is similar to the value recorded by Olomu (1995).

Protein content
The protein content obtained on cattle, goat, and camel meat in this study is similar to the value obtained by Igene et al., (1990) and Farruk (1991) respectively. The crude protein (27.88%) obtained from sheep compared favourably with the value of 27.21% reported by Olumo (1995).

Fat extract
The fat extract content of 15.21% obtained on cattle meat is similar to the value of 15.31 reported by Oguntola and Akinleye (1995). The ether extract content of goat (10.45%) is higher than the value of 9.86% reported by Oguntola and Akinleye (1995) while value on mutton and camel tend to be similar to value reported by Olumo (1995).

Ash content
The ash content value of 8.5% obtained on cattle meat is higher than the value of 8.0% reported by Igene and Farruk (1990). The ash value 7.20% and 7.11% on sheep and goat meat in this study a similar to the values of 7.40 and 7.90 reported by Igene and Tukur (1986) which could be due to the age and sex of the animal.

Storage yield of Kilishi
The result in this study shows that there is no significant difference (p >0.05) in yield between Kilishiobtained after roasting and after one month in preservation. This is due to the loss in moisture content which occurs at a faster rate during the first month and then occurs slowly. This is in accordance with Adaku et al (1985) who reported that Kilishiis a traditional intermediate meat product.

Storage yield of Kilishi

Table 2: shows the storage yield of Kilishi from four animal species

<table>
<thead>
<tr>
<th>Species</th>
<th>Kilishi weight before preservation (kg)</th>
<th>Mean weight after one month preservation (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>0.42</td>
<td>0.37</td>
</tr>
<tr>
<td>Sheep</td>
<td>0.42</td>
<td>0.34</td>
</tr>
<tr>
<td>Goat</td>
<td>0.43</td>
<td>0.24</td>
</tr>
<tr>
<td>Camel</td>
<td>0.45</td>
<td>0.45</td>
</tr>
</tbody>
</table>

The result on the storage yield of Kilishi show that there is no significant difference (p<0.05) in yield between the Kilishi of all species obtained after roasting and after one month in preservation. The highest mean weight of 0.45 kg was obtained on camelKilishi while the lowest mean weight of 0.24 kg was on goat Kilishi.

Sensory Evaluation
Table 3: Mean Score by the taste panel over five months

<table>
<thead>
<tr>
<th>Species</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camel</td>
<td>373.33</td>
<td>273.33</td>
<td>286.67</td>
<td>333.33</td>
<td>286.67</td>
<td>290.87&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Cattle</td>
<td>240.00</td>
<td>266.67</td>
<td>260.00</td>
<td>400.00</td>
<td>373.33</td>
<td>327.33&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Sheep</td>
<td>313.33</td>
<td>333.33</td>
<td>366.67</td>
<td>266.67</td>
<td>253.30</td>
<td>306.68&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Goat</td>
<td>333.33</td>
<td>353.33</td>
<td>373.33</td>
<td>266.67</td>
<td>273.33</td>
<td>320.10&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Mean</td>
<td>315.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td>305.83&lt;sup&gt;a&lt;/sup&gt;</td>
<td>321.67&lt;sup&gt;a&lt;/sup&gt;</td>
<td>306.67&lt;sup&gt;a&lt;/sup&gt;</td>
<td>296.67&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Note: figure with the same letter are not significantly different (p > 0.05)

From the table above, it can be observed that Kilishi from cattle meat scores significantly higher (p > 0.05) than Kilishi from camel meat and there is no significant difference (p > 0.05) between cattle, sheep and goat Kilishi.

**Sensory evaluation of different meat products**

From the result of the taste panellists, it can be observed that Kilishi from cattle meat scores significantly higher (p > 0.05) than Kilishi from other products which could be due to bread differences as reported by Igene et al. (1995). The result also indicates that the longer in storage period the better the taste of the Kilishi up to the fourth month but in the fifth month the quality of the Kilishi of all the species dropped. This is probably due to the increased in the toughness of the Kilishi in the fifth month. The result increased of this study was in accordance with the findings of Adaku et al., (1985) who reported that Kilishi if well dried could be stored for sixth month without spoilage. The groundnut cake and pepper are partially responsible for the colour of Kilishi which is the reddish brown.

**IV. SUMMARY AND CONCLUSION**

Conclusively the study revealed that Kilishi from the large animal (camel and cattle) are usually tougher than that of the smaller animals (sheep and goat). It has also been established that Kilishi could be stored a longer period and be a very good traditional technology of meat preservation. Therefore improvement of this indigenous knowledge of meat preservation need to be further investigated.

**REFERENCES**


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